



NATIONAL
BUREAU OF
ECONOMIC
RESEARCH

CURRENCY CRISES

EDITED BY

PAUL KRUGMAN

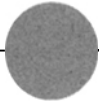


This Page Intentionally Left Blank

Currency Crises



**A National Bureau
of Economic Research
Conference Report**



Currency Crises

Edited by **Paul Krugman**

The University of Chicago Press

Chicago and London

PAUL KRUGMAN is professor of economics at Princeton University and a research associate of the National Bureau of Economic Research.

The University of Chicago Press, Chicago 60637
The University of Chicago Press, Ltd., London
© 2000 by the National Bureau of Economic Research
All rights reserved. Published 2000
Printed in the United States of America
09 08 07 06 05 04 03 02 01 00 1 2 3 4 5
ISBN: 0-226-45462-2 (cloth)

Library of Congress Cataloging-in-Publication Data

Currency crises / edited by Paul Krugman.

p. cm.—(A National Bureau of Economic Research conference report)

Includes bibliographical references and indexes.

ISBN 0-226-45462-2 (cloth : alk. paper)

1. Currency question—History—20th century. 2. Foreign exchange—History—20th century. 3. Financial crises—History—20th century. I. Krugman, Paul R. II. Conference report (National Bureau of Economic Research)

HG3881 .C87 2000
332.4'5—dc21

00-037712

© The paper used in this publication meets the minimum requirements of the American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1992.

National Bureau of Economic Research

Officers

Carl F. Christ, *chairman*
Kathleen B. Cooper, *vice-chairman*
Martin Feldstein, *president and chief executive officer*
Robert Mednick, *treasurer*
Sam Parker, *chief financial officer*

Susan Colligan, *corporate secretary*
Kelly Horak, *controller and assistant corporate secretary*
Gerardine Johnson, *assistant corporate secretary*

Directors at Large

Peter C. Aldrich	Martin Feldstein	Rudolph A. Oswald
Elizabeth E. Bailey	Stephen Friedman	Robert T. Parry
John H. Biggs	George Hatsopoulos	Peter G. Peterson
Andrew Brimmer	Karen N. Horn	Richard N. Rosett
Carl F. Christ	Judy C. Lewent	Kathleen P. Utgoff
Don R. Conlan	John Lipsky	Marina v.N. Whitman
Kathleen B. Cooper	Leo Melamed	Martin B. Zimmerman
George C. Eads	Michael H. Moskow	

Directors by University Appointment

George Akerlof, <i>California, Berkeley</i>	Marjorie B. McElroy, <i>Duke</i>
Jagdish Bhagwati, <i>Columbia</i>	Joel Mokyr, <i>Northwestern</i>
William C. Brainard, <i>Yale</i>	Andrew Postlewaite, <i>Pennsylvania</i>
Glen G. Cain, <i>Wisconsin</i>	Nathan Rosenberg, <i>Stanford</i>
Franklin Fisher, <i>Massachusetts Institute of Technology</i>	Craig Swan, <i>Minnesota</i>
Saul H. Hymans, <i>Michigan</i>	David B. Yoffie, <i>Harvard</i>
	Arnold Zellner, <i>Chicago</i>

Directors by Appointment of Other Organizations

Marcel Boyer, <i>Canadian Economics Association</i>	Richard D. Rippe, <i>National Association for Business Economics</i>
Mark Drabenstott, <i>American Agricultural Economics Association</i>	John J. Siegfried, <i>American Economic Association</i>
Gail D. Fosler, <i>The Conference Board</i>	David A. Smith, <i>American Federation of Labor and Congress of Industrial Organizations</i>
A. Ronald Gallant, <i>American Statistical Association</i>	Josh S. Weston, <i>Committee for Economic Development</i>
Robert S. Hamada, <i>American Finance Association</i>	Gavin Wright, <i>Economic History Association</i>
Robert Mednick, <i>American Institute of Certified Public Accountants</i>	

Directors Emeriti

Moses Abramovitz	Franklin A. Lindsay	Bert Seidman
George T. Conklin, Jr.	Paul W. McCracken	Eli Shapiro
Thomas D. Flynn	Geoffrey H. Moore	
Lawrence R. Klein	James J. O'Leary	

Since this volume is a record of conference proceedings, it has been exempted from the rules governing critical review of manuscripts by the Board of Directors of the National Bureau (resolution adopted 8 June 1948, as revised 21 November 1949 and 20 April 1968).

This Page Intentionally Left Blank

Contents

	Acknowledgments	ix
	Introduction	1
	Paul Krugman	
1.	Currency Crisis and Unemployment: Sterling in 1931	7
	Barry Eichengreen and Olivier Jeanne	
	<i>Comment:</i> Michael D. Bordo	
2.	Political Contagion in Currency Crises	47
	Allan Drazen	
	<i>Comment:</i> Carmen M. Reinhart	
3.	Balance-of-Payments Crises in Emerging Markets: Large Capital Inflows and Sovereign Governments	71
	Guillermo A. Calvo	
	<i>Comment:</i> Roberto Rigobon	
4.	The Onset of the East Asian Financial Crisis	105
	Steven Radelet and Jeffrey Sachs	
	<i>Comment:</i> Frederic S. Mishkin	
5.	Is Launching the Euro Unstable in the Endgame?	163
	Robert P. Flood and Peter M. Garber	
	<i>Comment:</i> Peter B. Kenen	

6.	The Mexican Peso in the Aftermath of the 1994 Currency Crisis	183
	Sebastian Edwards and Miguel A. Savastano <i>Comment: J. Bradford De Long</i>	
7.	The Aftermath of the 1992 ERM Breakup: Was There a Macroeconomic Free Lunch?	241
	Robert J. Gordon <i>Comment: Paul Krugman</i>	
8.	Current Account Reversals and Currency Crises: Empirical Regularities	285
	Gian Maria Milesi-Ferretti and Assaf Razin <i>Comment: Jaume Ventura</i>	
9.	Panel Presentation: The Asian Model, the Miracle, the Crisis, and the Fund	327
	Jeffrey A. Frankel	
10.	Panel Presentation: Involving the Private Sector in Crisis Resolution	339
	Peter B. Kenen	
	Contributors	345
	Author Index	347
	Subject Index	351

Acknowledgments

Thanks to those who made this conference possible, above all Kirsten Foss Davis and the rest of the NBER Conference Department, without whom we would have experienced a crisis as well as studying them!

This Page Intentionally Left Blank

Introduction

Paul Krugman

There is no generally accepted formal definition of a currency crisis, but we know them when we see them. The key element is a sort of circular logic, in which investors flee a currency because they fear that it might be devalued, and in which much (though not necessarily all) of the pressure for such a devaluation comes precisely from that capital flight. Such crises have been a recurrent feature of the international economy ever since gold and silver coins were replaced by paper; currency crises played a large role in the economic turmoil of the interwar era, in the breakup of Bretton Woods, and in the early stages of the Latin American debt crisis of the 1980s. And since the late 1970s currency crises have also been a major subject of academic study.

But nothing in the past history of the subject prepared economists for the 1990s. Future historians may, in fact, dub this the Age of Currency Crises: never before, not even in the interwar period, have currency crises played such a central role in world affairs. The massive attacks that roiled the European Monetary System in 1992–93 were a high-water mark for currency speculation; but that mark was soon surpassed by the “tequila” crisis of 1995; and *that* mark surpassed by the still-unfolding Asian currency crisis of 1997–98, which at the time of writing seems to be spreading back to Latin America. Currency crises—both crises that actually do happen and the sometimes desperate efforts of national governments and international agencies to head them off before they start—have become a defining force for economic policy in much of the world.

Paul Krugman is professor of economics at Princeton University and a research associate of the National Bureau of Economic Research.

It might seem that the decision to hold a special conference on currency crises at the National Bureau of Economic Research was a natural response to this vastly heightened importance of the subject. In fact, however, this is only partly true. Martin Feldstein approached me with the idea for such a conference in 1996, when the European and Latin crises had subsided and the idea that something even worse could happen to emerging Asia never even entered people's minds. By the time of the conference in February 1998, of course, what had been conceived as a low-key academic research meeting had acquired enormous salience.

Aside from topicality, however, why was another conference on a well-established research field needed? The answer is that despite two decades of research on the causes and consequences of currency crises, important issues are either unresolved or require a fresh look in the face of new experience. Here is a review of the three main issues that the conference revisited.

What Drives Crises?

Despite the fact that everyone agrees in a broad sense about the nature of currency crises—about the circular logic in which expectations of devaluation make devaluation more likely—the details have long been disputed. In general, this dispute divides researchers along two fault lines.

First, through what channel does speculation against a currency make the devaluation of that currency more likely? In the early currency crisis models, the channel was assumed to be essentially a mechanical linkage: speculation led to a depletion of foreign exchange reserves, which would then force the central bank to give up its defense of the original parity. One can still defend this assumption as a useful first pass at the problem—and in some cases even a reasonably good description of events. However, from the early years of currency crisis research many economists have argued that in the real world governments have much more freedom of action than the stylized models recognized, and that as a result the logic of such crises was more subtle and less mechanical than the existing theory.

Until recently the most influential alternative to the classic foreign-reserve-driven crisis model was what Eichengreen, Rose, and Wyplosz (1996) have dubbed “second generation” crisis models, which emphasize not the mechanical exhaustion of foreign exchange but the problems of macroeconomic policy. Loosely, a second-generation model imagines a government that is physically able to defend a fixed exchange rate indefinitely, say, by raising interest rates, but that may decide the cost of defense is greater than the cost in terms of credibility or political fallout from abandoning the defense and letting the currency float. In this case a currency crisis can develop because doubts about the government's willingness to defend the parity force it to raise interest rates, and the need to

keep interest rates high in turn raises the cost of defending the parity to a level the government finds unacceptable. The second-generation model came into its own in the European crises of 1992–93 and remains an important piece of the research agenda. In chapter 1 Barry Eichengreen and Olivier Jeanne argue that a version of second-generation theory does well at explaining not only recent European experience but also one of the important currency crises of the interwar period: Britain's departure from the gold standard in 1931. Allan Drazen's analysis of contagion, in chapter 2, is also predicated on second-generation logic, in which abandonment of the fixed parity brings macroeconomic gains but political costs, costs that are less if other countries have also faltered.

However, the emerging market crises of 1995 and 1997 do not seem to fit either first- or second-generation logic. After all, according to second-generation models devaluing or floating a currency gives the government freedom to follow more expansionary policies; yet in both Latin America and Asia currency crises were followed by severe recessions. Most researchers have therefore concluded that a different type of model—third generation?—is needed, with most work focusing on the issues involving financial intermediaries and liquidity effects. Guillermo Calvo's chapter 3 offers a rich menu of possible third-generation crisis models; Steven Radelet and Jeffrey Sachs offer an insightful comparison of the “real economy” implications of alternative crisis stories in chapter 4 and argue for what may be becoming the canonical story about emerging market crises, the idea that such crises are essentially bank runs that manifest themselves through the foreign exchange market.

While the mechanism of crisis has been one source of dispute, the determinants of whether and when a crisis occurs has been another. Early crisis models were “fundamentalist”: that is, crises happened to countries whose fixed exchange rates were unsustainable in the long run, and happened when underlying economic conditions—such as the level of foreign exchange reserves—deteriorated past some critical point. However, an alternative tradition—particularly associated with Maurice Obstfeld (1994), who unfortunately could not attend the conference—argues that crises involve a strong element of self-fulfilling prophecy, that exchange regimes that could have survived indefinitely can nonetheless collapse if subjected to an essentially random speculative attack. Radelet and Sachs argue this position strongly for emerging Asia: drawing on both economic evidence and the apparent lack of early warning signs from the financial markets, their view is that this was a gratuitous crisis, that nothing in the Asian situation warranted such a sudden reversal of fortune.

It may be worth noting that in the months following the conference, two broad strands of “third generation” modeling did emerge. One strand—building on an idea largely due to Ronald McKinnon (see in particular McKinnon and Pill 1996) but applied to the Asian crisis by a number of

authors—focused on the role of implicit loan guarantees in generating excessive risky investment. Currency crises are then interpreted as a crisis of this moral hazard regime; it is the collapse of the investment that precipitates the macroeconomic setback.

The other strand elaborates on the “bank run” story suggested by Radelet and Sachs, emphasizing self-fulfilling collapse via either literal bank runs—a view promulgated by Chang and Velasco (1998a, 1998b)—or some kind of balance-sheet-driven financial contraction.

While there are dissenters, it seems fair to say that academic opinion has swung fairly strongly toward the self-fulfilling crisis view, largely because of the phenomenon of “contagion”: the way that a crisis in one country seems able to trigger a crisis in another, even when the economic links appear to be minor. Most economists have concluded that this can happen only if believing makes it so—that is, if the nervousness created by a crisis in one country can set in motion a self-fulfilling run on the currency of another. However, the Drazen chapter points out that since in many crisis models the cost of abandoning a peg is essentially political—presumably because of the loss of credibility when a government reneges on a pledge to maintain the exchange rate—the lack of strong economic linkages may be irrelevant. If governments find safety in numbers, if devaluing when other countries have already devalued is less costly to one’s reputation than acting alone, contagion can be consistent with a fundamentalist story about the timing of crises.

Clearly these controversies have not been resolved; but clearly also there has been a deepening of our understanding of the issues, and considerable movement in the views of the main protagonists.

How Should We Model Governments?

One of the main issues in currency crisis modeling—closely tied to the distinction between first-, second-, and third-generation models—is the question of how to think about government behavior. The early models assumed a very passive government, which stolidly doled out foreign exchange until the last dollar was gone; later models have tended to assume a much more sophisticated, activist policy. It also turns out that analyzing crises requires that one specify not only what the government will do *during* the crisis but what policies it will follow if its defense of the exchange rate fails.

Most of the papers in the volume give at least some consideration to these issues. Two focus specifically on government policies. In chapter 5 Robert Flood and Peter Garber take on a currency regime that was at the time of writing still prospective—the “Stage III” regime in Europe, in which the euro exists as a unit of account but not yet as an actual circulating currency. It is widely assumed that the financial arrangements within

Stage III will ensure the invulnerability of that system to speculative attack. Flood and Garber point out, however, that at least in principle those arrangements imply a willingness of national central banks to extend each other completely open-ended credit lines; if one has doubts about whether they will actually do so, one also has doubts about whether the system is really crisis-proof. One need not agree that a Stage III crisis is at all likely to agree that this kind of careful attention to the implications of monetary arrangements can be crucial.

Sebastian Edwards and Miguel Savastano consider the policies followed by the Bank of Mexico after the 1994 crisis—a period during which the peso suffered a megadevaluation, far greater than most analysts had expected, and in which interest rates rose to unexpected heights. In chapter 6 Edwards and Savastano show that the textbook assumption that a central bank pegs until its reserves are gone, then lets the currency float freely, is far from the reality: in actuality the peso was the subject of considerable attempts at short-term management even in the postcrisis float.

What Are the Effects of Crisis?

If there has been one area in which views of currency crises have shifted most since the origins of the academic literature two decades ago, it is probably the consequences of such crises for the real economy. In the early models crises were thought of as monetary events with few real consequences. Second-generation models, which emphasized the macroeconomic payoff to devaluation, suggested that real economic performance should if anything improve following a successful speculative attack—and the folk wisdom has been that this was in fact the case in Europe following the 1992 crisis. More recently, the experience of emerging economies has suggested to many that currency crises, by forcing these countries to move suddenly from current account deficit to surplus, cause severe economic downturns.

On closer examination, however, these generalizations are far less clear. Robert Gordon revisits the postcrisis European landscape in chapter 7 and finds that the conventional view that it was better to fail than to succeed at currency defense is heavily colored by just one comparison—Britain versus France—and that the overall picture is much less clear. (And the subsequent rise of the pound suggests that structural factors may have played a bigger role, and monetary ones a smaller one, in British success than widely believed.) Gian Maria Milesi-Ferretti and Assaf Razin focus on emerging economies in chapter 8, examining a cross section of many crisis episodes. Their surprise conclusion is that currency crises and sudden current account reversals are not the same thing—and that while currency crashes are normally associated with sharp declines in output, current account reversals are not. At the very least this suggests that we need

to rethink the channels through which the adverse effect of currency crises takes place.

A Field in Transition

The study of currency crises is a field in flux, largely because the world itself keeps on throwing up new crises for us to examine at a rate that would be gratifying to scholars if it were not so terrifying to policymakers. The papers collected in this volume are very far from the last word. But they represent the latest thinking, captured at a moment in which some of the best minds in economics were focused on the theory and practice of speculative attack, and will surely serve as the basis for much more work to come.

References

- Chang, R., and A. Velasco. 1998a. Financial fragility and the exchange rate regime. New York: New York University, C. V. Starr School of Business. Working paper.
- . 1998b. Financial crises in emerging markets: A canonical model. New York: New York University, C. V. Starr School of Business. Working paper.
- Eichengreen, B., A. Rose, and C. Wyplosz. 1996. Speculative attacks on pegged exchange rates: An empirical exploration with special reference to the European Monetary System. In *The new transatlantic economy*, ed. M. Canzoneri, W. Ethier, and V. Grilli. New York: Cambridge University Press.
- McKinnon, R., and H. Pill. 1996. Credible liberalizations and international capital flows: The overborrowing syndrome. In *Financial deregulation and integration in East Asia*, ed. T. Ito and A. O. Krueger. Chicago: University of Chicago Press.
- Obstfeld, M. 1994. The logic of currency crises. *Cahiers Economiques et Monétaires* (Bank of France) 43:189–213.

Currency Crisis and Unemployment Sterling in 1931

Barry Eichengreen and Olivier Jeanne

1.1 Introduction

With this conference, held nineteen years after the appearance of Krugman's pathbreaking article on speculative attacks, the literature on this subject can be said to have passed through adolescence and reached maturity (in, one hopes, all senses of the word). Like any maturing subject, this one evinces changing preoccupations. The early literature on speculative attacks focused on conflicts between the stance of monetary and fiscal policies on the one hand and the authorities' exchange rate commitment on the other. An attack was assumed to occur when excessively expansionary monetary and fiscal policies gradually depleted the central bank's international reserves. It was triggered when those reserves fell to a critical threshold at which they were abruptly exhausted by currency speculators. This model was attuned to the time in the sense that inflation and, by implication, excessively expansionary monetary and fiscal policies were widespread problems, creating chronically overvalued currencies, and in that capital markets were less than fully liberalized, limiting the

Barry Eichengreen is the George C. Pardee and Helen N. Pardee Professor of Economics and Political Science at the University of California, Berkeley, and a research associate of the National Bureau of Economic Research. Olivier Jeanne is an economist in the research department of the International Monetary Fund and a research affiliate of the Centre for Economic Policy Research, London.

This paper benefited from the comments of Tim Hatton, Michael Bordo, and conference participants. The first version was completed while Barry Eichengreen was visiting the International Monetary Fund and Olivier Jeanne was visiting the Department of Economics at the University of California, Berkeley. The hospitality of these institutions is gratefully acknowledged.

ability of central banks and governments to borrow to defend the exchange rate.¹

More recently, attention has shifted to conflicts between the internal and external objectives of governments. Where the “first generation” models referred to above highlighted conflicts between domestic and external policy instruments, “second generation” models focus instead on internal and external objectives. In recent models, optimizing central banks and governments are assumed to maximize a welfare function that has as arguments domestic variables like output, employment, and the stability of the banking system on the one hand and external variables like the commitment to the exchange rate peg on the other. Central banks are free to borrow, and the level of reserves no longer determines their capacity to defend the exchange rate. But there may be a conflict between the steps required to defend the currency and those that work to stabilize output, employment, and the banking system. Hence, worsening domestic conditions may tip the balance toward policies to stabilize output and employment and induce the authorities to abandon the currency peg. To the extent that the markets are aware of these incentives, a gradual deterioration in domestic conditions may lead investors to anticipate the inevitable and precipitate an attack. And that attack can occur without evidence of the inflation, current account deficits, monetary excesses, and overvaluation on which first-generation models depend.²

Like their predecessors, these second-generation models, developed in the early 1990s, were stimulated by the events of the time. The speculative attacks of the early nineties took place in an environment of high capital mobility in which the ability of central banks to borrow was no longer an issue. In a number of cases, of which France in 1992–93 is the most frequently cited example, attacks occurred in the absence of obvious evidence of monetary excesses, inflation, competitiveness problems, and current account deficits. They took place in the context of high unemployment, which rendered governments reluctant to raise interest rates and restrict credit in order to defend the currency if doing so meant aggravating labor market conditions. Some countries had weak banking systems whose stability might have been further jeopardized by policies restricting the availability of credit. Others had governments that had issued large amounts

1. Borrowing to defend the exchange rate was not impossible, only difficult. But to the extent that borrowed reserves had to be paid back with interest, borrowing aggravated any existing fiscal imbalance and might not even delay the crisis. See Buiter (1987).

2. The original Krugman formulation assumed purchasing power parity, so no change in the ratio of domestic to foreign price levels was possible; excess demand at home produced current account deficits but no overvaluation. Subsequent models relaxed the purchasing-power-parity assumption and allowed monetization to produce inflation and overvaluation in the period leading up to the attack (e.g., Calvo 1987; Willman 1988). But from the standpoint of the distinctions of concern to us here, these differences in assumption are of little consequence.

of short-dated public debt, on which debt-servicing costs were highly sensitive to the level of interest rates. All these were reasons why officials might have perceived a conflict between the measures needed to defend the currency and those appropriate for pursuing domestic economic objectives, and why a deterioration in domestic conditions might precipitate an attack.³

However appealing the explanation these models provide for such episodes as the attacks on the French franc in 1992–93, their generality has been questioned by authors who continue to emphasize excessive inflation and problems of external competitiveness as causes of currency crises (see, e.g., Krugman 1996; Dornbusch, Goldfajn, and Valdés 1995). Second-generation models, they note, have been subjected to few empirical tests (see, however, Jeanne 1997a; Jeanne and Masson 2000). In a sense, the generality and empirical applicability of the insights about real-world behavior that can be gleaned from these models remain contentious issues.

In this paper we explore the insights about the 1931 sterling crisis to be gained from applying a second-generation model and in turn attempt to push this strand of literature forward a few modest steps. Our focus on the 1930s is no happenstance, for the Great Depression is the obvious hunting ground for investigators seeking to understand the connections between unemployment and currency instability. Not only was this a decade of unprecedented unemployment throughout the industrial world, but the period was marked by rampant speculative attacks that culminated in the collapse of the gold-exchange-standard system. Much has been written about the unemployment and the currency crises of the 1930s, but in most of this literature the two phenomena are only obliquely linked. And the sterling crisis is the obvious place to start. Unemployment had been the highest for the longest in the United Kingdom, and the attack on

3. The distinction we have drawn here, between first-generation models, in which attacks occur because domestic demand is excessive (and spills over into imports and reserve losses) and second-generation models, in which attacks occur because domestic demand is deficient (causing unemployment and undermining the authorities' resolve to defend the currency), is different from that drawn by other authors (viz. Krugman 1996; International Monetary Fund 1997; Flood and Marion 1999). These authors emphasized instead the distinction between models that are characterized by unique or by multiple equilibria. From our point of view, this is a secondary issue: both classes of models we have described may feature either unique or multiple equilibria, depending on details of specification. First-generation models produce a unique equilibrium if the authorities' policy process is unique and invariant (in Krugman's case, if they adopt an unchanging fiscal policy and monetize all deficits). They produce multiple equilibria if the policy process is contingent and the authorities are assumed to shift to a more inflationary monetary policy if and only if the currency is attacked (as in Flood and Garber 1984 and Obstfeld 1986). But both possibilities are also present in second-generation models. If a rise in (exogenously determined) unemployment increases devaluation expectations without feedback, the timing of speculative attacks will be uniquely determined. But if unemployment in turn depends on the level of interest rates, which respond to devaluation expectations, then expectations of devaluation can prove self-fulfilling and multiple equilibria can arise.

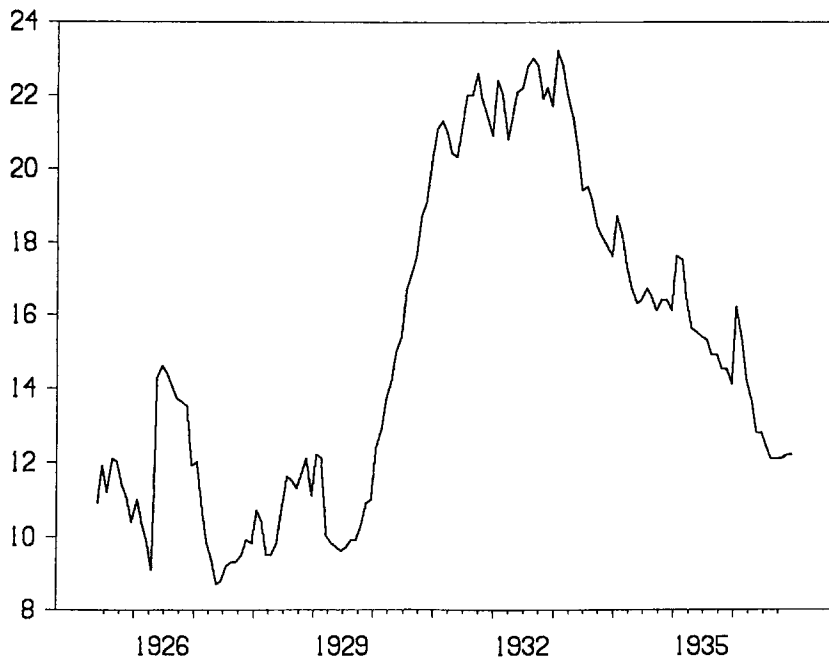


Fig. 1.1 Unemployment rate

sterling in 1931 was the pivotal event in the collapse of the interwar gold standard. We believe—and seek to convince the reader—that a second-generation model of currency crises and unemployment sheds considerable light on this episode.

We do so in a paper organized as follows. Section 1.2 presents an overview of the unemployment and monetary situations. Besides reviewing the evidence, we introduce some prior accounts that are interpretable in terms of the relations driving second-generation models. Section 1.3 presents a theoretical model suitable for formalizing the facts and derives its properties. Section 1.4 reports our attempt to marshal econometric support for that specification. Section 1.5 analyzes the causes of the sterling crisis. Section 1.6, in concluding, seeks to draw out the broader implications.

1.2 Background

The period on which we focus is demarcated by Britain's return to the prewar parity on 25 April 1925 and its departure from gold on 19 September 1931. Figure 1.1, displaying the monthly rate of unemployment as calculated by the Ministry of Labour, reminds us that unemployment was a thorn in the lion's paw throughout the period. Having risen to the double

digits by the time the return to gold took place, the unemployment rate jumped to a new peak in excess of 14 percent in the wake of the coal strike of mid-1926, whose disruptive effects lingered for several quarters. It hovered in the range of 9 to 12 percent before soaring to levels in excess of 20 percent following the onset of the Great Depression.⁴

Debate centered on whether the government's exchange rate commitment had contributed to this joblessness. Starting in 1920 Britain underwent five years of retrenchment in order to reverse the effects of its wartime inflation and to reduce prices to lower levels like those that prevailed in the United States, thereby permitting the prewar exchange rate against the dollar to be restored. Sterling appreciated faster than wages, and prices declined. The markets knew that the act of Parliament suspending the gold standard would expire in 1925 and that extending it would embarrass the government, suggesting that the authorities would persist in their efforts to deflate and to restore sterling to its prewar level against the dollar prior to the end of that year.⁵ They bid up the currency in anticipation.⁶

Monetary stringency and high real interest rates superimposed on a backdrop of large-scale demobilization had predictable effects. Unemployment was already high, in other words, when the sterling parity was restored. But why it rose as high as it did and then failed to decline are contested issues. On one side are those who emphasize a series of negative shocks (the coal strike in 1926, interest rate hikes by a Federal Reserve Board concerned with "excessive speculation" on Wall Street starting in 1928, and then the Great Depression) imposed on a labor market that had lost much of its nominal flexibility, combined with a government prevented from engaging in much countercyclical stabilization by the constraints of a fixed exchange rate. On the other side are observers who emphasize labor market rigidities caused by an overly generous unemployment insurance scheme that raised the reservation wage, reduced the in-

4. The official unemployment series reported here was generated by dividing the number of insured workers registered as unemployed by the number covered by the unemployment insurance system. This is problematic to the extent that coverage of the insurance system was incomplete; in particular, agricultural workers, public employees, household workers, and recent labor force entrants (who had not yet made the requisite number of weekly contributions to qualify for insurance) were excluded. Feinstein (1972) adjusted the annual averages using decennial census figures for unemployment as benchmarks, obtaining slightly lower rates. But it was the official figures based on the insurance system that were fodder for the political debate and as such figured in the government's objective function and hence in market assessments of likely future policies.

5. A process modeled by Miller and Sutherland (1994).

6. The extent to which sterling was therefore overvalued when pegged to the dollar in April 1925 is the subject of a classic debate. Keynes's (1925) estimate was that sterling was overvalued by 10 to 15 percent. Subsequent authors have challenged his calculations on a number of grounds; e.g., from a variety of available U.S. price indexes, Keynes just happened to choose the one for the state of Massachusetts indicating the largest overvaluation for sterling. More representative indexes suggested a somewhat smaller overvaluation on the order of 5 to 10 percent.



Fig. 1.2 Real exchange rate

tensity of search, and boosted the equilibrium unemployment rate. The modern literature acknowledges the compatibility of the two views, although there is no consensus on the relative weights that should be attached to them.⁷

Some insight into the operation of these factors can be gleaned from figures 1.2, 1.3, and 1.4. Figure 1.2 shows the real exchange rate, measured as the ratio of U.K. and U.S. consumer prices. It provides no evidence of real appreciation and growing overvaluation in 1929–31—to the contrary.⁸ Figures 1.3 and 1.4 suggest that the real wage and real interest rate were more important channels transmitting the negative demand shock to the labor market.⁹ Given that the nominal interest rate is bounded at zero, deflation boosted the *ex post* real interest rate, producing Fisherian debt deflation (fig. 1.4).¹⁰ Given the downward resistance of money wages,

7. The state of the art is Hatton (1988) and Dimsdale, Nickell, and Horsewood (1989).

8. Multilateral effective exchange rate indexes based on trade weights tell essentially the same story; see Redmond (1980).

9. The real wage was computed as the nominal wage divided by the consumer price index (CPI). The real interest rate is a moving average of the three-month nominal interest rate net of CPI inflation over the preceding twelve months.

10. The international evidence on the operation of these mechanisms is extensive; see, e.g., Bernanke and James (1991).

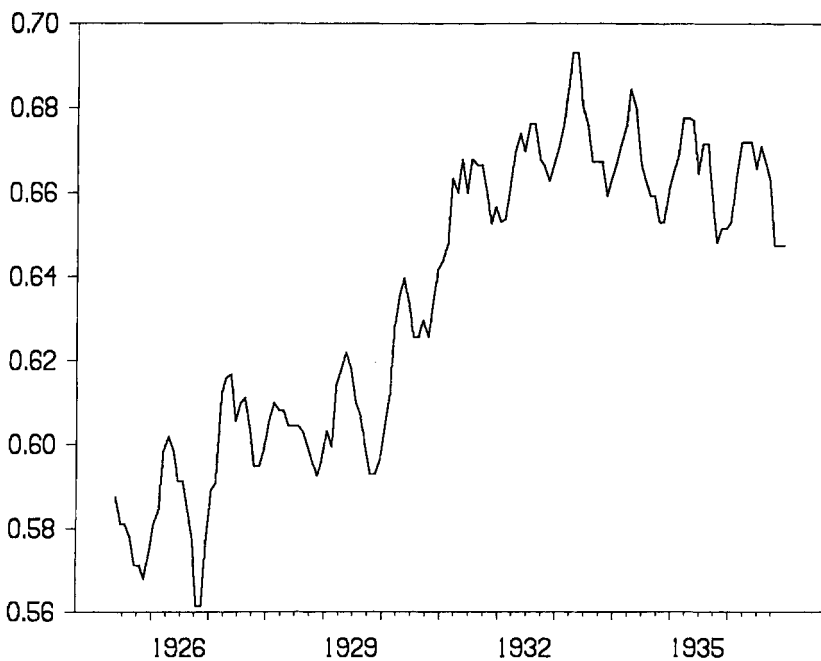


Fig. 1.3 Real wage (w/p)

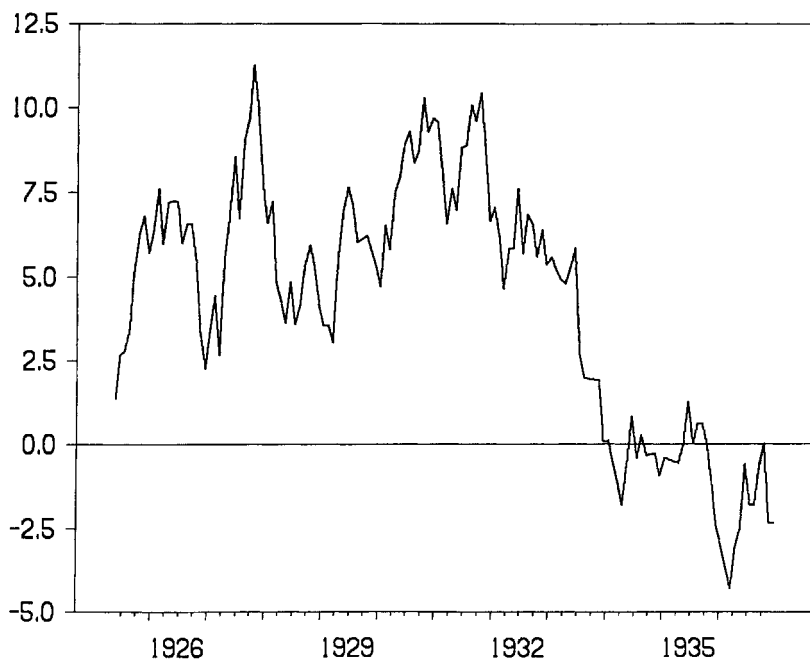


Fig. 1.4 Real interest rate

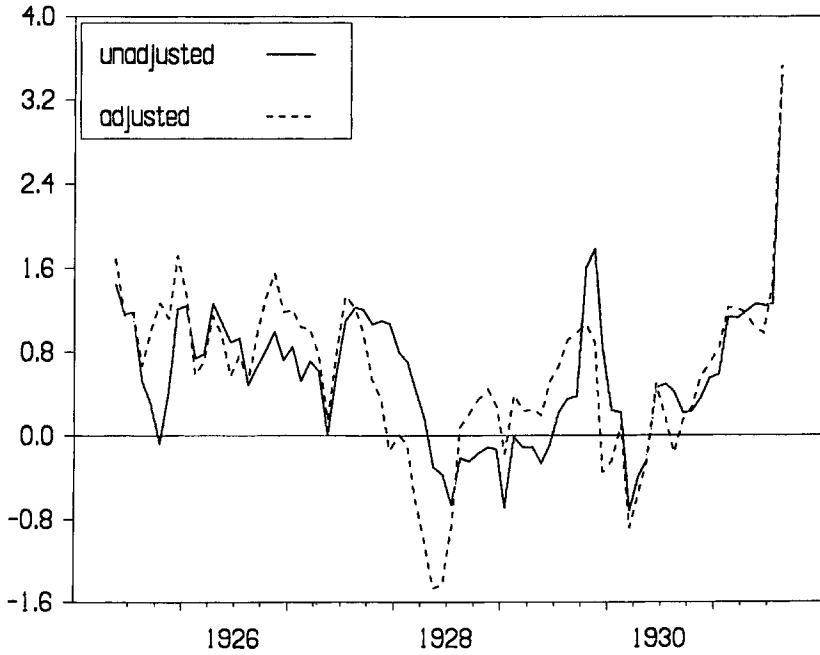


Fig. 1.5 Sterling devaluation expectations (percent)

deflation led to a large rise in the real cost of labor (fig. 1.3). With the authorities slow to adjust unemployment benefits in nominal terms, the fall in prices also led to a large increase in the real value of benefits. Thus the fixed exchange rate, operating through these channels, transmitted the negative external disturbance into a sharp rise in unemployment after 1929.

This unemployment then fed back to the foreign exchange market. Figure 1.5 shows the interest differential as a crude measure of devaluation expectations, along with a more sophisticated measure: the expected realignment probability times the expected change in the exchange rate in the event of a realignment constructed using Svensson's (1993) drift-adjustment method.¹¹ These estimates suggest that the realignment expectation rose from zero to about 1 percent at the beginning of 1931 (although this perceived probability was no larger than the devaluation expectations that prevailed immediately following Britain's return to gold, during the 1926 coal strike, and during the 1927 episode when the Bank of France

11. The change in the exchange rate was regressed on a constant and on the current rate to obtain an estimate of expected movements within the band. The fitted values were then subtracted from the interest rate, producing the estimates of the expected rate of devaluation.

was converting sterling reserves into gold). In August 1931, devaluation expectations shot upward, coincident with the German financial crisis. This pattern suggests that any effect of unemployment on devaluation expectations was nonlinear: while unemployment rose steadily from the end of 1929, devaluation expectations rose only modestly at best before shooting upward in the two months immediately prior to Britain's forced suspension of the sterling parity.¹²

The linkage between unemployment and realignment expectations hinted at in the historical literature can be understood in terms of the mechanisms highlighted by second-generation speculative attack models. A brief review of events serves to bring this out. Reports of "distrust of sterling" first began to circulate in November 1930, following the Nazis' gains in the Reichstag election and the consequent shock to confidence (Clay 1957, 369). Gold began draining from London to Paris and New York, creating mounting concern in the Committee of Treasury, the Bank of England's policy-making body. The collapse of the Credit-Anstalt in June and the contagious spread of the crisis to Germany were an even more serious shock. Austria's and Germany's imposition of exchange controls reminded observers that gold convertibility was not sacrosanct, and their import-restricting measures weakened Britain's prospective current account balance.¹³ In addition, under the provisions of the German standstill, some £70 million of German debts to British banks were frozen (Cairncross and Eichengreen 1983, 62).

As in modern models of contagion, the crisis soon spread to Britain. On Monday 13 July, the day the failure of one of Germany's largest financial institutions, the Darmstadter Bank, was announced, the Bank of England first lost gold for export. Not only did that failure freeze additional British claims on central European banks, but it occurred on the same day the press printed the findings of the Macmillan committee, whose report included an alarming estimate of London's short-term foreign indebtedness. Two days later sterling fell sharply against the dollar and the French franc, and gold losses accelerated. Over the two and a half weeks from 13 July, the Bank of England lost more than £50 million of reserves, the equivalent of a month and a half of exports. Sterling dropped sharply on 15 July,

12. A prior attempt to account for the time profile of devaluation expectations (Eichengreen and Hsieh 1996) did not test for such a nonlinearity. These authors regressed the measures in fig. 1.5 on U.S. and U.K. unemployment, the British real exchange rate (a proxy for British competitiveness), the British balance of trade (as a monthly proxy for the current account), and German gold reserves (a measure of any contagion effects of the German crisis). They found that an increase in British unemployment was positively associated with devaluation expectations over the entire sample period (significantly so, with a *t*-statistic ranging from 2 to 4).

13. Similarly, the increasingly real threat that the countries of central and eastern Europe might suspend interest payments on their external debts and that Germany might suspend reparation payments led to negative revisions of consensus forecasts of the British current account position.

prompting George Harrison of the Federal Reserve Bank of New York to cable Montagu Norman, the governor of the Bank of England, expressing his alarm. Next followed the release of the Report of the May Committee on National Expenditure, which showed how markedly the fiscal position had deteriorated in the face of the deepening slump.

The immediate task for the government then became to strengthen the fiscal position. Not only would this reduce the pressure of demand, improving the current account, but it would signal the authorities' commitment to financial orthodoxy, strengthening confidence and not incidentally making it easier to borrow abroad. (J. P. Morgan and Co., among others, made clear that their willingness to lend to the British government would be conditioned on its adoption of budgetary measures.) This proved, however, to be easier said than done. The Labour cabinet was unwilling to significantly reduce unemployment benefits, as recommended by the May committee. The resulting deadlock led the prime minister, Ramsay MacDonald, to tender his government's resignation to the king. The coalition national government that was formed on 24 August did little better in the month that followed. The chancellor, Philip Snowden, unveiled a new emergency budget on 10 September, but marches by the unemployed, objections by judges and teachers over prospective pay cuts, and passive disobedience by sailors in the Atlantic fleet, played in the press as a mutiny, raised doubts that it could be implemented. This rebellion on the left raised the prospect of a Labour victory in the impending general election, implying that any rapidly implemented fiscal steps might only be reversed (Cottrell 1995).

Thus, with the immobilization of fiscal policy, responsibility for defending the exchange rate fell to the central bank. What is striking about the Bank of England's response was its reluctance to raise interest rates. An increase in the discount rate was considered on 16 July but rejected. The rate was raised by one point to 3.5 percent on 23 July and by another point a week later. But this was the final change prior to the suspension of gold convertibility. The textbook response would have been to "let gold go" (to allow gold losses to set the deflationary price-specie flow mechanism into motion) and to step up Bank rate to reinforce the deflationary pressure. And from July there were calls for the Bank of England to do just that (Sayers 1976, 392–93). Instead, it utilized spot and forward market intervention to support the exchange rate, keeping it well above the gold export point and relying on foreign credits to finance the requisite operations in the hope that the weakness of the balance of payments would prove transitory.¹⁴ All the while, reserves drained away. They were replen-

14. The one time the Bank of England allowed sterling to fall below the gold export point, on 5 August, precipitated a near panic, after which the Bank resolved not to repeat the experience. An analysis of the Bank's spot and forward intervention is Moggridge (1972).

ished in late August by another round of foreign credits, but by 17 September more than half of these had been consumed. The reserve losses of the 18th were massive and unprecedented. The Bank of England saw the writing on the wall: late on the 18th, a Friday, Sir Ernest Harvey, the Bank's deputy governor, informed the prime minister that the Bank retained limited resources for intervention on Saturday, but in any case it would be unable to support the rate when the markets reopened on Monday. The Bank should therefore be authorized to suspend gold payments, with legislation to be passed on Monday. The decision was taken to abandon gold.

This hesitancy to raise the discount rate and to otherwise allow credit conditions to tighten is remarkable in light of the fact that Bank rate increases had been the standard tool for dealing with reserve losses since the days of Walter Bagehot.¹⁵ As Fraser put it, "That Great Britain should go off the gold standard with the bank rate at 4 1/2 per cent seems unbelievable. That the rate was not pushed up to 8 or 10 per cent in July 1931 created an unfavourable impression abroad, and caused foreigners to believe that, after all, the British authorities would not make a real fight for the gold standard" (1933, 113).

The explanation, historical accounts suggest, is that the authorities feared that interest rate increases would worsen unemployment, already in the neighborhood of 20 percent, and aggravate the stagnant condition of the British economy. "At the onset of the Great Depression," Janeway wrote, "Britain had already suffered nearly a decade of unemployment in excess of one million insured workers. This was the central economic fact that constrained monetary policy throughout the period" (1995-96, 255). Further deterioration in the employment situation threatened to undermine support for the government and for its gold standard policies, suggesting that the discount rate increase might ultimately have to be reversed. Realizing that the tactic was unsustainable and, if anything, increased the likelihood that the defense of the exchange rate would have to be abandoned, investors would have responded negatively to further increases in Bank rate and stepped up their sales of domestic assets.

What distinguished the Bank of England's priorities in 1931 from its priorities in previous periods was partly that unemployment had now scaled unprecedented heights, tipping the balance away from further austerity in the interest of currency stabilization. In addition, important changes in the political environment had occurred. Before World War I, in Sir Otto Neimeyer's famous words, "a change in bank rate was no more regarded as the business of the Treasury than the colour which the Bank painted its front door." During the war, however, the maintenance of the

15. As Bank of England officials themselves described in National Monetary Commission (1910) and again in their evidence before the Macmillan committee in 1931 (Committee on Finance and Industry 1931).

gold standard and pursuit of price stability had been subordinated to other, more pressing goals, ultimately, national survival. This “wartime politicization” of Bank rate carried over to the March 1919 veto by Lloyd George’s chancellor of a proposed increase (Janeway 1995–96, 255). When the central bank again attempted to raise interest rates in October 1919 to prevent the economy from overheating, it was strongly attacked by establishment spokesmen like the *Economist* and the *Statist*. Even more significant than the existence of this opposition, as Hume notes, were the arguments on which it was based, namely, whether “a rise in bank rate [will] check speculation more than it checks production” (*Economist*, 8 November 1919, p. 850; quoted in Hume 1970, 133). Sayers noted similarly that each of the Bank rate increases of the early 1920s aroused “criticism on the grounds of aggravation of the trade depression” (1976, 129–39). He went on to observe that this marked “a new tide that was destined to affect policy, or at least the atmosphere in which policy was taken, for the remainder of the decade.” Clearly, World War I was a watershed dividing the central bank autonomy of the nineteenth century from the more politicized monetary policy environment of the interwar years.

The rise of the Labour Party, the growth of trade unionism, and the prewar extension of the franchise had all worked to heighten this politicization. The 1920s were the years of the first Labour government, whose ministers were surely more sensitive to unemployment than their Conservative shadow counterparts. The unemployment problem acquired new prominence and not merely by virtue of its magnitude. It is important to understand that the concept of unemployment as an aggregate phenomenon, distinct from being unemployed as an individual condition, only became current as late as the 1880s and after. Before that, being unemployed was regarded more as an individual failing than as a possible corollary of national economic policy.¹⁶ By the 1920s, of course, things were very different.

The links from monetary policy to domestic economic outcomes had been highlighted by Keynes, of course, in “The Economic Consequences of Mr. Churchill,” where he asked, “By what modus operandi does credit restriction” reduce labor costs, increase competitiveness, and restore external balance? “In no other way than by the deliberate intensification of unemployment” (1925, 16). Other well-known authors lent legitimacy to this view. As G. D. H. Cole wrote in the *Morning Post* on 13 June 1924, “There is a Great God named Par who is worshiped daily at the Treasury and in the magnificent temples the big five are building on every street. Par likes unemployment; it is his form of human sacrifice. And on Par’s altars the Treasury daily burns incense in the form of currency and credit.”

16. We refer readers to whom these arguments appear unfamiliar or implausible to Eichengreen and Hatton (1988).

One can question the depth of comprehension of these points by the man in the street or the MP in the back benches, but there is no question that such rhetoric worked to heighten at least superficial awareness of the links between monetary policy and unemployment.

Central bankers understood these links as well. In evidence to the Macmillan Committee on Finance and Industry (today, a comparable body would be given a name like the “Committee on Monetary Policy and Unemployment”), Norman and Harvey, the Bank of England’s governor and deputy governor, were forced to defend their policies against the charge that these aggravated unemployment. Central bankers having every incentive to shroud themselves in ambiguity, there is no smoking gun—no statement that “we are reluctant to raise interest rates and defend the sterling parity for fear of aggravating unemployment.” Still, their responses give away the game. Norman was first asked whether he took macroeconomic conditions—“the industrial position” in contemporary parlance—into account when raising or lowering Bank rate. In response, he gave a bit of ground. “I should answer by saying that we do have them in view, yes, but that the main consideration in connection with movements of the Bank Rate is the international consideration.” H. P. Macmillan, the committee chairman, then asked whether a lower Bank rate would have eased the internal situation. Norman conceded the point: “I think the internal situation would have been much easier over the last few years if the rate had been x per cent instead of y per cent, say 4 per cent instead of 6 per cent.” The chairman responded, “You mean there would have been less unemployment.” Norman acknowledged, “I think there would.” Keynes forced Norman to dig his hole deeper: “So it is of the essence of the case that the bank-rate should have an important effect, that when it is raised it should have an effect in the direction of unemployment. That is what you want. Am I right?” Norman was cornered: “Yes,” he replied, “I should think it was.” (See Sayers 1976, 178–80.)

Contemporaries drew the obvious conclusion. As Fraser put it, “A democratic government . . . cannot shut its eyes to such things [to complaints that monetary policy was aggravating unemployment], and, consciously or subconsciously, the British Government were influenced by them, and so they chose the policy that would minimize social unrest” (1933, 113). Hawtrey was more prosaic: “To raise the rate when unemployment among insured work people had risen to 22 per cent. was surely to gild the lily. If, in the language of 1848, the price of the convertibility of the note was to be a further disemployment of labour, the position had become untenable. And in fact it had” (1938, 143).

Subsequent generations of historians have generally agreed. Morton (1940) put it bluntly, that the Bank of England was constrained by the fear that a higher interest rate would worsen unemployment. Clay wrote that “the decline in employment and profits [following the onset of the depres-

sion] intensified the criticism of the monetary policy with which Norman was associated" (1957, 363). Pollard is equally to the point. In his words, "It was, in part, the depth of the slump and the level of unemployment which inhibited the raising of the bank rate to panic heights" (1969, 226). Palyi, while critical of the Bank of England's inaction, acknowledged that it is attributable to the unwillingness of "a depression-ridden country, with the number of unemployed rising from 1,455,000 at the end of 1929 to 2,500,000 at the end of 1930 . . . to countenance a severe deflationary move" (1972, 271). While he concluded that it would have been preferable for the British authorities to defend sterling rather than to cave in to domestic unemployment pressures, he admitted in a formulation that anticipates our model, that it is a question of "policy priorities." Kunz's conclusions are similar. "With business already very depressed," she wrote, "neither management nor labour nor their representatives in Parliament were willing to pay the price which such a high Bank rate would exact . . . in the prevailing investment climate either a large rise in Bank rate or a loss of gold would be interpreted as a sign of panic" (1987, 284).

Thus primary sources and the secondary literature alike support the view that the exchange rate peg, maintained in the face of a massive external disturbance, aggravated unemployment, while the rise in unemployment limited the willingness of the authorities to defend that exchange rate when it came under attack. Analyzing these issues further requires a formal model, to which we now turn.

1.3 Model

This section presents a model of currency crises in which the variable driving the crisis is unemployment. While this model will be discussed mainly with reference to sterling's interwar experience, it may be viewed more generally as an attempt to explore the logic of a particular class of currency crises, those in which unemployment is the key factor underlying the fragility of the currency.¹⁷ This model may also provide insights into episodes of crisis in which unemployment, without being the main factor, played a role along with other more traditional fundamentals such as real overvaluation or the trade balance.

Unemployment-based currency crises involve the interaction of two aspects of the economy that are usually considered separately, the labor market and the foreign exchange market. Accordingly, our model has two parts, one describing the macrostructure of the economy and the other characterizing exchange rate policy. The macroeconomic part of the model is standard. The evolution of wages and prices is assumed to depend on

17. This class arguably includes also the 1992 sterling crisis (Eichengreen and Hsieh 1996) and the 1992–93 French franc crisis (Jeanne 1997b).

the unemployment rate through a traditional Phillips curve, and the unemployment rate is determined by the real wage and the real interest rate. The policy part of the model endogenizes exchange rate policy in the spirit of second-generation models of currency crises. The government decides whether to maintain the peg by minimizing a loss function that depends on the state of the economy.¹⁸ The interesting properties of the model come from the two-way interaction of the two parts. While the level of unemployment affects the willingness of the government to defend the currency and so the credibility of the fixed peg, conversely the credibility of the fixed currency peg affects the level of domestic interest rates and economic activity. We study the response of the economy to an external deflationary shock and show that it can fit a number of stylized facts of sterling's interwar experience.

1.3.1 Assumptions

The macroeconomic structure is summarized by three equations for unemployment, wage, and prices:

$$(1) \quad u_t = a_1 u_{t-1} + a_2 \omega_{t-1} + a_3 r_t,$$

$$(2) \quad \Delta w_t = a_4 \Delta p_t - a_5 u_{t-1},$$

$$(3) \quad p_t = a_6 w_t + (1 - a_6)(p_t^* + e_t),$$

where u_t , w_t , p_t , p_t^* , e_t , $\omega_t \equiv w_t - p_t$, and $r_t = i_{t-1} - \Delta p_t$ denote deviation of the unemployment rate from its natural level, nominal wage, domestic and foreign nominal prices, exchange rate, real wage, and ex post real interest rate, respectively, and Δ is the first-difference operator ($\Delta x_t = x_t - x_{t-1}$). With the exception of the interest rate, all variables are in logarithm.

Equation (1) states that the unemployment rate is increasing with the level of the real wage and the ex post real interest rate.¹⁹ It is important to note that the monetary transmission channel at work here is different from the standard one. The interest rate appearing on the right-hand side is the ex post real interest rate, not the ex ante real interest rate $r_t^e = i_t - E_t(\Delta p_{t+1})$. A rise in the ex post real interest rate can depress economic activity by redistributing purchasing power from debtors to creditors, an idea originally put forward by Irving Fisher in his debt deflation theory of the Great Depression and referred to as the "balance sheet channel of

18. The government's loss function depends on the unemployment rate, as in Jeanne (1997b). The model in Jeanne's paper does not include, however, wage or price equations.

19. The assumption that the real wage enters with one lag simplifies the computations but is not crucial for the results. Adding the real exchange rate $q_t = p_t - (p_t^* + e_t)$ to the determinants of unemployment would not change significantly the properties of the model, since by eqs. (2) and (3) variations in the real exchange rate are proportional to those of the real wage under the fixed peg.

monetary policy” in the modern literature (see, e.g., Bernanke and Gertler 1995).²⁰

Equation (2) is a naive Phillips curve, which takes the rate of wage inflation as increasing with the rate of change of the domestic price and decreasing with the unemployment rate. This relation is not constrained by the hypothesis that wage setters have rational expectations, a hypothesis that seems difficult to reconcile with the extreme nominal stickiness of wages in the interwar United Kingdom.²¹ Equation (3) states that the domestic price level is a weighted average of the domestic wage and the cost of imported goods. Hereafter we assume that the foreign inflation rate, Δp^* , is constant.

We assume that the home country is initially committed to a fixed exchange rate arrangement designed to maintain the nominal exchange rate at a constant level. This commitment is not irreversible, however. In each period, the government may invoke an escape clause and devalue the currency by an exogenous amount d . We denote by π_t the probability estimated at t of a devaluation at $t + 1$. This is an important variable, which reflects the lack of credibility of the peg.

We assume that the domestic and foreign interest rates satisfy uncovered interest parity and that foreign exchange market participants form their expectations in a rational way. Under the fixed peg, the expected rate of depreciation is equal to the devaluation probability times the expected amount of the devaluation, and interest parity may be written

$$(4) \quad i_t = i^* + \pi_t d.$$

The foreign nominal interest rate, i^* , satisfies the Fisher relation:

$$(5) \quad i^* = r^* + \Delta p^*,$$

where r^* , the foreign real interest rate, is assumed to be constant.

The government decides whether to devalue by considering a trade-off between its internal and external objectives. We assume that devaluation makes it possible to reduce unemployment by an amount Δu ,²² but entails costs for the government. Some of these costs are borne by the policy-

20. Introducing the ex ante real interest rate in the unemployment equation is possible but would complicate the analysis of the equilibrium. The ex ante real interest rate in a given period depends on the market expectations of the government’s decision at the following period, which themselves depend on the next-period expectations. By forward induction, the equilibrium depends on the expectations over the infinite horizon. Models of currency crises of this kind have been studied by Krugman (1996) and Jeanne and Masson (2000).

21. This does not mean that all agents have adaptive expectations: we assume that the expectations of foreign exchange market participants are rational.

22. A devaluation can reduce the unemployment rate by improving competitiveness, reducing the real wage (if the nominal wage is sticky), or allowing the government to set lower interest rates. While we do not model these channels explicitly, those relying on the wage and the interest rate are consistent with the unemployment eq. (1).

maker responsible for the devaluation, others by the country as a whole. In the case of the United Kingdom, devaluation might hasten sterling's loss of international currency status, dealing a blow not only to national pride but also to seigniorage revenue and the importance of London as a financial center.

Formally, we assume that the government decides to opt out or not so as to minimize a loss function that depends on the deviation of unemployment from its natural level and on the opting-out cost:²³

$$(6) \quad L_t = u_t^2 + \delta_t C_t,$$

where $\delta_t = 1$ if it devalues (zero otherwise). We assume that the opting-out cost C_t follows an identically and independently distributed stochastic process. The stochastic nature of the opting-out cost may reflect unpredictable events in the social or political spheres, such as an election, the collapse of a political coalition, or a strike, that raise or lower domestic resistance to devaluation. We assume that the policy-making process can be in two states with different expected opting-out costs.²⁴ In state 1 the opting-out cost is given by $C_t = C_1 + \epsilon_{1t}$; in state 2 it is $C_t = C_2 + \epsilon_{2t}$, where ϵ_1 and ϵ_2 are i.i.d. normal shocks. The state with the lower C corresponds to a political or social situation that makes devaluation more likely. At any given period there is a probability 1/2 that the policy-making process is in state 1 and 1/2 that it is in state 2.

1.3.2 Reduced-Form Dynamics

Substituting out nominal variables from the structural equations yields the following reduced form for the dynamics of the unemployment and real wage rates:

$$(7) \quad \begin{pmatrix} u_{t+1} \\ \omega_{t+1} \end{pmatrix} = B \begin{pmatrix} u_t \\ \omega_t \end{pmatrix} + \alpha r^* + \beta \Delta p^* + \gamma \pi_t,$$

where $B = (b_{ij})_{i,j=1,2}$, $\alpha = (\alpha_1, \alpha_2)'$, $\beta = (\beta_1, \beta_2)'$, and $\gamma = (\gamma_1, \gamma_2)'$ are a 2×2 matrix and vectors, the coefficients of which depend on the structural parameters of the model (see the appendix). Equation (7) provides a convenient decomposition of the effects at work in the model. The first term on the right-hand side characterizes the adjustment of the economy toward

23. The loss function is instantaneous, i.e., not intertemporal. This assumption greatly simplifies the analysis, in particular because it allows us to characterize the dynamics of unemployment before a devaluation without making any assumption about the exchange rate regime following the devaluation. Since the opting-out cost may be interpreted as the discounted sum of expected flow costs, the myopia implied by eq. (6) is limited to unemployment. This may reflect the fact that voters determine their votes on the basis of the current unemployment rate or that the policymaker stays in office for a short time.

24. This assumption, while not necessary for the main properties of the model, is useful for estimation.

equilibrium when there are no foreign disturbances and the credibility of the exchange rate peg is perfect. The second and third terms correspond to the effects of foreign rates of interest and inflation on the domestic economy, the last term to credibility effects.

The devaluation probability is an endogenous variable of the model. It equals the probability that the benefit of devaluation in terms of reduced unemployment will exceed the opting-out cost in the next period. This probability is between zero and one, since the opting-out cost is stochastic,²⁵ and it depends on the level of unemployment. Because the government's loss function is convex in the unemployment rate, the incentive to devalue is stronger the higher the level of unemployment. It is shown in the appendix that the government's optimal decision is to devalue if the unemployment rate implied by the fixed exchange rate goes beyond a critical level and that the devaluation probability, π_t , may be written

$$(8) \quad \pi_t = \Pi(b_{11}u_t + b_{12}\omega_t + \alpha_1 r^* + \beta_1 \Delta p^*),$$

where $\Pi(\cdot)$ is an increasing function.²⁶ The intuition behind equation (8) is that the devaluation probability is increasing with the next-period unemployment rate, which in turn is a function of the current values of the unemployment rate, the real wage, and the foreign real interest rate.

The dynamics of the economy are characterized by equations (7) and (8). The main question of interest, for our purposes, is how the domestic economy responds to external shocks, in particular to changes in the foreign inflation rate, Δp^* . The response of the economy involves the labor, financial, and foreign exchange markets and the spillovers across these markets. The linkage from currency to labor is characterized by equation (7): devaluation expectations tend to generate unemployment by raising the real interest rate. Conversely, as equation (8) shows, a rise in unemployment or the real wage weakens the credibility of the fixed peg. This two-way interaction of the labor and foreign exchange markets is likely to affect the stability of the fixed exchange rate peg.

First, consider a steady state in which unemployment, the real wage, and the devaluation probability remain constant at levels denoted by \bar{u} , $\bar{\omega}$, and $\bar{\pi}$.²⁷ It is shown in the appendix that

25. The opting-out cost is the only source of uncertainty in this model, but it would not be difficult to add shocks in the structural eqs. (1), (2), and (3).

26. Note that the model may give rise to multiple equilibria, in which case the function $\Pi(\cdot)$ is not well defined. The multiplicity of equilibria, a generic property of second-generation models of currency crises, has been exploited by a number of authors to discuss self-fulfilling speculation (see, e.g., Obstfeld 1996; Velasco 1996; Jeanne 1997a). A discussion of this issue in the context of the present model may be found in the appendix.

27. The steady state properties we describe below are not *long-run* properties of the economy. In general the steady state devaluation probability is strictly positive, so that the domestic government devalues sooner or later with probability one.

$$(9) \quad \bar{u} = -\frac{1 - a_4}{a_5} \Delta p^*,$$

$$(10) \quad \bar{\omega} = -\frac{(1 - a_1)(1 - a_4)}{a_2 a_5} \Delta p^* - \frac{a_3}{a_2} (r^* + d\bar{\pi}).$$

The domestic economy is sensitive to the foreign inflation rate because of nominal wage stickiness, the extent of which is measured by $1 - a_4$. Foreign deflation, say, generates upward pressure in the real wage and increases unemployment, leading to a rise in devaluation expectations. An increase in the foreign real interest rate depresses the real wage in the long run by exerting upward pressure on unemployment.

The dynamics of the economy out of the steady state are complicated by their nonlinearity, but we can make some qualitative statements. In particular, it is easy to see that the devaluation expectations contribute to increase the persistence of unemployment. This persistence is the sum of two terms:

$$(11) \quad \frac{\partial u_{t+1}}{\partial u_t} = b_{11} + \gamma_1 b_{11} \Pi'.$$

The first term reflects structural persistence mechanisms that are independent of exchange rate policy. The second term comes from the exchange rate regime: an increase in unemployment in the current period raises the interest rate premium and the unemployment rate in the following periods.

To illustrate, the dynamics of the unemployment and real wage rates can be represented in (ω, u) -space for different degrees of credibility of the fixed peg (corresponding to different levels of the opting-out cost, C). In figure 1.6 we show how the economy converges to its steady state starting from an excessive real wage for two different degrees of credibility. In both cases the dynamics are stable, but they have very different shapes. When the peg is less credible, the real wage has to fall by a larger amount before unemployment starts to decline. As a result the unemployment rate scales higher levels and remains at those for longer, further weakening the currency.

1.3.3 External Shocks and Currency Crisis

In this subsection, we argue that external shocks, such as a change in the foreign inflation or interest rate, can reproduce some key features of the behavior of the U.K. economy in the interwar years, including the sterling crisis.

Assume that starting from a steady state with a constant foreign price level, the foreign inflation rate jumps from zero to $\Delta p^* < 0$. In the first period after the shock, imported deflation raises the real wage and un-

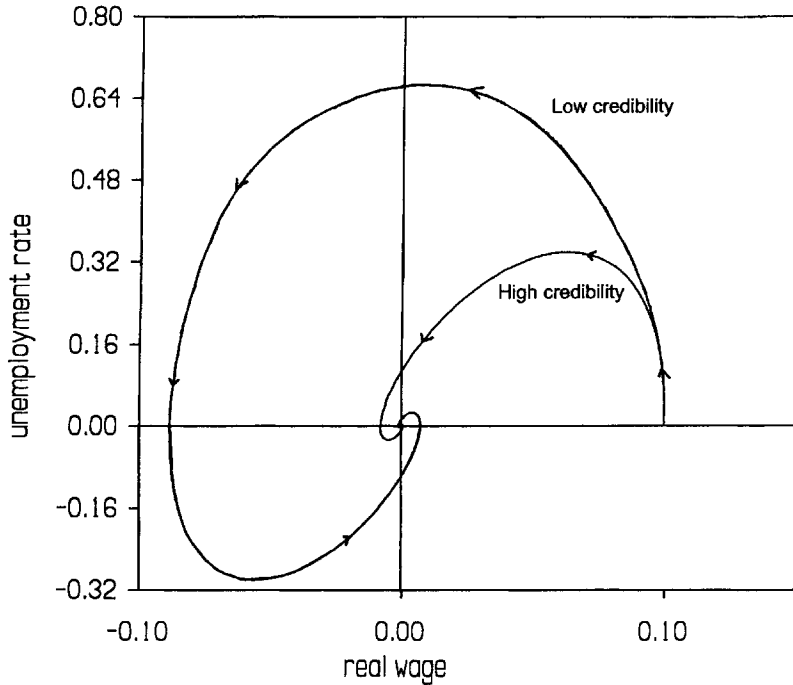


Fig. 1.6 Dynamics of unemployment and real wage

employment. From our steady state analysis, we know that the unemployment rate will converge toward a higher level, which progressively exerts downward pressure on the wage. Whether the long-term real wage is higher or lower than its initial level depends on the parameters. As the unemployment rate increases, devaluation expectations begin to rise. And because the relation between the unemployment rate and the devaluation probability is nonlinear, devaluation expectations may rise very little at first, but jump upward when unemployment reaches a critical level. An example of these dynamics is shown in figure 1.7.

1.4 Estimation

We estimated the model on monthly data for the period 1925:5–36:12, a sample covering sterling's participation in the interwar gold standard and the following five years. The choice of a sample period extending after the devaluation was dictated by our desire to analyze not only the period leading up to the sterling crisis but its consequences.

The unemployment, wage, and price equations were estimated using as many as six lags of each variable, with an instrument for the current values

of explanatory variables in order to avoid simultaneous equation bias. One term for each variable turned out to be sufficient, and current-period values were never significant. The exogeneity assumption could not be rejected using Hausman tests, which is not surprising given that we use relatively high frequency data. As an additional check, we also report the results of two-stage least squares estimation.

Details about sources and definitions are found in the appendix. We took the logarithms of all variables except the interest rate and the devaluation probability.

1.4.1 Unemployment Equation

The explanatory variables for this equation are the real wage, the real interest rate, and the lagged unemployment rate. The real wage is defined as the (log of the) nominal wage divided by the CPI. Since there are generally thought to be lags in the transmission of interest rates to economic activity, we measured the real interest rate as a moving average of the three-month nominal interest rate net of CPI inflation over the preceding twelve months.

Results of OLS estimation are shown in table 1.1. The full specification (col. [1]) reveals the coefficient on the real exchange rate to be insignifi-

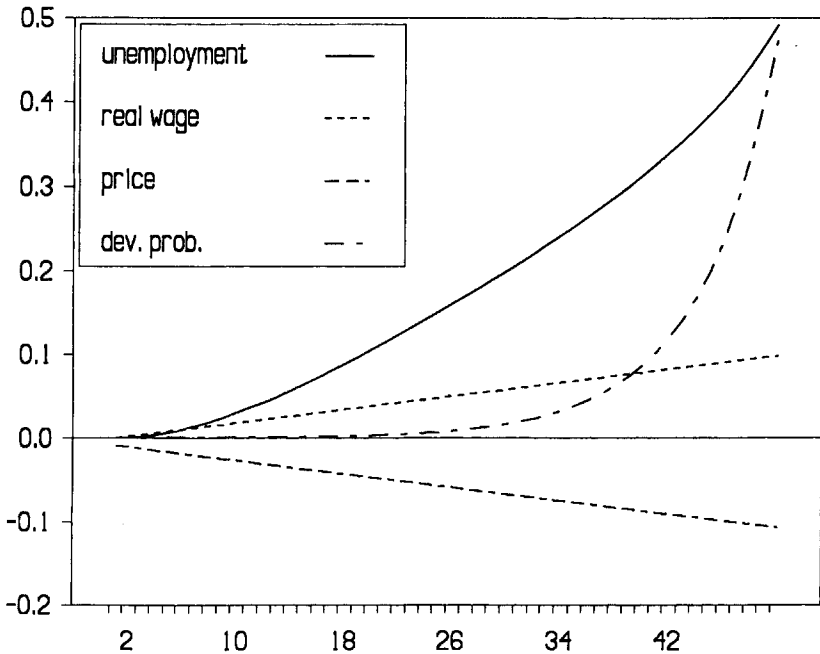


Fig. 1.7 Impact of foreign deflation

Table 1.1 Unemployment Equation

Variable	Dependent Variable: Unemployment Rate (u)			
	(1)	(2)	(3)	(4)
Constant	0.259 (0.203)	0.292 (0.136)	0.315 (0.136)	0.305
u_{-1}	0.935 (0.029)	0.934 (0.028)	0.931 (0.028)	0.933
ω_{-1}	0.296 (0.158)	0.294 (0.158)	0.333 (0.158)	0.293
$r_{-1} (\times 10^2)$	0.507 (0.197)	0.484 (0.165)	0.524 (0.166)	0.171
$(e + p - p^*)_{-1} (\times 10^2)$	1.450 (6.994)			
\bar{R}^2	0.958	0.958	0.959	
DW	1.912	1.906	1.902	
Durbin's h	0.552	0.590	0.610	

Note: Numbers in parentheses are standard errors. The coefficients for the real interest rate and the real exchange rate have been multiplied by 100.

cantly different from zero. Removing it (as in col. [2]) does not change the other results. Column (3) reports the results of two-stage least squares estimation, which are not significantly different from those of OLS.²⁸ A Chow test provides no evidence of a structural break following Britain's departure from gold; testing for a break in September 1931 yields $F(4,127) = 1.082$, well below the 10 percent significance level. The coefficients on the real wage and the real interest rate are significant and positive, as anticipated. Permanent changes in these variables have little impact in the short run but sizable effects in the long run due to the persistence of unemployment. The long-term elasticity of the unemployment rate with respect to the real wage is 4.43, implying that a permanent 1 percent increase in the real wage raises unemployment from, say, 10 percent to 10.44 percent in the long run. A permanent 1 percent rise in the real interest rate raises unemployment from 10 to 10.74 percent.

The statistical significance of these results should be qualified by the fact that the variables in this equation are not clearly stationary. An augmented Dickey-Fuller (ADF) test with six lags does not reject a unit root in unemployment, the real wage, and the real interest rate at the 10 percent level. The importance one should give to nonstationarity, as always, is debatable: on theoretical grounds, unemployment and the real interest rate should be stationary, and while a unit root in the real wage could be attrib-

28. We used two lags of unemployment, the real wage, and the real interest rate as instruments.

Table 1.2 Wage Equation

Variable	Dependent Variable: Change in Nominal Wage (Δw)			
	(1)	(2)	(3)	(4)
Constant ($\times 10^2$)	0.181 (0.190)	2.519 (0.711)	2.999 (0.711)	2.495 (0.732)
Δp_{-2} ($\times 10^2$)	4.900 (1.950)	5.158 (1.878)	8.817 (2.325)	5.157 (1.878)
u_{-1} ($\times 10^2$)	-0.073 (0.071)	-0.243 (0.084)	-0.296 (0.085)	-0.241 (0.085)
b ($\times 10^2$)		0.934 (0.275)	1.099 (0.276)	0.924 (0.283)
\bar{R}^2	0.041	0.111	0.147	0.111
DW	1.946	2.112	2.136	2.112

Note: Numbers in parentheses are standard errors. All coefficients are multiplied by 100.

uted to technological progress, it is actually due to price deflation in our data. There is some evidence that unemployment, the real wage, and the real interest rate are cointegrated,²⁹ which allows us to estimate the unemployment equation as an error correction model: the results are reported in column (4) of table 1.1. The estimated coefficients are not significantly different from those obtained from OLS, except that for the real interest rate, which is lower.

Previous authors estimating models of the interwar economy have obtained broadly similar results. Dimsdale and Horsewood (1995) reported a quarterly equation for employment rather than unemployment, obtaining rather similar real wage coefficients up to a sign change.³⁰ Also using quarterly data, Hatton (1988) found a significant negative effect of the real wage (lagged twice) on employment. Beenstock and Warburton (1986) found small but statistically significant effects of real wages on both labor supply and labor demand. Broadberry's (1983) estimates of labor supply and demand provide less support for the importance of real wages, although his sample is limited to fifteen annual observations for the period 1924–38.

1.4.2 Wage Equation

Results are in table 1.2. Those in column (1) limit the set of explanatory variables to inflation and unemployment, as in the simple Phillips curve of the model. The coefficient on inflation, while significant, is low, imply-

29. The ADF *t*-test applied to the residuals of the cointegrating regression (as described by Hamilton 1994, 599) rejects the absence of cointegration at the 10 percent level.

30. They include two lags of the real wage and normalize money wages by the GDP deflator.

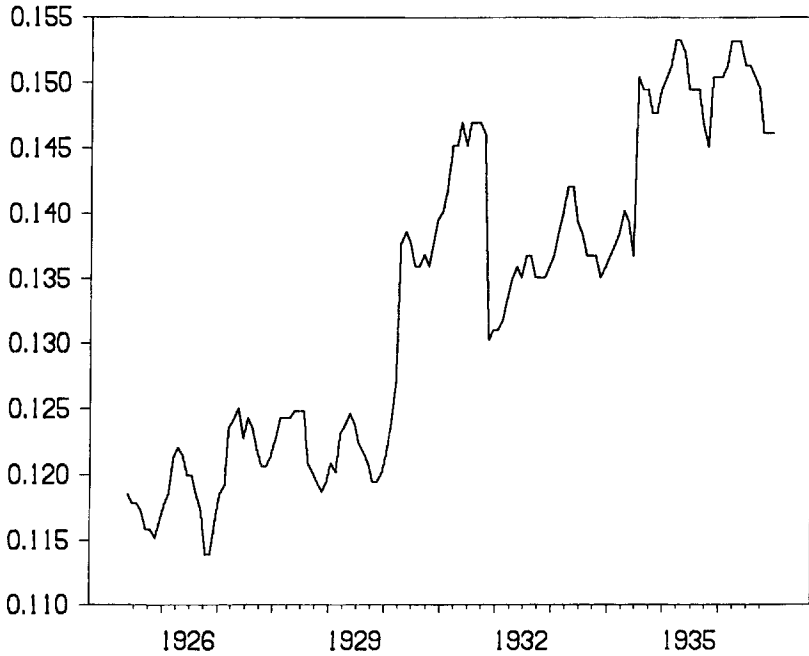


Fig. 1.8 Real unemployment benefit (*b/p*)

ing that less than 5 percent of price variation is reflected in the nominal wage. The unemployment rate, on the other hand, is not significant. The weak explanatory power of the equation is consistent with the conclusion of authors such as Sargan (1964) and Hatton (1988) that a simple Phillips curve performs poorly for the interwar years, a period during which prices and unemployment fluctuated widely but nominal wages moved sluggishly.

A standard treatment of this problem is to add the replacement rate (the ratio of unemployment benefits to wages) as a shift variable for unemployment. In theory, in the presence of unemployment benefits, wage setters place less weight on employment and more weight on the level of compensation when setting the reservation wage. Indeed, Britain had a relatively generous unemployment insurance system between the wars (Burns 1941), and previous authors utilizing the level of benefits in time-series estimation tend to identify a large effect, albeit somewhat smaller in more recent studies (contrast Benjamin and Kochin 1979 with Dimsdale and Horsewood 1995). But the sharp increase in the real level of benefits when price levels fell in the Great Depression (fig. 1.8) admits of alternative interpretations: is the coefficient on the real benefit really capturing the impact of more generous benefits on job search, or is it in fact picking

up the effects on unemployment of the collapse of prices and demand that set in starting in 1929? Be this as it may, the elasticity of long-run equilibrium unemployment with respect to the benefit is 3.84, implying that a 1 percent increase in the benefit is sufficient to raise the natural rate of unemployment from 10 to 10.4 percent, an effect only about half the size of that obtained by Dimsdale and Horsewood.³¹ With the addition of the benefit variable, the coefficient on unemployment is now significant as well, and the coefficient on lagged prices, plausibly, is larger than before. A Chow test provides some evidence of a structural break in September 1931: $F(4, 129) = 2.895$, which is significant at the 5 percent level.³² This is due to a fall in the elasticity of wages with respect to prices after the devaluation of sterling in 1931. (It is impossible to reject the null of no structural break in the other coefficients.) On its face, the direction of this change is surprising: following Alogoskoufis and Smith (1991), one would expect wages to respond less powerfully to prices under a fixed exchange rate, when the price level should show stronger mean reversion, than under a floating rate, when it is likely to exhibit greater persistence. A possible reconciliation is that wage setters anticipated the persistent deflation that characterized the relatively restrictive global monetary environment of the interwar gold standard and in contrast did not expect the Bank of England to make powerful reflationary use of monetary policy once the gold standard was abandoned.³³ Column (3) reports the result when the coefficient for price inflation is allowed to differ before and after the sterling crisis, as suggested by the results of this stability test. Column (4) reports the results of two-stage least squares estimation.

While the rates of change of wages and prices are stationary, unemployment and real benefits are not, and an ADF *t*-test does not produce any evidence of cointegration between them. Thus the strategy of estimating the equation as an error correction model, which we implemented in the case of the unemployment equation, is impossible here. We tried to solve this problem in several ways—distinguishing between short-term and long-term unemployment (as in Crafts 1989), adding Bain and Price's (1980) annual index of union membership density to the explanatory variables, and adding a time trend—but still found no evidence of cointegration.³⁴

31. The long-run or "natural" rate of unemployment is that consistent with zero wage and price inflation.

32. This result contrasts with Hatton (1988), who found no evidence of a structural break in his wage equation estimates on quarterly data.

33. This is consistent with interpretations that emphasize the reluctance of central banks to make aggressive use of reflationary monetary policy following the abandonment of the gold standard (e.g., Eichengreen 1992).

34. This prompted us to reestimate the entire model as an unrestricted vector autoregression in the differenced variables; we discuss these results below. Fortunately, the main results were not changed.

Table 1.3 Price Equation

Variable	Dependent Variable: CPI Inflation (Δp)			
	(1)	(2)	(3)	(4)
Constant ($\times 10^3$)	-0.609 (0.853)			
Δw_{-1}	0.374 (0.340)	0.733 (0.057)	0.762 (0.060)	0.731 (0.057)
Δp_{-1}^w	0.255 (0.058)	0.267 (0.057)	0.238 (0.060)	0.269 (0.057)
\bar{R}^2	0.119	0.122	0.560	0.125
DW	1.548	1.573	1.948	1.580

Note: Variable p^w denotes the wholesale price index. Numbers in parentheses are standard errors. The constant has been multiplied by 1,000.

1.4.3 Price Equation

In our model, the rate of change of the CPI is a weighted average of the rates of change of the nominal wage and the cost of imported factors of production. Following Capie and Collins (1983), we use the wholesale price index, which is dominated by internationally traded goods, as a proxy for the latter. The unrestricted regression is given in column (1) of table 1.3. The wage and import price coefficients are both positive as expected, as in such previous work as that of Dimsdale et al. (1989). It is impossible to reject the joint hypothesis that the constant is zero and that the coefficients for the nominal wage and the CPI sum to unity, as anticipated. These restrictions are imposed in column (2). Now the greater weight is placed on the wage component, as predicted by neoclassical production and pricing theory. In view of the low Durbin-Watson statistic, we also estimated this equation under the assumption of an MA(1) error, but this did not alter the result significantly (see col. [3]). Evidence of a structural break is weak; a Chow test yields $F(1,136) = 2.762$, which is marginally significant at the 10 percent level. To the extent that there is evidence of a break, this takes the form of a lower weight on import prices and a correspondingly higher weight on wages after sterling's devaluation.³⁵ As column (4) shows, the two-stage least squares estimates are not significantly different from those of OLS.

1.4.4 Devaluation Probability

The model specifies the devaluation probability as a nonlinear function of the unemployment rate. We estimated this equation using nonlinear

35. This may in turn reflect the collapse of international trade and Britain's imposition of a general tariff in 1932, which could have reduced the weight of imported inputs in the price equation.

Table 1.4 **Devaluation Expectation Equation**

Variable	Dependent Variable: Devaluation Probability (π)
v_1	10.922 (8.253)
σ_1	4.343 (4.295)
v_2	3.153 (0.020)
σ_2	0.032 (0.016)

Note: Table reports estimation of eq. (12). Numbers in parentheses are standard errors.

least squares over the period 1925:5–31:8. Estimation requires an empirical measure of the dependent variable; this was obtained using the drift-adjustment method under the assumption that the expected magnitude of devaluation was 10 percent.

The specification takes the devaluation probability as equal to the predicted value plus a forecast error:

$$(12) \quad \pi_t = \frac{1}{2}F_{\sigma_1}(u_{t+1} - v_1) + \frac{1}{2}F_{\sigma_2}(u_{t+1} - v_2) + \eta_t,$$

where $F_{\sigma}(\cdot)$ is the cumulative of a normal distribution with variance σ^2 (see the appendix).

The results are reported in table 1.4 and figure 1.9. While the model does not explain month-to-month fluctuations in the devaluation probability, it does capture the sharp increase in devaluation expectations toward the end of the estimation period, coinciding with the sterling crisis.

1.5 Causes of the Sterling Crisis

The results of section 1.4 are consistent with the view that the proximate cause of the sterling crisis was the dramatic rise in unemployment in 1929–31. The model is compatible with a number of different interpretations of this rise. These include the rise in real interest rates when the worldwide deflation set in starting in 1929 and the fall in the price of imported goods once world price levels began to plummet. These external disturbances affected the real economy through their interaction with slowly adjusting nominal wages and unemployment benefits. In addition, in our model the impact of external shocks is amplified by the response of financial markets: the rise in unemployment increases the exchange risk premium, further elevating domestic interest rates and further depressing unemployment. The question is how much weight to attach to these different elements. To shed some light on it, we ran three counterfactual simulations, one that indexed unemployment benefits, one that eliminated the

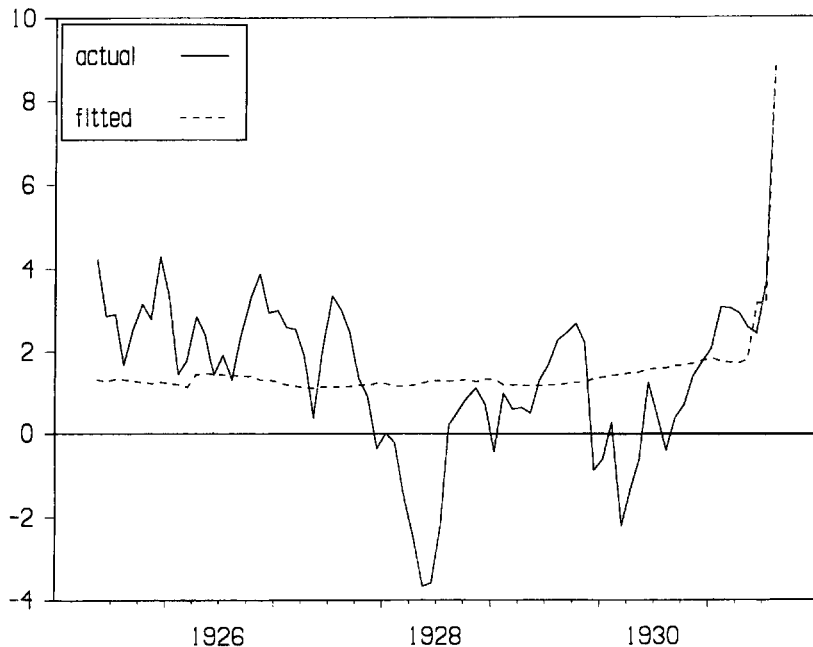


Fig. 1.9 Devaluation probability (percent)

interest rate shock, and one that eliminated imported deflation.³⁶ This exercise requires some assumptions about the path that would have been followed by the wholesale price index and the real interest rate had Britain not gone off gold. We assumed that the variations in the wholesale price index would have been the same in the United Kingdom as in France, which maintained its gold peg until 1936, and the real interest rate was set at a constant level equal to its average value over the fixed rate period.

Counterfactual 1: Indexing Unemployment Benefits. Figure 1.10 shows the evolution of the unemployment rate and the devaluation probability over the period 1925:5–32:12 under the assumption that real unemployment benefits were held constant at their 1925:5 level. The unemployment rate exhibits the same upward march as in the historical data, and by mid-1932 the devaluation probability jumps to a level of the same order of magnitude as during the sterling crisis. This suggests that the sterling crisis might have been postponed by a few months had unemployment benefits been indexed but that the course of this history would have been little changed otherwise.

36. These simulations are run using the equations in col. (2) of table 1.1, col. (3) of table 1.2, and col. (3) of table 1.3 and the equation in table 1.4.

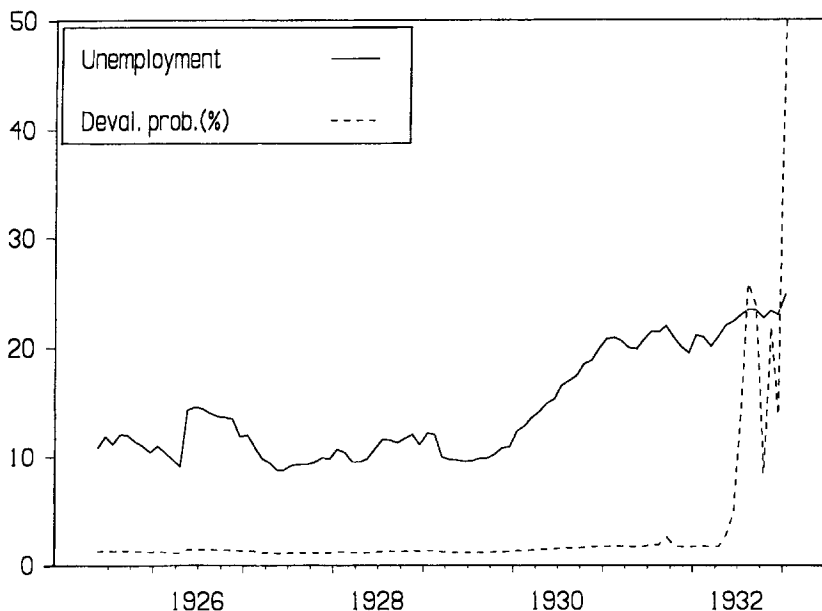


Fig. 1.10 Counterfactual 1: constant real benefit

Counterfactual 2: No Interest Rate Shock. Figure 1.11 shows the evolution of unemployment with the world real interest rate held constant at its 1928:12 level. The effect of removing the interest rate shock on unemployment is large but transitory. The unemployment rate would have been 4 percentage points lower than in the historical data in the summer of 1931. It would have grown at a quicker pace afterward, however, so that sterling would have been devalued at the beginning of 1934.

Counterfactual 3: No Imported Deflation. Figure 1.12 shows the unemployment rate and devaluation probability holding the price of imported goods constant at its May 1925 level. The unemployment rate is now 6 percentage points lower in mid-1931 than in the historical data and decreases afterward. As a result the sterling crisis would have been permanently postponed.

The reader may worry that our counterfactual results hinge too sensitively on the structural assumptions of our model or the estimation method. In order to check this, we reestimated the model as an unrestricted vector autoregression in the differenced variables with six lags and included the residuals of the cointegrating relation between unemployment, the real wage, and the real interest rate as an error correction term. Again, we found that removing the real interest rate shock would have postponed the sterling crisis by a few months, while removing the foreign price shock

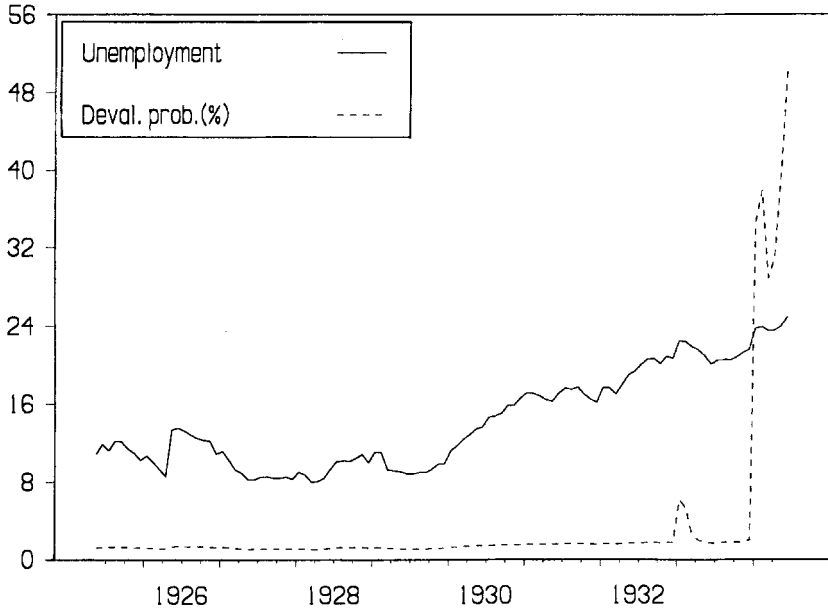


Fig. 1.11 Counterfactual 2: no interest rate shock

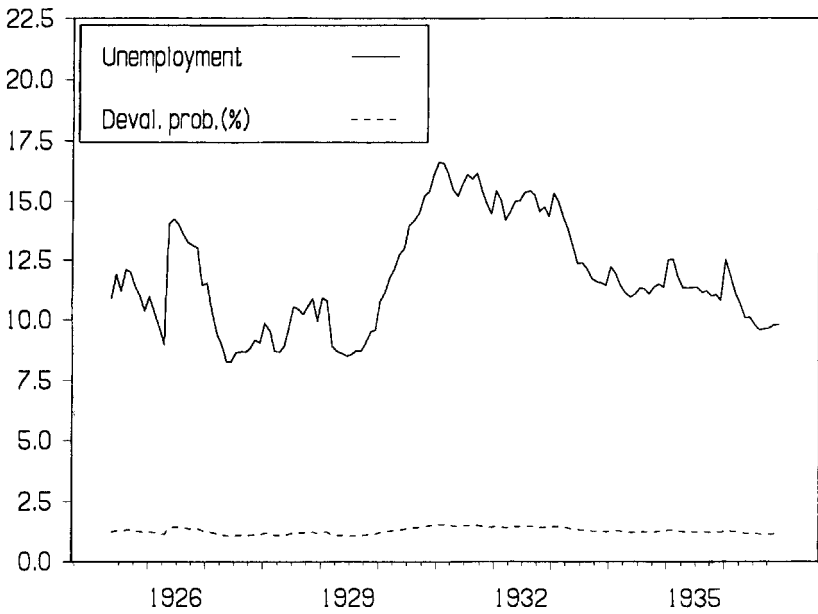


Fig. 1.12 Counterfactual 3: no imported deflation

would have postponed it permanently. This confirms that imported deflation was the main factor driving the rise in unemployment that in turn precipitated the sterling crisis.

1.6 Conclusion

In this paper we have analyzed currency crises in a model of unemployment, where the two-way interaction of devaluation expectations and unemployment gives rise to a rich set of dynamic possibilities. In our model, unemployment can heighten devaluation expectations, given the knowledge that the government may be prepared to pay the costs of opting out of its exchange rate commitment when a high level of joblessness increases the urgency it attaches to the pursuit of reflationary policies. Heightened devaluation expectations can in turn increase unemployment by adding a devaluation premium to interest rates. It is straightforward to see how an external shock can have a major impact through these feedback effects on both unemployment and the stability of the currency.

We have presented qualitative and quantitative evidence supporting this interpretation of the 1931 sterling crisis. Qualitative accounts, for their part, lay considerable weight on the pressure that a high and rising unemployment rate placed on British governments to pursue policies designed to stimulate recovery from the Great Depression, and on how the reluctance of those governments to raise interest rates in the face of speculative pressure undermined confidence in their commitment to the maintenance of the sterling parity. Our econometric estimates and simulations provide quantitative support for this interpretation. They suggest that the 1931 sterling crisis should be understood in terms of the pressure brought to bear on fragile governments by large foreign shocks superimposed on less than credible domestic policy commitments. We suspect that a similar model can shed light on currency crises in a variety of other times and places.

Appendix

Reduced-Form Dynamics

Taking the first difference of equation (3) and using equation (2) to substitute out the nominal wage gives

$$(A1) \quad \Delta p_t = -\frac{a_5 a_6}{1 - a_4 a_6} u_{t-1} + \frac{1 - a_6}{1 - a_4 a_6} \Delta p^*.$$

Equation (2) gives an expression for the rate of change of the real wage

$$\Delta \omega_t = \Delta w_t - \Delta p_t = -(1 - a_4)\Delta p_t - a_5 u_{t-1},$$

which, using the equation for Δp_t , may be written like the reduced-form equation for the real wage given in equation (7) with

$$(A2) \quad b_{21} = -\frac{a_5(1 - a_6)}{1 - a_4 a_6},$$

$$(A3) \quad b_{22} = 1,$$

$$(A4) \quad \alpha_2 = 0,$$

$$(A5) \quad \beta_2 = -\frac{(1 - a_4)(1 - a_6)}{1 - a_4 a_6},$$

$$(A6) \quad \gamma_2 = 0.$$

Using $r_t = i_{t-1} - \Delta p_t = r^* + \Delta p^* + d\pi_{t-1} - \Delta p_t$ to substitute out the real interest rate in equation (1), the unemployment equation may be rewritten

$$(A7) \quad u_t = a_3 r^* + \left(a_1 + \frac{a_3 a_5 a_6}{1 - a_4 a_6} \right) u_{t-1} + a_2 \omega_{t-1} \\ + \frac{a_3(1 - a_4)a_6}{1 - a_4 a_6} \Delta p^* + a_3 d\pi_{t-1}.$$

Whence the reduced-form equation for unemployment is given by equation (7) with

$$(A8) \quad b_{11} = a_1 + \frac{a_3 a_5 a_6}{1 - a_4 a_6},$$

$$(A9) \quad b_{12} = a_2,$$

$$(A10) \quad \alpha_1 = a_3,$$

$$(A11) \quad \beta_1 = \frac{a_3(1 - a_4)a_6}{1 - a_4 a_6},$$

$$(A12) \quad \gamma_1 = a_3 d.$$

Devaluation Probability

The government devalues if this lowers the loss function (6); that is, $u_{t+1}^2 > (u_{t+1} - \Delta u)^2 + C_{t+1}$, or

$$u_{t+1} > \frac{1}{2} \left(\frac{C_{t+1}}{\Delta u} + \Delta u \right),$$

where u_{t+1} is the unemployment rate at $t + 1$ conditional on no devaluation. The right-hand side of this inequality is the threshold level of unemployment above which the government prefers to devalue.

The devaluation probability at t is equal to the probability that the next-period unemployment rate (conditional on no devaluation) is above the threshold triggering a devaluation; that is,

$$(A13) \quad \pi_t = \text{Prob}_t \left[\frac{1}{2} \left(\frac{C_{t+1}}{\Delta u} + \Delta u \right) < u_{t+1} \right] = F(u_{t+1}),$$

where $F(\cdot)$ is the cumulative distribution function of $(1/2)(C_{t+1}/\Delta u + \Delta u)$.

Given our assumptions about the stochastic process followed by the opting-out cost, $F(\cdot)$ takes the form

$$(A14) \quad F(u) = \frac{1}{2} F_{\sigma_1}(u - v_1) + \frac{1}{2} F_{\sigma_2}(u - v_2),$$

where $F_{\sigma_k}(\cdot)$ is the cumulative of a normal distribution of variance $\sigma_k^2 = \text{Var}(\epsilon_k)/4\Delta u^2$ and $v_k = C_k/2\Delta u + \Delta u/2$ ($k = 1, 2$).

Using the reduced form (7) to substitute out u_{t+1} , one obtains a relation between the devaluation probability and current macroeconomic variables:

$$(A15) \quad \pi_t = F(b_{11}u_t + b_{12}\omega_t + \alpha_1 r^* + \beta_1 \Delta p^* + \gamma_1 \pi_t).$$

This equation implicitly defines π_t as a function of the economic fundamentals u_t and ω_t . Note that the right-hand side is increasing with π_t and may thus intersect the left-hand side in several points. If this is the case the devaluation probability is not determined uniquely by the economic fundamentals, and the beliefs of foreign exchange market participants may become self-fulfilling. The logic of this multiplicity is that high devaluation expectations validate themselves by increasing unemployment in the home country.

A sufficient condition for uniqueness is that the slope of the right-hand side of equation (A15) be everywhere lower than one; that is,

$$(A16) \quad \gamma_1 \max F' < 1.$$

If the condition above is satisfied, the devaluation probability is given by equation (8), where function $\Pi(\cdot)$ is increasing and satisfies $\lim_{-\infty} \Pi = 0$ and $\lim_{+\infty} \Pi = 1$.

Steady States

In steady state the real wage is constant:

$$(A17) \quad \Delta \omega_t = b_{21} \bar{u} + \beta_2 \Delta p^* = 0,$$

so that the steady state level of unemployment is given by equation (9).

In steady state the reduced-form equation for unemployment is

$$(A18) \quad \bar{u} = b_{11}\bar{u} + b_{12}\bar{\omega} + \alpha_1 r^* + \beta_1 \Delta p^* + \gamma_1 \bar{\pi},$$

which, using equation (9), implies (10).

Data

All data are monthly, from May 1925 to December 1936. Many are extracted from the *International Abstract of Economic Statistics* (IAES 1934) for the period 1925–30 and the *Recueil International de Statistiques Economiques* (RISE 1938) for the period 1931–36.

- u* Percentage of insured persons unemployed, males and females (IAES+RISE, Great Britain).
- w* Index of average weekly wages (IAES+RISE, Great Britain).
- p* Cost of living index (IAES+RISE, Great Britain).
- p^w* Wholesale price index (IAES+RISE, Great Britain).
- i* U.K. three-month nominal interest rate (Einzig 1937, app. III).
- i^{*}* U.S. three-month nominal interest rate (Einzig 1937, app. III, New York).
- p^{*}* U.S. consumer price index (Sayre 1948, table 1, column “All items”).
- e* Dollar-sterling exchange rate (IAES+RISE, United States).
- b* Weighted index of benefit rates (Burns 1941, 368). Weights are the same as in Hatton (1988).

References

- Allogoskoufis, George, and Ron Smith. 1991. The Phillips curve, the persistence of inflation, and the Lucas critique: Evidence from exchange rate regimes. *American Economic Review* 81:1254–75.
- Bain, G. S., and R. Price. 1980. *Profiles of union growth*. Oxford: Blackwell.
- Beenstock, Michael, and Peter Warburton. 1986. Wages and unemployment in interwar Britain. *Explorations in Economic History* 23:153–72.
- Benjamin, Daniel, and Levis Kochin. 1979. Searching for an explanation for unemployment in interwar Britain. *Journal of Political Economy* 87:441–78.
- Bernanke, Ben, and Kevin Carey. 1996. Nominal wage stickiness and aggregate supply in the Great Depression. *Quarterly Journal of Economics* 111:853–83.
- Bernanke, Ben, and Mark Gertler. 1995. Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives* 9:27–48.
- Bernanke, Ben, and Harold James. 1991. The gold standard, deflation and financial crisis in the Great Depression. In *Financial markets and financial crises*, ed. R. Glenn Hubbard, 33–68. Chicago: University of Chicago Press.
- Broadberry, S. N. 1983. Unemployment in interwar Britain: A disequilibrium approach. *Oxford Economic Papers* 35:463–85.
- Brown, William Adams, Jr. 1940. *The international gold standard reinterpreted, 1914–1934*. New York: National Bureau of Economic Research.

- Buiter, Willem. 1987. Borrowing to defend the exchange rate and the timing and magnitude of speculative attacks. *Journal of International Economics* 23:221–40.
- Burns, Eveline. 1941. *British unemployment programs, 1920–1938*. Washington, D.C.: Social Science Research Council.
- Cairncross, Sir Alec, and Barry Eichengreen. 1983. *Sterling in decline*. Oxford: Blackwell.
- Calvo, Guillermo. 1987. Balance of payments crisis in a cash-in-advance economy. *Journal of Money, Credit, and Banking* 19:19–32.
- Capie, Forrest, and Michael Collins. 1983. *The interwar British economy: A statistical abstract*. Manchester: Manchester University Press.
- Clay, Sir Henry. 1957. *Lord Norman*. London: Macmillan.
- Committee on Finance and Industry [Macmillan Committee]. 1931. *Report*. Cmd. 3897. London: His Majesty's Stationery Office.
- Cottrell, P. L. 1995. The Bank of England in its international setting, 1918–1972. In *The Bank of England: Money, power and influence, 1694–1994*, ed. Richard Roberts and David Kynaston, 83–139. Oxford: Clarendon.
- Crafts, N. F. R. 1989. Long-term unemployment and the wage equation in Britain, 1925–1939. *Economica* 56:247–54.
- Dimsdale, Nicholas H., and Nicholas Horsewood. 1995. Fiscal policy and employment in interwar Britain: Some evidence from a new model. *Oxford Economic Papers* 47:369–96.
- Dimsdale, Nicholas H., S. J. Nickell, and Nicholas Horsewood. 1989. Real wages and unemployment in Britain during the 1930s. *Economic Journal* 99:271–92.
- Dornbusch, Rudiger, Ilan Goldfajn, and Rodrigo O. Valdés. 1995. Currency crises and collapses. *Brookings Papers on Economic Activity*, no. 2:219–93.
- Eichengreen, Barry. 1992. *Golden fetters: The gold standard and the Great Depression, 1919–1939*. New York: Oxford University Press.
- Eichengreen, Barry, and T. J. Hatton. 1988. Interwar unemployment: An introduction. In *Interwar unemployment in international perspective*, ed. Barry Eichengreen and T. J. Hatton, 1–60. Dordrecht: Kluwer.
- Eichengreen, Barry, and Chang-Tai Hsieh. 1996. Sterling in decline again: The 1931 and 1992 crises compared. In *European economic integration as a challenge to industry and government*, ed. Richard Tilly and Paul Welfens, 355–92. Berlin: Springer.
- Einzig, Paul. 1937. *The theory of forward exchange*. London: Macmillan.
- Feinstein, C. H. 1972. *National income, expenditure and output of the United Kingdom, 1855–1965*. Cambridge: Cambridge University Press.
- Flood, Robert, and Peter Garber. 1984. Gold monetization and gold discipline. *Journal of Political Economy* 92:90–107.
- Flood, Robert, and Nancy Marion. 1999. Perspectives on the recent currency crisis literature. *International Journal of Finance and Economics* 4:1–26.
- Fraser, H. F. 1933. *Great Britain and the gold standard*. London: Macmillan.
- Hamilton, James D. 1994. *Time series analysis*. Princeton, N.J.: Princeton University Press.
- Hatton, T. J. 1988. A quarterly model of the labour market in interwar Britain. *Oxford Bulletin of Economics and Statistics* 50:1–25.
- Hawtrey, R. G. 1938. *A century of bank rate*. London: Longmans, Green.
- Hume, L. J. 1970. The gold standard and deflation: Issues and attitudes in the 1920s. In *The gold standard and employment policies between the wars*, ed. Sidney Pollard, 122–45. London: Methuen.
- International abstract of economic statistics, 1919–1930*. 1934. London: International Conference of Economic Services.
- International Monetary Fund. 1997. *International capital markets: Developments,*

- prospects and key policy issues. Part 2, Selected issues.* Washington, D.C.: International Monetary Fund.
- Janeway, William H. 1995–96. The 1931 sterling crisis and the independence of the Bank of England. *Journal of Post-Keynesian Economics* 18:251–68.
- Jeanne, Olivier. 1997a. Are currency crises self-fulfilling? A test. *Journal of International Economics* 43:263–86.
- . 1997b. The persistence of unemployment under a fixed-exchange rate peg: Theory and application to the franc fort policy. CIDER Working Paper no. C97-093. Berkeley: University of California, Department of Economics.
- Jeanne, Olivier, and Paul Masson. 2000. Currency crises, sunspots and Markov-switching regimes. *Journal of International Economics* 50:327–50.
- Keynes, John Maynard. 1925. *The economic consequences of Mr. Churchill.* London: Macmillan.
- Krugman, Paul. 1979. A model of balance-of-payments crises. *Journal of Money, Credit, and Banking* 11:311–25.
- . 1996. Are currency crises self-fulfilling? In *NBER macroeconomics annual*, ed. Ben S. Bernanke and Julio J. Rotemberg. Cambridge, Mass.: MIT Press.
- Kunz, Diane. 1987. *The battle for Britain's gold standard in 1931.* Beckenham, England: Croom Helm.
- Miller, Marcus, and Alan Sutherland. 1994. Speculative anticipations of sterling's return to gold: Was Keynes wrong? *Economic Journal* 104:804–12.
- Moggridge, Donald. 1972. *British monetary policy, 1924–1931.* Cambridge: Cambridge University Press.
- Morton, W. A. 1940. *British finance.* Madison: University of Wisconsin Press.
- National Monetary Commission. 1910. *Interviews on the banking and currency systems of England, Scotland, France, Germany, Switzerland and Italy.* S. Doc. 405. Washington, D.C.: Government Printing Office.
- Obstfeld, Maurice. 1986. Rational and self-fulfilling balance-of-payments crises. *American Economic Review* 76:72–81.
- . 1996. Models of currency crises with self-fulfilling features. *European Economic Review* 40:1037–47.
- Palyi, Melchior. 1972. *The twilight of gold, 1914–1936.* Chicago: Regnery.
- Pollard, Sidney. 1969. *The development of the British economy, 1919–1967.* London: Arnold.
- Recueil International de Statistiques Economiques, 1931–1936.* 1938. La Haye: Office Permanent de l'Institut International de Statistique.
- Redmond, John. 1980. An indicator of the effective exchange rate of the pound in the 1930s. *Economic History Review*, 2d ser., 33:83–91.
- Sargan, J. D. 1964. Wages and prices in the United Kingdom: A study in econometric methodology. In *Econometric analysis for national economic planning*, ed. P. E. Hart, G. Mills, and J. K. Whittaker. London: Butterworths.
- Sayers, Richard S. 1976. *The Bank of England, 1891–1944*, vol. 3. Cambridge: Cambridge University Press.
- Sayre, Robert. 1948. *Consumers' prices, 1914–1948.* New York: National Industrial Conference Board.
- Svensson, Lars. 1993. Assessing target zone credibility: Mean reversion and devaluation expectations in the ERM, 1979–1992. *European Economic Review* 37:763–802.
- Velasco, Andres. 1996. Fixed exchange rates: Credibility, flexibility, and multiplicity. *European Economic Review* 40:1023–35.
- Williamson, Philip. 1992. *National government and national crisis.* Cambridge: Cambridge University Press.

Willman, Alpo. 1988. The collapse of the fixed exchange rate regime with sticky wages and imperfect substitutabilities between domestic and foreign bonds. *European Economic Review* 32:1817–38.

Comment Michael D. Bordo

In this fascinating paper, Eichengreen and Jeanne extend the logic of the recent second-generation currency crisis models to explain the sterling crisis of 1931, a crisis that precipitated the demise of the interwar gold exchange standard. In simplest terms, the story they tell is that the United Kingdom abandoned gold convertibility on 20 September 1931 because the monetary authorities were unwilling to raise the discount rate sufficiently to defend convertibility. The authorities were concerned that such actions would increase the level of unemployment from its already high level. The explanation works through a model in which the monetary authority has a loss function that balances the costs of rising unemployment against the costs of lost credibility (including the benefits from sterling's role as a reserve currency and London's position as a financial center).

As unemployment rises the costs of abandoning convertibility decline relative to the political costs of not doing so. Exchange market participants understand this, so that the probability of devaluation increases. The level of unemployment is driven by the external shocks of the Great Depression via two channels: the effect of deflation on real wages in the face of nominal rigidities and the effect of deflation on ex post real interest rates via a credit market channel. Estimating the model and solving for the probability of devaluation gives the result of a marked jump in the probability of devaluation in the late summer of 1931, thus anticipating the crisis. A counterfactual displayed in figure 1.12 shows that in the absence of the external deflationary shocks of the Great Depression, the probability of sterling devaluation in 1931 would have been negligible.

The model is neat, easy to understand, and, if you believe the assumptions on which it is based, very compelling. The problem is that I am not convinced that it *was* the authorities' concern over rising unemployment that led them to throw in the towel on parity at \$4.86. This is not to say that it was not the shocks of the Great Depression that pushed the United Kingdom over the edge.

My first concern is over the issue of credibility. It is not obvious that the 1992 U.K. loss function—that the authorities were unwilling to persist

in maintaining a high Bank rate to defend sterling during the Exchange Rate Mechanism crisis because of the effects high interest rates would have on mortgage rates and the level of unemployment—applies to the United Kingdom in 1931.

The interwar gold standard was an attempt to reconstruct (although modified into a gold exchange standard) the pre-World War I classical gold standard. That regime, for the United Kingdom and other key players, was based on a credible commitment to gold parity. One can view the gold standard as a contingent rule, as I do in an article with Finn Kydland (Bordo and Kydland 1995) and as Eichengreen does in his recent book *Globalizing Capital* (1996). Under the rule, member countries stick to gold parity except in the event of a well-understood dire emergency, such as a war. In that case, you abandon convertibility and follow expansionary financial policies on the understanding that after the emergency is over you go back to gold at the previous parity. Another contingency, which is less clear-cut, is a financial crisis—not one produced by the monetary authorities' own actions—that is, a domestic banking crisis and a currency crisis together (referred to in an earlier literature as an internal and an external drain). In that case, you temporarily leave gold, as was the case for a number of crises in the nineteenth century when the Bank of England invoked a Treasury Letter. Rising unemployment was *not* one of those contingencies. It was not in the loss function. When unemployment went up, people emigrated to North America or Australia.

After World War I, the United Kingdom returned to gold at the prewar parity of \$4.86. To do so, it put the British economy through the wringer. The return to gold reflected the victory of the “City” view that only a return to the original parity would recapture the credibility of the prewar regime and the benefits that accrued to the City of London. Keynes and others opposed the policy, but they represented a minority position.

Evidence provided by a number of scholars, including Eichengreen (1992), suggests that the interwar gold exchange standard, at least the dollar-sterling exchange rate, was indeed credible at least up to the summer of 1931. So the question that arises is, What changed between 1925 and 1931 to justify using a late-twentieth-century loss function instead of the nineteenth-century loss function that lay behind the 1925 resumption? True, Eichengreen in *Golden Fetters* (1992) and in section 1.2 of this paper discusses the growing power of the labor movement, universal suffrage, the rise of socialism, and so forth. But to make the case for this paper, the authors need to come up with more convincing qualitative evidence than the “hints” that are given in section 1.2 that the U.K. monetary authorities in the period under consideration viewed rising unemployment increasingly as their primary objective.

My reading of the history of the crisis, based on Sayers (1976), Cairn-

cross and Eichengreen (1983), and others, is that it is not clear that rising unemployment and the unwillingness to raise Bank rate because of what it would do to unemployment was the key reason for the crisis. The literature focuses on two other factors. The first is the basic overvaluation of sterling since 1925 and the resultant weakness in the current account of the balance of payments. Thus the United Kingdom was continuously threatened with being forced off the gold standard for an old-fashioned first-generation currency crisis model reason. Indeed, two earlier sterling crises, in 1927 and 1929, when unemployment did not spike above its interwar level, were averted by rescue packages arranged with the Federal Reserve and the Bank of France.

The second factor in the received account of the crisis is the budget deficit, which, although not large by modern standards and on a full employment basis may have been a surplus, was perceived by contemporaries who believed in fiscal orthodoxy as inconsistent with adherence to the gold standard. According to Sayers, the budget deficit (and the May committee report in July 1931, which forecast that it would rise) was the key factor driving the attack on sterling. The budget deficit also may explain the unwillingness to raise the discount rate because it would increase debt service. It is true that raising unemployment by raising unemployment benefits was interrelated with the deficit. But we need to know why the national government formed in August 1931, which did not include the Labour Party, would have been hamstrung in the attempt to balance the budget because of the issue of rising unemployment.

These points suggest that in addition to qualitative evidence for the main assumption of the paper, we need to see evidence that a simpler explanation for the crisis, based on the fundamentals of the balance of payments and the government's fiscal stance, with the timing of the attack related to the European banking crisis, does not explain the events of September 1931.

One point in the authors' favor, however, is that there exists no convincing explanation for the failure of the Bank of England to raise Bank rate in the following two months before abandoning gold, after doing so in July 1931. That the Bank was seriously committed to staying on gold is evident from the efforts made to obtain credits from the United States and France. Possibly the Bank did not raise Bank rate so as to put pressure on the government to balance the budget as Cairncross and Eichengreen suggest, or to frighten holders of sterling as Sayers posits, but the answer to the question, unless the authors are correct, seems still to be a mystery.

On the other hand, why is it that the Bank of England, once it was released from convertibility constraints, did not immediately relax monetary policy in order to combat unemployment? Instead, it waited several months.

References

- Bordo, Michael D., and Finn E. Kydland. 1995. The gold standard as a rule: An essay in exploration. *Explorations in Economic History* 32:423–64.
- Cairncross, Richard, and Barry Eichengreen. 1983. *Sterling in decline*. Oxford: Oxford University Press.
- Eichengreen, Barry. 1992. *Golden fetters: The gold standard and the Great Depression*. New York: Oxford University Press.
- . 1996. *Globalizing capital: A history of the international monetary system*. Princeton, N.J.: Princeton University Press.
- Sayers, Richard S. 1976. *The Bank of England, 1891–1944*. Cambridge: Cambridge University Press.

Political Contagion in Currency Crises

Allan Drazen

2.1 Introduction

The possibility of contagion in currency crises across countries is highly topical, to say the least. Though the phenomenon is widely discussed and is supported by solid empirical evidence,¹ construction of convincing theoretical models of contagion is still in its infancy. Moreover, in existing models of contagion, political aspects of the decision whether to defend a currency against attack, central to the “new generation” crisis models, do not play an important role. This paper argues that political factors of two sorts may be key to understanding some examples of apparent contagion, most importantly the European Monetary System (EMS) crisis of 1992–93. First, the political nature of the decision to devalue, combined with incomplete information about government objectives in making this decision, is often crucial to the appearance of speculative pressures. Second, when one of a country’s principal objectives in maintaining a fixed exchange rate is (explicit or implicit) political integration with its “neighbors,” a devaluation by one of those neighbors will increase speculative pressures on the country. This argument is especially relevant to the EMS but is not limited to it.

In section 2.2 models of speculative attack are summarized to make

Allan Drazen is professor of economics at the University of Maryland, College Park, and the Hebrew University of Jerusalem and a research associate of the National Bureau of Economic Research.

The author thanks Paul Masson, Carmen Reinhart, conference participants, and seminar participants at the Hebrew University of Jerusalem for helpful comments, as well as Esteban Vesperoni for able research assistance.

1. See, e.g., Eichengreen and Wyplosz (1993), Gerlach and Smets (1995), and, esp., Eichengreen, Rose, and Wyplosz (1996).

clear the political nature of the devaluation decision. In section 2.3 existing models of contagion are summarized, as is the concept of *political contagion* introduced in this paper. In section 2.4 a very simple model is presented, along with a discussion of how it may be easily extended to a multiperiod framework. Section 2.5 suggests why, on the basis of varied types of evidence, political contagion may have been important in the 1992–93 EMS crisis. Section 2.6 concludes.

2.2 Models of Speculative Attack

In Krugman's seminal 1979 paper on exchange rate collapse, an inconsistency in fundamentals induces a steady loss in reserves, ending in an abandonment of fixed rates. For example, the government is running a deficit and is financing it by printing money. The rate of monetary expansion is inconsistent with the fixed exchange rate in the long run; in the short run, individuals do not want to hold the higher level of domestic currency and exchange it for foreign-currency-denominated assets. The peg rate must be abandoned when reserves hit a minimum level, which is common knowledge to all market participants. However, the peg collapses not at the date implied by simply extrapolating the steady decline of reserves but in a speculative attack at some earlier date, namely, the first date at which optimal investor behavior implies such an attack will succeed.

Krugman's model of the inevitable abandonment of an unsustainable peg was a major step in understanding how currencies collapse, and it has been extended in a number of directions. It has been criticized, however, because its description of the decision to abandon a fixed exchange rate is clearly unrealistic in some cases. In the Krugman model policymakers are passive, sticking with current mutually inconsistent policies and abandoning the fixed rate reflexively when the critical minimum level of reserves is reached. They neither take an aggressive role in defending the current exchange rate policy, nor do they adjust their commonly known policy objectives in light of external economic and political developments.

Though it may be accurate in some instances to argue that a devaluation reflects the technical infeasibility of continuing current policy, a more accurate characterization of the behavior of policymakers in many cases is that the decision about whether to devalue reflects the balancing of conflicting objectives. Deteriorating fundamentals are an important part of the story, but the decision to devalue is taken not because it is literally unavoidable but because of the importance of other objectives given external developments. Hence, devaluation is a *political* decision in that maintaining the peg is technically feasible (especially when a central bank can borrow reserves) but is seen by the government as no longer optimal in light of the costs of doing so and the importance of other objectives.

Krugman (1996) and others have applied the term "new crisis model" to models of currency crises that give a central role to government optimi-

zation and that characterize the devaluation decision in terms of a choice between conflicting objectives. As Krugman puts it in characterizing the new crisis model, "A government—no longer a simple mechanism like that in the classical model, but rather an agent trying to minimize a loss function—must decide whether or not to defend an exogenously specified exchange rate parity" (1996, 350). To the extent that weighing conflicting objectives is key to deciding how to respond to speculative pressures, political considerations are central to the new crisis model. Examples of this approach include Obstfeld (1994), Drazen and Masson (1994), Masson (1995), Ozkan and Sutherland (1995), Obstfeld (1996), and Bensaïd and Jeanne (1997).²

In these models, however, the treatment of speculators is far less meticulous than the treatment of policymakers: the latter are modeled as solving an explicit, well-formulated optimization problem; the former act optimally, but the optimization problem is generally either left implicit or is quite simplified. The problem of formulating devaluation expectations is stressed, but the information structure under which this takes place is quite simple. In Obstfeld (1994, 1996), for example, speculator behavior is summarized by their expectations of a devaluation, rationally conditioned on the government's optimal response to a single underlying shock and on the common-knowledge distribution of that shock. Drazen and Masson (1994) and Masson (1995) add uncertainty about the policymaker's objectives (the policymaker's "type") and consider how it will interact with uncertainty about fundamentals.

A more realistic model of optimal speculator behavior should have them solving a more complicated, dynamic signal extraction problem in which there are several types of shocks. Bensaïd and Jeanne (1997) is more satisfactory in this respect, with the probability of devaluation being derived via Bayesian updating of the policymaker's type. Drazen (1999) considers a dynamic model that allows for several types of shocks, where the rational expectations of devaluation are formed by Bayesian updating based on the history of policies and the current shock. In that model what is crucial in forming expectations of devaluation is not simply what policies were previously observed but also the circumstances in which they were observed. Not surprisingly, the information-based model of contagion presented here will be based on that model, though in a simplified form.

2.3 Contagious Currency Crises

"Contagion" appears to be the latest buzzword in foreign currency markets and in asset markets more generally. However, carefully reasoned

2. A model based on an optimizing government is *not* identical to one with multiple equilibria and the resultant possibility of self-fulfilling crises. A new crisis model can have a unique equilibrium, as in Drazen and Masson (1994), whereas a nonoptimizing model can have multiple equilibria, as discussed by Krugman (1996).

explanations of the causes of contagion, or even of what constitutes contagion, are as rare as discussions of the phenomenon are common.³ I will apply the term to currency crises to refer to the phenomenon whereby a currency crisis *itself* in one country makes a currency crisis (or currency weakness) in another country more likely. The emphasis is meant to differentiate true contagion from a common shock (*other* than a currency crisis) that affects countries differentially because of their differential susceptibility to infection. When differential vulnerability to an unobserved common shock reflects unobserved characteristics, we may get what looks like true contagion because a crisis in one country will be followed by a crisis in another, with no apparent explanation other than the original crisis itself. This is an identification problem well known in epidemiology. Following the very clear discussion in Masson (1998), we call these “monsoonal effects.”⁴

Masson makes a further distinction, arguing that contagion should be applied only to the case “where a crisis in one country may conceivably trigger a crisis elsewhere for reasons *unexplained* by macroeconomic fundamentals” (1998, 2; emphasis added). When a crisis in one country affects the fundamentals in another country (e.g., because a devaluation reduces the competitiveness of other countries and thus makes them more likely to devalue), he uses the term “spillover.” I will use the term “contagion” more generally.

2.3.1 Three General Models of Contagion

A well-developed general model of contagion is that of information “cascades,” in which asymmetrically informed investors acquire information sequentially by observing the actions of others who precede them. (See, e.g., Bikhchandani, Hirshleifer, and Welch 1992.) Agent 2 on the basis of his own information may prefer action A to action B, but he observes agent 1 choosing B. He thus infers that agent 1 has information favoring B, and this may push agent 2 to choose B as well. Agent 3, observing two previous choices of B, may also conclude that B is optimal, although his private information alone would imply choosing A. And so on. The general information cascade model may be more relevant for differentially informed investors in a given market than for contagion across foreign exchange markets. Two basic assumptions for an information cascade would not appear to be satisfied in foreign exchange markets: the cascade model relies on significant differences in private information across agents, but it is far from clear that there are such informational

3. E.g., the most common reason by far that market traders gave for devaluation contagion within the EMS in the Eichengreen and Wyplosz survey was that “markets ‘tasted blood’ (realized that there were profits to be made)” (1993, 98).

4. Masson focuses on shocks from industrial countries affecting Asian emerging markets, hence the terminology. We will use the term a bit more generally.

differences across large investors for major currencies; and the cascade model relies on significant transactions costs in order to generate sequential behavior, but foreign exchange markets are not characterized by such high transactions costs. Moreover, in discussions of the applicability of cascades to contagious currency crises, it is not clear what is the relevant information transferred *across* currency markets.

Less formally, the idea of informational externalities has been applied to foreign exchange markets as follows. It is argued that with uncertainty about policymakers' commitments to defending fixed exchange rates, the collapse of the exchange rate in one country may provide information that another country in similar macroeconomic circumstances is more likely to abandon its fixed parity. Though the argument is often heard, the logic is often incomplete. One could justify it in terms of a common unobserved shock that affects countries differentially due to different macroeconomic circumstances, but this is a monsoonal effect, rather than true contagion. As a contagion story, one must make clear what *new* information that is *relevant* to the second currency is being provided by the collapse of the first currency. Since devaluation in the first country provides no new information either about macroeconomic conditions per se (but see the arguments about spillovers below) or about the policy-making process in the second country (but see the discussion of political contagion in subsection 2.3.2 below) a less direct mechanism of contagion may be present.

More specifically, the argument that the collapse of the exchange rate in one country implies that another country in similar macroeconomic circumstances is more likely to abandon its fixed parity may be *probabilistic* or statistical. Market participants envision a collapse scenario that could occur under certain circumstances but assign it a low probability until it actually occurs in such circumstances. They then raise the probability of its occurring in similar circumstances elsewhere, perhaps increasing their speculation against those other countries. Hence, a crisis in one country, previously assigned low probability, may raise the probability of devaluation elsewhere. This is not herding to a currently faddish theory of contagion (a phenomenon that may itself be present), but statistical updating on the basis of drawing another observation favorable to a theory.

Another type of contagion model is a "spillover" model (to use Mason's terminology), focusing on trade linkages. This has been modeled formally by Gerlach and Smets (1995) and Eichengreen et al. (1996). An attack-induced devaluation in one country enhances its competitiveness, leading to trade deficits and declining reserves for its trading partners, making their currencies more vulnerable.⁵ If one looks simply at bilateral trade linkages, the idea may be relevant for some cases (as in the effect of

5. An alternative argument is that changes in the price levels of trading partners reduce demand for money, leading to a depletion of reserves.

the floating of the Finnish markka on 8 September 1992 on speculation against the Swedish krona, as discussed by Gerlach and Smets), but it does not appear to be a general explanation. The magnitudes seem wrong because “contagious” attacks hit currencies where the bilateral trade volumes just are not large enough. However, this bilateral view is probably too limited, for we should consider multilateral linkages, whereby two countries compete against one another in the same third-country market. Theoretically, this appears relevant for Asian countries with significant exports to Japan or the United States. However, the trade magnitudes are probably still too small to explain contagion beginning in Thailand, even when both bilateral trade and third-market trade are included.

An analogous argument is that spillovers occur via financial markets, as third-country investors liquidate their positions in one country to cover crisis-induced losses in another. It is far harder to assess empirically how important this was in the recent Asian crisis. In any case, this vehicle for contagion seems of little relevance for the Exchange Rate Mechanism (ERM) crisis of 1992–93.

A third line of argument is that contagion is linked to the possibility of multiple equilibria and self-fulfilling speculative attacks. Masson (1998), in fact, argues that only models of this sort are capable of producing true contagion, reflecting his view (see above) that contagion, by definition, refers to the simultaneous occurrence of currency crises not linked to macroeconomic fundamentals. In his model, a crisis is the result of a deterioration of the current account, reflecting in turn extremely high debt service. Interest rates include a devaluation premium, so that the expectation of a devaluation can be self-fulfilling. Masson’s argument concentrates on the simultaneity of a number of such episodes, rather than a causal link between them. Similarly, Eichengreen and Wyplosz (1993) suggest that high unemployment leads market participants to anticipate a future loosening of monetary policy, inducing speculation against the currency. The costs of defending the currency rise, due in part to the induced upward pressure on interest rates, so that a country may in fact devalue where it would not have in the absence of speculative pressure. Hence, the expectation of monetary loosening becomes self-fulfilling. This argument, as will be discussed in section 2.5 below, is close to but not identical to the one presented here.

2.3.2 Political Contagion

In the previous subsection, we summarized three general models of contagious currency crises. Each type of model is structured along the lines of the second-generation models of crisis, which stress the balancing of conflicting objectives in the devaluation decision, leading us to characterize these models as “political.” The objectives themselves, however, are basically economic, and the nature of the contagion is thus economic as

well. In this paper, I want to introduce a fourth type of contagion that is inherently political, in that the objectives that give rise to contagion are primarily political. Contagion will be intrinsically political, for in the absence of the political objective, devaluation in one country would not affect speculative pressure on another country's currency.

First, what does one mean by "primarily political" objectives in economic policy? Economic decisions are often made on the basis of largely political goals. Income distribution programs are a good case in point: transfers are made with the aim of maximizing votes for the incumbent party. The objective of a decision is clearly primarily political when it supports a political objective that is in conflict with economic objectives. Hence, holding the exchange rate fixed for the purpose of enhanced political integration at significant economic cost is a primarily political decision. As many have argued, this characterization describes the impetus toward fixed exchange rates in the move toward European Economic and Monetary Union (EMU). (Feldstein 1997 argues quite strongly on the primarily political nature of decisions surrounding EMU.)

More generally, the point that the decision to keep a fixed parity may be primarily political can be put as follows. One component of increased political-economic integration with other countries is often the maintenance of a fixed exchange rate with respect to their currencies. This may reflect the desire to form some sort of explicit currency area or trading bloc, as, for example, in the case of the EMU. Or it may be less explicit, in the sense that "cooperative behavior" means refraining from competitive devaluations. Hence, one may think of membership in a "club,"⁶ whether explicit or implicit, where the benefits of membership are heavily political and the condition for membership is the maintenance of a fixed exchange rate. (We consider in section 2.5 the specific institutional details that describe the EMU as such a club.)

The concept of political contagion in speculative attacks follows as an implication of the desire for political integration where maintenance of a fixed exchange rate is a membership condition on each potential member of the integrated unit. One must make one further assumption, namely, that the value of membership in the arrangement depends positively on who else is or may be a member. Hence, if a country learns that other potential members of the arrangement place less weight on meeting the conditions required to join and, hence, are less likely to participate, it will find less advantage in joining as well. It will therefore assign a lower value to maintaining a fixed exchange rate, especially when doing so requires sacrificing domestic goals.

6. I use the term "club" for lack of another term that is concise rather than cumbersome. One should note, however, that the role of clubs in providing public goods is not central to the argument here.

To complete the argument, suppose that speculators are uncertain about a country's commitment to a fixed rate because they are uncertain of the weight the country's policymakers put on conflicting objectives. Speculators know, however, that the desire for integration subject to the no-devaluation membership condition is an important objective. Rational behavior on their part will then imply that a successful attack on one currency (or perhaps even speculative pressure on the currency), revealing a weaker commitment than previously believed, creates an externality in the form of a lower commitment of all other potential members. These countries will therefore be more vulnerable to attack.⁷ We term this contagious effect *membership contagion*.

2.4 A Model of Membership Contagion

In this section we present a simple model of membership contagion and discuss the underlying concept in greater detail in subsection 2.4.3. The possibility of a contagious currency crisis depends on incomplete information about government intentions, allowing revelation of information about the intentions of other countries to affect the probability of a devaluation. This probability is derived under rational expectations, where it is shown how this probability depends on history, on the country's current circumstances, and on the actions of other countries.

To make things as simple as possible, we consider a single-period model, based on the more general multiperiod model presented in Drazen (1999). The more general model allows an explicit discussion of how rational devaluation probabilities evolve over time as a function of a country's current circumstances and the history of policy—specifically, how information from the history of policy and the circumstances in which those policy decisions were made affects the current information set. Here this updating of the past will be implicit, but it will be clear how the model is easily extended to a dynamic framework.

The sequence of events in the model is as follows. A country that has maintained a fixed exchange rate experiences a stochastic shock η , which is observed by both the government and speculators. Speculators then choose a level of speculation against the currency, given η and the probability they assign to a devaluation (of known size) at the end of the period. Specifically, speculators borrow domestic currency to be repaid at the end of the period and use it to buy foreign currency reserves. Since main-

7. This contagion argument should be distinguished from the earlier argument about the spillover of competitive pressures via real exchange rate effects in implicit trading arrangements. The previous argument concerned the trade effect of a lower real exchange rate following a nominal devaluation, which induces a trading competitor to devalue. Here the argument focuses on the contagious nature of "breaking the rules," *independent* of any effects on the real exchange rate.

taining the fixed parity requires that reserves remain above some critical level, speculative demand for reserves determines a minimum interest rate i that must be maintained if the government is to defend the fixed parity. On the basis of η and i , the government then decides whether to defend the fixed exchange rate (denoted by choice of policy F) by holding the interest rate at i or to abandon the parity and devalue (policy D) consistent with a lower interest rate. At the end of the period speculators sell their reserves back to the government and pay off their borrowing. Though speculators use a range of information in deciding whether to attack a currency, we consider basically three types of shocks here: a country-specific factor that is unobservable to speculators (the country's unobservable "type"), a country-specific shock that is observable to both the government and speculators, and, to model contagion, a cross-country observable shock.⁸ New information relevant to speculators will generally fall into one of these categories.

2.4.1 Speculator Behavior

As already indicated, key to speculator behavior is their borrowing of domestic currency in order to buy foreign currency reserves. Speculators are assumed to be atomistic, but the total cost of borrowing is assumed to be an increasing, convex function of the quantity borrowed.⁹ This assumption allows us to maintain the simplicity of working with a parametric interest rate, rather than an interest rate schedule, but at the same time to prevent speculators from taking infinite speculative positions. Under these assumptions, one can easily show that total demand for reserves by profit-maximizing speculators is increasing in the probability p that speculators assign to a devaluation and decreasing in the cost of borrowing funds (see Drazen 1999). For simplicity, we make the further reasonable assumption that the cost of borrowing funds is such that demand for borrowing goes to zero as i approaches infinity and goes to zero as p goes to zero.

Suppose that maintaining the fixed exchange rate requires foreign currency reserves to be above some minimum level. For given devaluation expectations, defending the fixed rate then requires keeping the interest rate high enough that total demand for reserves is no greater than this minimum level. (Speculators' beliefs about the probability of a devaluation are fully summarized by p , where we discuss below how rational beliefs are formed, conditional on available information.) This determines

8. In a multiperiod version of the model, the country-specific unobservable "type" would be time invariant, while the observable country-specific shock would be time varying.

9. In a multiperiod model, assuming that speculators can adjust their positions period by period allows us to retain the feature that in deriving their optimal position, risk-neutral speculators would need only to consider the probability of devaluation in the current period and would not need to form expectations of the probability of devaluation in future periods. See Drazen (1999).

the lowest interest rate consistent with maintaining the fixed parity (the “minimum required interest rate”), which given our assumptions is an increasing, continuous function of p , namely, $i(p)$.

2.4.2 The Government’s Choice Problem

We now turn to the decision problem of a social-welfare-maximizing government that has an announced commitment to a fixed exchange rate. If the government is to maintain the fixed parity (policy F), it must raise the interest rate to the level $i(p)$ consistent with maintaining sufficient foreign currency reserves, with the associated welfare loss due to the detrimental effect of high interest rates on the domestic economy. Four areas of negative impact are generally mentioned: negative impact on economic activity, especially when the economy is seen as depressed; negative impact on mortgage interest rates, especially when these rates are directly indexed to money market rates and defense of the exchange rate requires holding market rates high for significant periods (as in the case of the United Kingdom); impact of interest rates on increasing the budget deficit; and possible destabilization of the banking system. We represent these losses by a function $H(i, \eta)$, where H is increasing and concave in both the domestic interest rate i and the shock η and $H(\cdot) = 0$ if the government chooses to devalue rather than defend the fixed parity. The shock η is observed by both the government and speculators. It is meant to represent any currently observed factor known to affect the value the government may assign to maintaining a fixed exchange rate, such as changes in the level of foreign currency reserves or changes in domestic unemployment rates.

Not defending the fixed parity and devaluing has both benefits and costs. Since our interest is in the latter, we assume the benefits are subsumed in the function H . Whereas the benefits of devaluation are generally purely economic, the cost of not defending a fixed exchange rate are more political in nature in that they are costs associated with reneging on a commitment. In a multiperiod model loss of reputation would be foremost among these. Membership effects, as discussed in subsection 2.3.2, present another example of this sort of cost when devaluing creates a bar to participation in a cooperative arrangement. Two aspects of this cost are important for our modeling of contagion: first, that the cost the government assigns to devaluing is asymmetric information, known to the government but not fully known to speculators, and, second, that this cost depends, among other things, on (at least partially) known information about the commitment of other countries to the cooperative arrangement, or club, of the sort discussed in subsection 2.3.2 above.¹⁰ We consider them in turn, both in some detail.

10. There is no contradiction between saying that the country’s commitment to the fixed rate is not *fully* known and the commitment of other countries to a cooperative arrangement, which may itself depend on their maintaining fixed rates, is at least *partially* known. If this point is not clear here, it will be below.

The first aspect, asymmetric information about a government's intentions, is modeled as an element x which affects the loss from a devaluation, where x is known with certainty only to the policymaker himself (his "type"). Speculators, on the other hand, know only the distribution of possible types as summarized by a distribution $G(x)$ defined over $[\underline{x}, \bar{x}]$. The information summarized by the distribution and its supports could reflect learning about the government on the basis of past observation of its policies and of the circumstances in which these policies were undertaken, as will be discussed below.

The second aspect is summarized by a parameter Z , an index of the value to the country of being in the club. Z could be simply the number of other countries that satisfy the membership criteria, or it could be a weighted sum, with weights depending on the importance for the home country of a given country's participation. More generally, Z could encompass the probability of the club arrangement coming into being, as a function of the behavior of other countries. We present a fuller discussion of the determinants of Z in the next subsection. The loss ζ from a devaluation will equal xZ if the policymaker devalues and will equal zero otherwise.

The trade-off that a social-welfare-maximizing policymaker faces if the currency is attacked—maintaining the fixed exchange rate against maintaining low interest rates—may then be represented by the loss function

$$(1) \quad L = H(i, \eta) + \zeta(xZ),$$

where the second term is zero if the government defends the fixed exchange rate, while the first term is zero if it does not.¹¹

The government's policy choice, given the realization η and the interest rate $i(p)$ required to maintain the fixed exchange rate consistent with speculators' beliefs, as summarized by p , will be summarized by a cutoff type \hat{x} of policymaker who is just indifferent between devaluing and not devaluing. All types with $x < \hat{x}$ will devalue; all types with $x \geq \hat{x}$ will maintain the fixed parity. To see why, first derive the cutoff \hat{x} by equating the value of L in equation (1) under policy F (so that $L = H$) and policy D (so that $L = \zeta$), so that

$$(2) \quad \begin{aligned} \hat{x} &= \frac{H(i[p], \eta)}{Z} \\ &= \hat{x}(p, \eta, Z). \end{aligned}$$

The cutoff $\hat{x} = \hat{x}(p, \eta, Z)$ is continuous and increasing in p and η and continuous and decreasing in Z . For a type with $x \geq \hat{x}$, $xZ \geq H$, so that

11. In a multiperiod framework the government would minimize a discounted loss function in which each term would take the form of eq. (1), where the cost $\zeta(xZ)$ would be interpreted as a one-time cost. Optimization would be forward looking, in that the implications of policy F or D in any period for future trade-offs would be considered. See Drazen (1999).

it will be optimal to defend the fixed parity rather than devalue; for a type with $x < \hat{x}$, $xZ < H$, so that it will be optimal to devalue. Hence, the cutoff rule fully characterizes a government's optimal behavior, and the probability of a devaluation depends on $\hat{x}(p, \eta, Z)$, given \underline{x} and $G(x)$. For future use it is useful to denote by $\underline{\eta}$ the value of η such that $\hat{x} = \underline{x}$, for given p and Z . That is, $\underline{\eta}$ is the value of η such that even the government type with the lowest cost of devaluation finds it optimal to maintain a fixed exchange rate, so that the probability of a devaluation is zero.

The nature of the optimal policy should be intuitive. Other things equal, the higher is speculation against the currency (summarized by p), the more likely a government is to find it optimal to devalue, rather than keep interest rates high. (I.e., an increase in \hat{x} means that the probability that x lies below \hat{x} increases.) The realization of an exogenous shock η will affect the government's incentive to devalue and, as we shall see, the equilibrium level of speculation itself. Finally, the fewer countries that are potential members of the association (or the less important are the other qualifying countries, or the less likely for the association to come into being), the lower is Z and the higher is \hat{x} , so the higher is the probability of a devaluation.

The determination of \hat{x} , and its implications for possible policy choices, also indicates how updating would take place in a multiperiod model. Suppose \hat{x} is above \underline{x} in period $t - 1$, as it will be for sufficiently high η , and the government chooses to defend the currency. This policy choice implies that the government's x is above \hat{x} , so that the lower support of the distribution at the beginning of t will be $\hat{x} > \underline{x}$, the lower support in $t - 1$. This is simply Bayesian updating, with the implied updating of the distribution of $G(x)$. If the realization of the current shock η was sufficiently low that $\hat{x} \leq \underline{x}$, all possible types would defend the fixed rate and the observation of policy F would provide no information, so the lower support of the distribution at the beginning of $t + 1$ would remain \underline{x} . Hence, the current lower support \underline{x} and the associated distribution $G(x)$ summarizes what has been learned about the government's type prior to the current period on the basis of past observation of its policies and of the circumstances in which these policies were undertaken. The dynamics of speculative attacks based on such learning is the main focus of Drazen (1999), and this inference problem is one of the two key features distinguishing the multiperiod model presented in that paper from the single-period example presented here. (The other is the government's intertemporal optimization problem when it knows speculators are solving such an inference problem.)¹² Although we solve only a static problem, this discussion, combined with the discussion of the government's multiperiod objective in footnote 11, indicates how the model can be easily made dynamic.

12. A very similar multiperiod inference problem, as applied to the information conveyed by a policy of capital account liberalization, is presented in Bartolini and Drazen (1997).

2.4.3 Determinants of the Value of Membership

The heart of the model of membership contagion is the parameter Z , indicating the value of membership in a club, which depends on who else is, or is not, in the club. The extent of membership contagion will then depend on the specification of the club for which no-devaluation is the key membership criterion. As already indicated, this club may be a formal arrangement, such as an explicit common currency area or a trading bloc, or a far less explicit arrangement. To the extent that governments see such clubs as important, the political nature of the decision about whether to devalue may be seen in part as the decision about which club to join, the club of devaluers or the club of nondevaluers. Furthermore, if one views such clubs broadly, the club may be defined by politicians at the time devaluation decisions are being debated, rather than simply being preexisting or previously agreed upon arrangements. Hence, the concept of membership effects, and the possibility of contagion that arises from it, should be seen as including, but more broad than, simply explicit currency or trading arrangements.

The easiest case is that of explicitly defined clubs with no-devaluation as an explicit membership criterion, as is the case of the EMU as discussed in section 2.5. The link, however, from the no-devaluation membership criterion to contagion may be simple and direct, or it may be more subtle. The simplest link is where a devaluation disqualifies one country from joining the club for at least some period of time, and where the value to other potential members depends positively on that country's being a member. A less direct link is one in which devaluation by one country does not literally disqualify it over the relevant time horizon but makes its participation, or perhaps the existence of the arrangement itself, discretely less likely, thus lowering the value of membership to other potential members, making them more likely to devalue. This may be a more accurate description of the possible causal link from eventual membership in the EMU and the contagious currency crises in the EMS in 1992–93. An unanticipated devaluation by one potential member will reveal lower commitment to fixed exchange rates than previously believed, not only to speculators, but also to other potential members. This raises the probability they assign to that country's devaluing in the future and thus lowers the probability they assign to its meeting the membership criterion when it becomes effective.

In the context of an explicit currency union such as the EMU with a specific membership criterion of no-devaluation over a given horizon, there may be an even more subtle form of membership contagion. A devaluation by a country that other potential members view as important may lead to a weakening of the membership rules themselves. Suppose there is a desire to maximize the likelihood that the EMU will come into being

with, say, Italy as a member. Italian abandonment of the fixed parity in a way that might disqualify it because of failure to meet the membership criterion may lead to the no-devaluation rule being weakened, though not scrapped entirely. The weaker criterion would make other countries more likely to devalue, as this would no longer disqualify them, as previously. If several countries cannot “clear the bar,” one might expect the bar to be lowered, so that others that could have will put less effort into maintaining fixed rates. One should be careful, however, in distinguishing between the argument that contagion may result from a devaluation-induced weakening of a no-devaluation criterion and the far stronger argument that a country that devalued believed *ex ante* this would have no membership consequences. There is no real evidence that ERM countries that abandoned their fixed parities in 1992–93 did so with the anticipation that the criteria would be changed in such a way that this would have no political costs, nor that a devaluation by a potential EMU member left the probability of EMU unchanged.

A related, though less formal, argument is that once a major player devalues and deviates from a previously solid arrangement, other players suddenly realize, “It can be done!” This is a variant of the argument in subsection 2.3.1 whereby contagion across countries in similar macroeconomic circumstances may reflect a probabilistic calculation, whereby seeing the phenomenon once significantly raises the probability that market participants assign to its occurring elsewhere. Replacing “probability” by “possibility” and replacing “market participant” by “government” shows how the analogy can be made. It has been argued that Britain’s leaving the gold standard in 1931 may have had contagious effects on other countries for this reason (see, e.g., Eichengreen and Jeanne, chap. 1 in this volume).

What about less explicit clubs? More specifically, what sort of less explicit clubs might generate membership effects? And how might membership be defined? On a regional basis, politicians may attach weight to being “lumped together” in the eyes of international investors with neighbors whose economic performance is especially good, while differentiating themselves from countries in the same region whose performance is seen as poor. To the extent that there is a correlation between perceived performance and exchange rate regime, more specifically, fixed exchange rates, one obtains no-devaluation clubs. Such a club effect may be relevant for Asia or Latin America.¹³ One possibility for membership contagion then

13. It seems quite relevant for France as well in the early part of the EMS period. In contrast to the strongly expansionary policies that the socialist government followed after coming to power in May 1981, there was an important change in behavior in June 1982, reinforced in March 1983, when France shifted to far tighter fiscal and monetary policies, the *politique de rigueur*. The purpose of this change in policy, which had a serious cost in terms of significantly higher unemployment, was to convince investors of a change in under-

comes from the argument in the previous two paragraphs, by which a devaluation by one club member weakens the membership criterion and makes other members more likely to devalue. That is, if one “success story” that previously maintained fixed rates suddenly devalues under specific circumstances, governments may perceive that avoiding devaluations under all circumstances is no longer a criterion in the eyes of investors to be part of the favored group. Of course, when devaluation itself is seen as revealing weakness, “reverse contagion” may result. If devaluations by its neighbors are seen as revealing economic problems that may have a regional component, a country’s commitment to fixed exchange rates may be strengthened because it wants to make clear that it still belongs the no-devaluation club. The strength with which China and Hong Kong defended their exchange rates in the recent Asian turmoil would appear to reflect reverse membership contagion.

2.4.4 Speculator Inference and Rational Devaluation Beliefs

In subsection 2.4.2 we derived the optimal behavior of speculators on the basis of their beliefs about the probability of a devaluation p . On the basis of speculator behavior, we derived optimal behavior of the government in deciding whether to defend the fixed exchange rate. To close the model, we must ensure that the beliefs of speculators are consistent with government optimal behavior, that is, that they are rational. Hence, we must calculate the true probability of devaluation based on the beliefs p and equate them.

Given the cutoff nature of the government’s optimal decision problem, the probability of a devaluation should reflect beliefs over government types. These beliefs are fully summarized by the set $[\underline{x}, \bar{x}]$ and the conditional cumulative distribution associated with this set, $G(x)$. The actual probability of a devaluation, call it π , can then be calculated using $G(x)$ and the cutoff type \hat{x} , namely, as $G(\hat{x})$ for states where $\hat{x} > \underline{x}$ (i.e., for $\eta > \eta$, as defined above) and zero otherwise. With the actual probability of devaluation π so defined, we may relate it to the perceived probability p using the definition of $\hat{x} = \hat{x}(p, \eta, Z)$ in equation (2). Since our focus is not on the role of history as summarized by \underline{x} , we will suppress the dependence of π on \underline{x} and concentrate on the roles of η and Z . The rational equilibrium devaluation probability, for given values of η and Z , is then

$$(3) \quad \begin{aligned} \pi &= G(\hat{x}(\pi, \eta, Z)) && \text{for } \eta > \underline{\eta}(Z), \\ &= 0 && \text{for } \eta \leq \underline{\eta}(Z), \end{aligned}$$

lying government objectives. France made this change credible by accepting high unemployment without devaluing. There were no realignments for a three-year period, despite unemployment rising above 10 percent. For a fuller discussion, see Drazen and Masson (1994).

where $\bar{\eta}(Z)$ is defined by equation (2) for $\hat{x}(0, \bar{\eta}, Z) = \underline{x}$. Equation (3) will always be satisfied for $\pi = 0$, as $\hat{x}(0, \eta, Z) < \underline{x}$. There will be at least one interior solution for sufficiently high η , given Z (i.e., $\eta > \bar{\eta}(Z)$), or for sufficiently low Z , given η . Given the characteristics of $\hat{x}(\bar{p}, \eta, Z)$ from equation (2) and the definition of $\pi(\eta, Z)$ in equation (3), it is clear that the equilibrium level of speculation π is increasing in η and decreasing in Z . The solution $\pi(\eta, Z)$ is central to our analysis of the dynamics of contagious speculative attacks.

The model admits the various types of contagion discussed above. An *information cascade* depends on what information is being transmitted; membership contagion discussed below will provide an example. Contagion via *spillover of fundamentals* can be represented by a change in fundamentals in another country inducing an increase in η , and hence in π . Contagion arising from *multiple equilibria* follows from the possibility of multiple solutions to equation (3). There will always be a solution $\pi = 0$, namely, where speculators believe there is no probability of a devaluation and do not speculate against the currency (due to the interest cost of borrowing), so that the government finds it costless to defend the currency. There may also be multiple interior solutions. (In this case, we take the highest value of π that satisfies the first part of eq. [3] as the interior solution for the discussion of other types of contagion, so that eq. [3] will have one positive and one zero solution.)

Our focus is on *political contagion* in speculative attacks, more specifically, the possibility of *membership contagion*, as discussed subsection 2.4.3. This would be characterized by the positive dependence of π on Z , the (possibly weighted) index of other potential members of the club. (A crucial assumption is that Z is known to both speculators and the government, as is the fact that $\zeta(xZ)$ is increasing in Z .) Hence, as long as *no*-devaluation is a membership criterion and a devaluation provides new information about Z , one obtains true contagion: a successful speculative attack on one potential member country will increase the probability of attack on other potential members.

2.5 Membership Contagion in the 1992–93 EMS Crisis

We now ask whether there is any evidence relating speculative attacks in the 1992–93 EMS crisis to membership contagion. (As argued above, the concept is also applicable to the desire for membership in less formal cooperative arrangements, but we focus here on the EMS.) We present not formal econometric tests but evidence more in the nature of “case studies,” culled from other sources, suggesting that the concept may in fact be relevant. This will concern the answers to two questions: First, is there evidence that a devaluation in one country affected the probability of a de-

valuation in other countries? Second, if the answer to the first question is positive, is there evidence that this contagion may reflect membership effects?

On the first question, there seems to be general agreement that Britain's abandonment of its defense of the pound sterling in September 1992 did put pressure on some other European currencies. One can see this using the Eichengreen-Rose-Wyplosz index of crisis. More simply, looking at forward rates (measured as deutsche marks per unit of domestic currency), one can see a sharp fall in the rates for the Italian lira, the Spanish peseta, and the Irish punt, and a less sharp fall for the Danish krona and the French franc on 14 September 1992.¹⁴ The Swedish abandonment of its defense of the krona in November appears to have had similar contagious implications.

The far harder question is whether membership effects were involved. This may be itself divided into two questions. First, as far as immediate causation, does a devaluation by one potential member lower the perceived probability of EMU? Second, does a lower probability of EMU actually taking place lower the political resolve of potential members to defend their fixed parity?

The first question is largely one of institutional detail, though not entirely, as the discussion in subsection 2.4.3 should make clear. As is well known, one of the convergence criteria required to qualify for EMU is that a country maintain exchange rate stability: it must keep its currency within the EMS fluctuation bands "without severe tensions" for at least two years before joining the monetary union. A devaluation, even one time, outside the EMS bands may thus prevent a country from joining the EMU. This formal membership criterion could then lower the perceived probability of EMU either directly, if the devaluation occurred within two years of when the criterion would be relevant, or indirectly, whereby a devaluation at some point lowers the perceived probability of a wide EMU coming into being in the more distant future. This second linkage, more relevant when discussing the connection between the EMS crisis of 1992–93 and later implementation of EMU, is discussed in subsection 2.4.3. Given the uncertainty about whether some countries would be able to meet the no-devaluation-for-two-years criterion when it becomes binding, a current devaluation would lower the perceived probability of EMU coming into effect.

14. The model would predict that not all currencies would be equally affected by contagion. For strong currencies with $\pi = 0$ originally, the increase in Z would still leave $\hat{x} < \underline{x}$, so that equilibrium $\pi(\eta, Z)$ will still equal zero and no change in speculative pressures will be observed. For other currencies, however, a successful speculative attack elsewhere will increase already present speculative pressures or will introduce them if absent (i.e., where the increase in Z pushes \hat{x} above \underline{x} , so that π rises from zero to $G(\hat{x}(\pi, \eta, Z)) > 0$).

One caveat concerns the previously discussed possibility that the failure of a large country to meet the convergence criteria might create the expectation that the criteria themselves would be changed so much that the devaluation has no effect on perceptions about the likelihood of EMU. As discussed above, there appears to be no evidence for this extreme view. When Italy or the United Kingdom withdrew in September 1992, the perception was quite the opposite; namely, raising serious questions about the future of EMU. Hence, in terms of the model, the EMU convergence criteria imply that a devaluation by one potential EMU country will lower Z for all other potential EMU members.¹⁵

Will the reduced possibility of EMU lower the “political resolve” of countries that have maintained the fixed parity and make them more likely to devalue? There is much to suggest that this may be the case. First, there seems no doubt that the desire to play a role, preferably an important one in the EMU, was a factor in decisions not to devalue. For example, in his discussion of monetary policy in the EMS during this period, Mélitz (1995) asks why many countries (especially France) followed Germany’s lead in adopting tight monetary policy though they were going through recessions. Given France’s lower inflation than Germany’s and its high unemployment, there is no reason a devaluation would have led markets to question France’s monetary discipline. To explain the policy choice, Mélitz argues that “the French official behavior can best be explained on the basis of long-run political goals. By maintaining the policy of the *franc fort*, the French authorities wished to promote the aim of monetary union and, in addition, assure themselves an important place, along Germany’s side, in future European monetary control” (1995, 26).

An even stronger statement of how new information about the political “will” in one country affects currency values in other countries can be found in Eichengreen and Wyplosz (1993). Speaking about the relation between speculative pressures and the prospects for EMU, they write: “Until the summer of 1992, anticipations of a smooth transition to monetary union had stabilized expectations and hence the operation of the EMS. At that point, the protracted process of negotiation and ratification allowed doubts to surface about whether the treaty would ever come into effect. This altered the costs and benefits of the policies of austerity required of countries seeking to qualify for European monetary union, leading the markets to anticipate that those policies would ultimately be abandoned” (1993, 52). They go on to argue that this may have played a role in the fall 1992 crisis. They suggest, as I have, that in making policy decisions, these governments traded off the costs of high unemployment against the benefits associated with qualifying for monetary union. Were

15. Moreover, as discussed in subsection 2.4.3, the perception that membership criteria would be significantly changed could lead to membership contagion via a different linkage.

the benefits of the latter reduced, the government's calculations would be affected. They write:

An implication of this trade-off is that the stability of exchange rates should be correlated with the prospects for European monetary union. This was clearly the case in 1992. The weakness of the lira dated from the day the negative outcome of the Danish referendum was known. The lira, the British pound, the Danish krone, and the French franc all fell on June 3, the first day after the referendum. The Danish *nej* was a surprise; it had not been forecast by the opinion polls. Initially, reports stated that legal experts saw no way the Maastricht treaty, or even parts of it, could be approved and enacted by only eleven EC members. Doubts were compounded by press reports that confusion about the treaty's viability would stoke German concerns about the wisdom of pressing ahead with European monetary union. Italian businessmen voiced fears that Danish rejection would undermine Italy's resolve to comply with the convergence criteria laid down at Maastricht.¹⁶

The Eichengreen-Wyplosz argument is clearly close to the argument about membership contagion presented here, though it is not a contagion story per se, whereby weakness in *one* currency weakens *another* via the political decision-making mechanism. It is more accurately characterized as a nondevaluation, common shock—the negative outcome of the Danish referendum and, more generally, of the process of protracted negotiations mentioned in the first quote—hitting *all* currencies before any one of them is attacked. But the arguments are similar, each stressing how what are termed here membership effects can weaken the currencies of potential members in a club. The argument in this paper takes the Eichengreen-Wyplosz argument one step further, showing how membership effects can induce contagion in currency crises.

2.6 Conclusions

The argument here was not meant to suggest that membership contagion explains the EMS crisis of 1992–93 to the exclusion of other factors. German monetary policy had “monsoonal” effects, and spillovers of competitiveness clearly played a role in some of the EMS devaluations, as they have in other contagious currency crises. The purpose of the paper was to highlight a political mechanism for contagion that may have played a role in recent currency crises but has received no careful discussion in the literature. The discussion in section 2.5 should make clear the importance of external political events for currency crises in general and the possibility

16. Eichengreen and Wyplosz (1993, 85–86). For references on these, especially quotes in the *Financial Times*, 4 June 1992, 23 June 1992, on Italy, see n. 43 of Eichengreen and Wyplosz (1993).

of contagious membership effects in particular. Moreover, such effects need not be limited to explicit monetary unions. The next step is to find stronger evidence of such membership effects, in both explicit and implicit cooperative arrangements. It will not be easy, but it may be quite worthwhile.

References

- Bartolini, Leonardo, and Allan Drazen. 1997. When liberal policies reflect external shocks, what do we learn? *Journal of International Economics* 42:249–73.
- Bensaid, Bernard, and Olivier Jeanne. 1997. The instability of fixed exchange rate systems when raising the nominal interest rate is costly. *European Economic Review* 41:1461–78.
- Bikhchandani, S., D. Hirshleifer, and I. Welch. 1992. A theory of fads, fashions, customs, and cultural change as informational cascades. *Journal of Political Economy* 100:992–1026.
- Drazen, Allan. 1999. The role of economic conditions in interpreting interest rate defense against speculative attacks. College Park: University of Maryland. Working paper.
- Drazen, Allan, and Paul Masson. 1994. Credibility of policies versus credibility of policymakers. *Quarterly Journal of Economics* 109:735–54.
- Eichengreen, Barry, Andrew Rose, and Charles Wyplosz. 1996. Contagious currency crises. NBER Working Paper no. 5681. Cambridge, Mass.: National Bureau of Economic Research.
- Eichengreen, Barry, and Charles Wyplosz. 1993. The unstable EMS. *Brookings Papers on Economic Activity*, no. 1:51–143.
- Feldstein, Martin. 1997. The political economy of the European Economic and Monetary Union: Political sources of an economic liability. *Journal of Economic Perspectives* 11:23–42.
- Gerlach, Stefan, and Frank Smets. 1995. Contagious speculative attacks. *European Journal of Political Economy* 11:5–63.
- Krugman, Paul. 1979. A model of self-fulfilling balance of payments crises. *Journal of Money, Credit, and Banking* 11:311–25.
- . 1996. Are currency crises self-fulfilling? In *NBER macroeconomics annual 1996*, ed. Ben S. Bernanke and Julio J. Rotemberg, 345–78. Cambridge, Mass.: MIT Press.
- Masson, Paul. 1995. Gaining and losing EMS credibility: The case of the United Kingdom. *Economic Journal* 105:571–82.
- . 1998. Contagion: Monsoonal effects, spillovers, and jumps between multiple equilibria. Washington, D.C.: International Monetary Fund, Research Department. Working paper.
- Méltiz, Jacques. 1995. Comment. In *European currency crises and after*, ed. C. Bordes, E. Gardin, and J. Méltiz. Manchester: Manchester University Press.
- Obstfeld, Maurice. 1994. The logic of currency crises. *Cahiers Economiques et Monétaires* (Bank of France) 43:189–213.
- . 1996. Models of currency crises with self-fulfilling features. *European Economic Review* 40:1037–48.

Ozkan, F. Gulcin, and Alan Sutherland. 1995. Policy measures to avoid a currency crisis. *Economic Journal* 105:510–19.

Comment Carmen M. Reinhart

Drazen's paper represents a first effort to formalize the role of political considerations in the process of how currency crises are transmitted across international borders. The theoretical literature on "contagion" is scarce, and the empirical literature equally so. Yet the EMS currency crises of 1992–93, the aftermath of the Mexican peso crisis of late 1994, and the meltdown of several Asian currencies in 1997 all have a flavor of "contagious currency crises." Thus gaining a better understanding of the channels for contagion is a fruitful and timely line of inquiry.

The concept of *political contagion* stressed in the paper has been largely ignored in the literature, if not in the statements of those individuals ultimately responsible for monetary and exchange rate policy decisions, as we are reminded in this paper. Political contagion revolves around the policy trade-off between the political losses incurred if policymakers decide to devalue and the economic gains achieved by doing so. The political losses arise primarily because policymakers wish to belong to a "club" that requires them to maintain the exchange rate peg as the fee for membership. The benefits from staying in the club are largely political and may accrue over the medium to long term. Contagion, in this context, arises if an "important" member of the club devalues, thereby reducing the resolve of other club members to maintain the peg. This is referred to as "true" contagion and distinguished from "monsoonal effects," which arise from economic transmission mechanisms. Importantly in this model, it is assumed that it is policymakers who decide which of the other club members influence their decision to devalue. Furthermore, devaluation is a political decision, not the inevitable outcome of the depletion of central bank reserves following bouts of speculative attacks.

The trade-off between the economic gains of abandoning the peg and the credibility losses incurred in this model is common to "second generation" models of currency crises. For instance, the cost of maintaining the peg is rising unemployment or prohibitive debt-servicing costs (see Obstfeld 1996). In any case, the policymakers' decision to devalue improves the economic situation even if it ruins their credibility.

Carmen M. Reinhart is professor in the School of Public Affairs and the Department of Economics of the University of Maryland, College Park, and a research associate of the National Bureau of Economic Research.

I will group my remarks into three areas: the first pertains directly to the model outlined in this paper, the second is addressed to a broader family of second-generation balance-of-payments crisis models, and my final remarks apply to an even broader family of balance-of-payments crisis models that encompass first-generation, Krugman-type models.

As regards the *political contagion* model, it is evident that this paper offers valuable insights in understanding a “peer pressure” mechanism that may play a key role in influencing whether a country devalues or not, especially in the context of a club, such as a currency union. The EMS during the ERM currency crises of 1992–93 stands out in this regard. Besides introducing political considerations into the contagion process, the model is also useful in explaining why contagion may be regional rather than global. Perhaps this is an area that merits more attention and discussion in the paper. Specifically, the parameter Z , which summarizes the value to the country of being in the club, could be a weighted sum of the number of countries that satisfy the membership criteria, with weights depending on the importance for the home country of a given country’s participation. Hence, a member of the European Economic and Monetary Union may attach very little consequence to the collapse of a peg in far-away Thailand but a great deal of importance to a similar event in a neighboring country, one that is perceived to be an important member of the club. Though the empirical literature is scanty, the results in Calvo and Reinhart (1996) and Frankel and Schmukler (1996) suggest contagion tends to be regional rather than global. The evidence of contagion in Eichengreen, Rose, and Wyplosz (1996) may also point in that direction, as the bulk of their sample countries are in Europe.

Having said this, I do not think this model (in its present form) helps us to understand contagious crises in emerging markets. Judging from the emphasis on the ERM crisis, perhaps this was intentional. First, there is the assumption that devaluation is a matter of political choice. This presumes, as acknowledged in the paper, that the central bank has access to ample lines of credit should it need it to support the currency. The central banks of most emerging markets have limited access, if any, to international credit. At the time of devaluation of the Mexican peso in December 1994, the stock of central bank reserves at hand could be best characterized as pocket change. The same can be said of the flotation of the Thai baht in July 1997, once the forward position of the central bank was taken into account. Devaluation was a necessity, not a choice.

Second, the club is exclusively defined by the politicians. It is they who determine which countries weigh heavily in their resolve to maintain the peg and which do not. Yet many emerging countries do not get to choose which club they belong to. Korean politicians in 1997 thought they were joining the club known as the OECD; financial markets became convinced that Korea was a member of a different club, that of ailing tigers. Argenti-

na's currency board came under severe attack and Brazil's real less so following the peso's slide, not because these countries shared an explicit or implicit currency arrangement with Mexico, but because international financial markets decided they belonged to the failed exchange-rate-based inflation stabilization club. Thus it may be a fruitful exercise in the context of this model to explore the possible endogeneity of Z , which may be time varying and depend on both the types of shocks the economy is subjected to, η , and the market's assessment of the probability of devaluation, p .

Third, it is assumed, and this applies to other models that stress conflicting policy objectives, that the political and credibility losses of abandoning the peg are compensated by the economic gains from doing so. Central to this argument is the premise that devaluations are expansionary. Indeed, rumor has it that Nigel Lawson was happily singing in the shower hours after the devaluation of the pound during the ERM crisis. I would argue that a better characterization of the emerging market dilemma is as follows: If the country does not devalue and maintains tight monetary and fiscal policies to defend the peg, it has a recession—witness Argentina's 5.8 percent decline in GDP in 1995. If, on the other hand, the central bank caves in and devalues, the country also has a recession—recall Mexico's 6.2 percent decline in GDP during 1995 and Indonesia's 13.7 percent collapse of GDP in 1998. The bulk of the empirical evidence suggests that devaluations are contractionary in developing countries (see, e.g., Edwards 1989)—so much for relieving pressures on the unemployment rate. Furthermore, devaluation does not help relieve debt-servicing burdens through the mechanism of lower interest rates, as in industrial countries, which primarily have domestic currency debt. Foreign currency debt weighs heavily in both public and private sectors in most developing countries.

Hence, I would argue that models (such as this one) that focus on conflicting objectives provide insights into the crisis and, in this case, contagion process in industrial countries but are less helpful in understanding currency crises in emerging markets, which are usually followed by output collapses. In recent months, for instance, growth forecasts for the infected Asian countries have been continuously marked down, highlighting that their experience does not differ from others in this regard. Calvo's time-to-build model, for instance, suggests outcomes that are more in line with the stylized facts just described (see chap. 3 in this volume).

Last, to understand the causes and timing of crises and mechanisms of contagion, it may be necessary to rethink some of the assumptions embedded in both first- and second-generation models. Central to these models is the shared feature of the rational forward-looking speculator. Yet the empirical evidence is far from conclusive in providing support for the view that markets are forward looking. In our work we found that interest rates and domestic-foreign interest rate differentials had no valuable predictive

power, either in absolute terms or relative to other indicators, when it came to anticipating currency crises (see Kaminsky and Reinhart 1999). Goldfajn and Valdés (2000) reach a similar conclusion when analyzing the predictive ability of currency forecasts culled from the *Financial Times* surveys. Rating agencies do just as badly (see Goldstein, Kaminsky, and Reinhart 2000). The widespread use of mechanical backward-looking filter rules for trading decisions in financial markets also suggests that not all speculators know or care about economic or political fundamentals. Perhaps it is time to incorporate some of these features when we attempt to model “true” contagion, which I would define differently than in the paper, since I would suggest that medium- to longer-term political goals are also part of the broader set of “fundamentals” and the spirit of “true” contagion is to be found in herding behavior or animal spirits.

References

- Calvo, Sara, and Carmen M. Reinhart. 1996. Capital flows to Latin America: Is there evidence of contagion effects? In *Private capital flows to emerging markets*, ed. Guillermo A. Calvo, Morris Goldstein, and Eduard Hochreiter. Washington, D.C.: Institute for International Economics.
- Edwards, S. 1989. *Real exchange rates, devaluation, and adjustment: Exchange rate policy in developing countries*. Cambridge, Mass.: MIT Press.
- Eichengreen, Barry, Andrew Rose, and Charles Wyplosz. 1996. Contagious currency crises. NBER Working Paper no. 5681. Cambridge, Mass.: National Bureau of Economic Research.
- Frankel, Jeffrey, and Sergio Schmukler. 1996. Crisis, contagion, and country funds: Effects on East Asia and Latin America. Pacific Basin Working Paper no. PB96-04. San Francisco: Federal Reserve Bank of San Francisco.
- Goldfajn, Ilan, and Rodrigo Valdés. 2000. Are currency crises predictable? *European Economic Review*, forthcoming.
- Goldstein, M., G. Kaminsky, and C. M. Reinhart. 2000. *Assessing financial vulnerability: An early warning system for emerging markets*. Washington, D.C.: Institute for International Economics, forthcoming.
- Kaminsky, Graciela L., and Carmen M. Reinhart. 1999. The twin crises: The causes of banking and balance of payments problems. *American Economic Review* 89:473–500.
- Obstfeld, Maurice. 1996. Models of currency crises with self-fulfilling features. *European Economic Review* 40:1037–48.

Balance-of-Payments Crises in Emerging Markets

Large Capital Inflows and Sovereign Governments

Guillermo A. Calvo

3.1 Introduction

Recent financial crises in emerging markets have shared the following characteristics: (1) They have been preceded by large capital inflows. (2) They evolved through a complicated interaction among the domestic financial and nonfinancial sectors, international investors and banks, and sovereign governments. (3) Few people were able to predict them. (4) They led to a sharp growth slowdown, if not sheer output collapse.

The scientific literature has paid a great deal of attention to point 3 and has generated renewed interest in multiple equilibrium models (see, e.g., Obstfeld 1994; Obstfeld and Rogoff 1995; Eichengreen, Rose, and Wyplosz 1995; Calvo 1998a; Calvo and Mendoza 1996; Cole and Kehoe 1996). However, the models are still highly stylized, and as a result, not much of the richness of detail associated with point 2 has been captured by the models. Finally, points 1 and 4 have not been emphasized (an exception is Calvo 1998b).

Financial analysts (e.g., the financial press and jet-set guru-economists), on the other hand, have singled out the following factors as contributing to crises: large current account deficits (anything larger than 4 percent of GDP is likely to be called “large”); real currency appreciation; and, after the tigers went downhill, fixed or quasi-fixed nominal exchange rates. Of the three points, the only one that has some analytical, as opposed to

Guillermo A. Calvo is Distinguished University Professor in the Department of Economics and Director of the Center for International Economics at the University of Maryland, College Park.

The author is grateful to Roberto Rigobon and conference participants for useful comments.

factual, basis is the first. However, as argued in Calvo (1998b), the current account sustainability theory that provides analytical support for that point leaves much to be desired.

This paper tries to fill some of the gaps highlighted above. First, it will present a series of conventional representative-individual models in which currency crises can occur in the absence of current account deficits. This is not intended to debunk the view that current account deficits are important but to argue that if they are, one has to bring to the fore features that are not commonly emphasized in the literature. Actually, the paper will argue that current account deficits, although not a necessary condition for currency or financial crises, play a key role—together with “dollarization”—in the *resolution* of crises. It will be claimed that large current account deficits and dollarization make it more difficult to offset the effects of self-fulfilling crises on the basis of domestic policy alone, raising the need for international cooperation.

The paper will argue that not bringing the government into the limelight is a major omission. International financial crises have a flavor of their own that is not fully shared by purely domestic episodes (e.g., Orange County, California). Thus the paper will claim that a key reason for that is the presence of *sovereign* governments. This is a central aspect of the debt crisis literature, but it has been somewhat ignored in the currency-financial crisis literature.¹ The paper will argue that sovereignty and non-explicit government policy rules may go a long way toward generating financial vulnerability and multiple equilibria. Sovereignty induces “country risk,” and the latter prompts the government—explicitly or implicitly—to favor short-term debt and deposits.

Another aspect that will be highlighted in the paper is large capital inflows. It will be argued that together with sovereignty, large capital inflows magnify the financial vulnerability caused by short-term debt and deposits. In addition, and even more important, the perception that large capital inflows are transitory helps to plant in people’s minds the notion that the economy will eventually go back to where it started (before the capital inflow episode). The paper argues that this could be an important coordinating factor to shift expectations from a good to a bad equilibrium.

Output collapse will be addressed in the context of self-fulfilling prophecies. The paper will show that output loss can be rationalized in terms of “new classical” and price-stickiness models: in the first one because a crisis changes relative prices and may cause a generalized financial crash and in the second one for textbook-type Keynesian reasons associated with a contraction of aggregate demand. The new classical approach will be complemented by a discussion of “vanishing credit,” which shows how a

1. It should be pointed out, however, that in the multiple equilibrium literature cited above, the government reaction function plays a central role.

bad shock in a given sector could lead to a credit crunch in the whole economy. The paper will argue that these kinds of spillover effects are crucial for self-fulfilling prophecy theories to be able to give a full—qualitative and quantitative—account of current crises.

Finally, a major part of the paper will be devoted to providing a rationale for the fact that in Mexico and Argentina current account deficits have fallen but did not turn into surpluses, and yet output suffered a major collapse. This would be no major puzzle in a Keynesian context, but it is in a new classical one. The current account deficit measures net debt accumulation of the country as a whole. Thus, when it suddenly goes down to zero (as in Mexico in 1995), for example, all it means is that new net credit collapses to zero—although no debt repayment is called for. The paper explores a “time to build” model in which under these circumstances real effects could take place, even in a new classical environment, because curtailment of new credit may imply abandoning ongoing projects.

The paper is organized as follows. Sections 3.2 and 3.3 show models in which crisislike phenomena take place even though the current account is permanently in equilibrium. Section 3.4 discusses the role of sovereign governments, while section 3.5 highlights the role of large capital inflows. Section 3.6 explores factors that could explain growth slowdown or outright output collapse. Section 3.7 revisits current account deficits and shows their importance for the resolution of currency-financial crises. Section 3.8 studies the magnification effects of vanishing credit. Sections 3.9 and 3.10 analyze the implications of a time-to-build model.

3.2 Balance-of-Payments Crises with a Balanced Current Account: Full Neutrality

This section introduces money in a conventional model and discusses the relation between balance-of-payments crises and current account deficits.

Consider an infinitely lived representative-individual economy with time-separable utility. There exists one homogenous, fully tradable good. The utility index in period t is denoted by $u(c_t) + v(m_t)$, where c and m stand for consumption and real monetary balances.² Existence of commercial banks is not essential to make the following points, and thus, I will assume that money is just high-powered money issued by the central bank.

There is perfect capital mobility, and the real international rate of interest is constant and equal to ρ . To preserve stationarity, we will assume that the subjective rate of discount is also equal to ρ . For the sake of simplicity, we assume that the individual gets a constant flow of endowment income

2. Functions u and v are assumed to be twice differentiable, strictly increasing, and concave.

y and a constant flow of government lump-sum transfers (net of lump-sum taxes), g , per unit of time ($g > 0$). Under these conditions, the individual budget constraint at time zero is given by

$$(1) \quad m_0 + b_0 + \int_0^{\infty} (y + g - c_t - i_t m_t) e^{-\rho t} dt = 0,$$

where b_0 is initial net holdings of the pure foreign bond. Moreover, i denotes the nominal domestic interest rate. Assuming perfect capital mobility, we have

$$(2) \quad i_t = \rho + \varepsilon_t + \pi_t^*,$$

where ε_t and π_t^* denote the instantaneous rate of devaluation and international rate of inflation, respectively, at time t .

Thus, denoting by λ the Lagrange multiplier associated with budget constraint (1), the first-order conditions of the utility maximization problem are

$$(3a) \quad u'(c_t) = \lambda,$$

$$(3b) \quad v'(m_t) = \lambda i_t.$$

An implication of equations (3a) and (3b) is that consumption is constant through time, irrespective of the nominal interest rate.³ Let the constant optimal consumption rate be denoted by ψ . Then, by equations (3a) and (3b), we have

$$(4) \quad \frac{v'(m_t)}{u'(\psi)} = i_t.$$

Equation (4) implicitly defines a demand for real monetary balances m as a function of the nominal interest rate i .

Let international reserves be defined as the stock of international bonds held by the monetary authority. I denote them by b^* and assume that the government does not consume and rebates all its income to domestic residents in a lump-sum manner. To simplify the exposition, and without loss of generality, we will further assume that discontinuities occur only at time zero.⁴ Then the government's budget constraint satisfies⁵

$$(5) \quad b_0^* + (M_{0+} - M_0)/E_0 P_0^* + \int_0^{\infty} (\dot{M}_t/E_t P_t^*) e^{-\rho t} dt = \int_0^{\infty} g_t e^{-\rho t} dt,$$

3. For simplicity of exposition, we assume interior solutions.

4. Besides, the discontinuity at $t = 0$ is just allowed in order to illustrate that discontinuities do not change the basic result in eq. (8) below.

5. Again for simplicity, we assume that all prices and the exchange rate are differentiable everywhere for $t > 0$.

where E and P^* denote the nominal exchange rate and the international price level, respectively, and M_{0+} denotes the level of nominal monetary balances just after the policy announcement or other event at time zero inducing a discontinuous change in the stock of money. Thus the first term on the left-hand side of expression (5) is net government financial wealth; the second term is the stock seigniorage at time zero; and the integral involving M is the present discounted value of flow seigniorage. Equation (5) states that government lump-sum transfers (properly discounted) will be equal to the government's initial financial wealth, b_0^g , plus the present value of seigniorage from money creation.

Expressing the left-hand side of equation (5) in terms of $m = M/EP^*$, we get

$$(6) \quad b_0^g + m_{0+} - m_0 + \int_0^\infty [\dot{m}_t + (\varepsilon_t + \pi_t^*)m_t]e^{-\rho t} dt = \int_0^\infty g_t e^{-\rho t} dt,$$

where $m_{0+} = M_{0+}/E_0P_0^*$. Moreover, integrating by parts the left-hand side of equation (6), we have

$$(7) \quad b_0^g - m_0 + \int_0^\infty i_t m_t e^{-\rho t} dt = \int_0^\infty g_t e^{-\rho t} dt.$$

Consequently, using the government budget constraint (7) in the representative individual's budget constraint (1), we have that at equilibrium (recalling that $c = \psi$)

$$(8) \quad b_0 + b_0^g + y/\rho = \psi/\rho.$$

Equation (8) just states the commonsensical result that when individuals internalize the government's budget constraint—the government does not consume, and the private and public sectors face the same international interest rate—then the private discounted value of consumption equals initial (private plus public) financial assets plus the present discounted value of endowment income. It follows from equation (8) that at time zero the current account deficit is zero. Thus total financial assets $b + b^g$ do not change at time zero. However, since zero is just a label and could be any calendar time, it also follows that $b + b^g$ is constant over time, implying that *the current account is zero at all points in time*.

Balance-of-payments crisis scenarios are now very easy to set up. For example, following Krugman (1979), one could assume that the exchange rate is kept constant unless crisis hits, in which case the currency is allowed freely to float. By definition, a balance-of-payments crisis takes place when reserves— b^g in our notation—reach a minimum tolerable level and would continue falling unless policy is modified.

Consider first the Krugman case in which international inflation is zero. Hence, in the fixed-exchange-rate phase, reserves accumulate according to the following equation:

$$(9) \quad \dot{b}_t^s = \rho b_t^s - g.$$

Thus a balance-of-payments crisis occurs in finite time if

$$(10) \quad g > \rho b_0^s.$$

The rest of the story is just simple transliteration of Krugman (1979). In particular, since $g > 0$, postcrisis inflation is positive and when crisis hits there is a sudden loss of reserves.⁶

The above scenario can be enriched in an interesting manner by assuming that along the way there is an (expected) rise in the nominal international rate of interest. First, note that by first-order condition (4), we can write the demand for money as follows:

$$(11) \quad m = L(i), \quad L' < 0.$$

Therefore, as the international interest rate rises, the demand for money falls. If the fixed-exchange-rate regime is still sustainable, there will be a sudden loss of reserves (denoted by Δb^s), which—letting the resulting increase in the domestic nominal interest rate be denoted by Δi —is given by

$$(12) \quad \Delta b^s = L(\rho + \Delta i) - L(\rho) < 0.$$

Consider now the following sequence of events. At time zero, the stock of reserves is such that government transfers can be financed out of its yield. Thus, assuming that the inequality in expression (10) is reversed, the government steadily accumulates reserves. However, there are enough degrees of freedom so as to be able to generate a situation in which after the loss of reserves implied by equation (12), we have (denoting by $t_0 > 0$ the time of the interest rate hike)

$$(13) \quad g > \rho b_{t_0}^s.$$

Hence, as in the previous example, the economy is now bound to hit a balance-of-payments crisis. This is an interesting case because the crisis occurs by a combination of domestic and external factors.⁷

6. In this model, as in Krugman (1979), the crisis is accompanied by a sudden collapse in monetary aggregates. This is not borne out in a number of recent experiences (see, e.g., fig. 3.1 below). However, Kumhof (1997) shows that this does not imply a fundamental problem with the model, since the stability of monetary aggregates during currency crises can be rationalized by assuming that liquidity is also provided by short-term government bonds.

7. A crisis in which only external factors are at play is also possible. E.g., consider the case in which $g = 0$ and the nominal international interest rate rises gradually over time. One can make assumptions so as to ensure that the minimum tolerable level for international reserves would be reached due to the associated decline in money demand. Thus a crisis must eventually take place.

3.3 Balance-of-Payments Crises with a Balanced Current Account: Nontradable Goods

We now introduce a nontradable good, z , and start the analysis assuming that z is in fixed supply. Later the analysis is extended to a production economy.

3.3.1 Endowment Economy

A straightforward extension of the previous section's model would be to assume the instantaneous utility index to be $u(c_t) + v(m_t) + h(z_t)$, where h is a twice differentiable, increasing, and strictly concave function on the nonnegative real line. Normalizing z so that total supply is one, the market equilibrium condition for nontradables would be

$$(14) \quad z_t = 1$$

for all t . We denote the relative price of nontradables in terms of tradables (i.e., the *real* exchange rate as measured by the IMF) by p . Under these assumptions (and the other assumptions of section 3.2), one can readily show that both c and z will be constant over time; moreover, $p = h'(1)/u'(\psi)$, where ψ is given by equation (8). Hence, the real exchange rate is also constant over time, irrespective of the existence of a balance-of-payments crisis.

A more empirically relevant version of the model would assume, instead, that the instantaneous utility index depends only on c and z and money is held for cash-in-advance considerations. This type of model is developed in Calvo (1986). There an anticipated balance-of-payments crisis will bring about a real currency appreciation (i.e., p increases) together with a current account deficit before the crisis takes place. Both implications are realistic. However, my purpose is to show that credit problems associated with capital inflows are, in principle, independent of current account deficits. Therefore, I will modify Calvo (1986) and assume that the cash-in-advance constraint applies only to nontradables.⁸ More formally, I will assume

$$(15) \quad p_t z_t \leq \alpha m_t, \quad \alpha > 0.$$

The budget constraint for the representative individual becomes

$$(16) \quad m_0 + b_0 + \int_0^\infty (y_t + g - c_t - p_t z_t - i_t m_t) e^{-\rho t} dt = 0.$$

8. This is in line with the common assumption in ad hoc Mundell-Fleming-type models that the relevant price level is the nominal price of home goods.

Hence, since we will focus on cases in which the nominal interest rate is positive, liquidity condition (10) would be binding and, taking budget constraint (11) into account, the first-order conditions are

$$(17a) \quad u'(c_t) = \lambda,$$

$$(17b) \quad h'(z_t) = \lambda p_t(1 + \alpha_t).$$

Hence, c is constant over time. Therefore, one can show, once again, that the current account deficit is zero for all times. On the other hand, by equations (14) and (17b), we have

$$(18) \quad \frac{h'(1)}{\lambda} = p_t(1 + \alpha_t),$$

establishing a negative relation between p and i . Thus along an equilibrium path the real exchange rate p rises as the nominal interest rate declines (or, equivalently, as inflation falls), and vice versa.⁹

3.3.2 Production Economy

We now enrich the model by assuming that the instantaneous utility function is given by $u(c_t) + h(z_t) + n(l_t)$, where n is twice differentiable, strictly increasing, and concave function on the nonnegative real line and l stands for leisure. We assume the individual is endowed with one unit of leisure and that z is produced and satisfies

$$(19) \quad z_t = 1 - l_t.$$

Focusing on interior solutions, it is straightforward to show that the crisis scenarios discussed in the previous section will lead, before crisis, to an appreciation of the real exchange rate and an expansion of nontradable output. Thus GDP as conventionally computed will increase during the transition. After the balance-of-payments crisis, however, GDP falls precipitously. All along, however, the current account is undisturbed and in full balance.

3.3.3 Banks

Banks could easily be accommodated in the present framework. For example, let δ denote the legal minimum reserve requirement ($0 \leq \delta \leq 1$). We assume that bank deposits and cash are perfect substitutes, but if the return on deposits equals or exceeds that of cash ($= 0$ in terms of domestic currency), then the nonbank sector will exhibit no demand for cash (this is assumed to be the case in what follows).

Let us assume that banks lend at the pure market rate i . Then, under

9. This relation is the focus of Calvo, Reinhart, and Végh (1995).

no operating costs for banks, the deposit rate i^D satisfies the following zero-profit condition:

$$(20) \quad i^D = (1 - \delta)i.$$

Incorporating these new aspects into budget constraint (16) and noticing that by equation (20), $i - i^D = \delta i$, we get the following budget constraint (where m now is entirely composed of bank deposits because $i > 0$ and, hence, $i^D > 0$, dominating cash):

$$(21) \quad m_0 + b_0 + \int_0^\infty (y_t + g - c_t - p_t z_t - \delta i_t m_t) e^{-\rho t} dt = 0.$$

Thus first-order conditions (17a) and (17b) are now

$$(22a) \quad u'(c_t) = \lambda,$$

$$(22b) \quad h'(z_t) = \lambda p_t (1 + \alpha \delta i_t).$$

Therefore, from a formal point of view, the only change with respect to the cash-only case considered before is that the opportunity cost of money is δi . As expected, the opportunity cost boils down to i when the reserve requirement $\delta = 1$.

If $\delta < 1$, then banks have loanable funds equivalent to $(1 - \delta)m$ in terms of output. These funds are borrowed by depositors to build their stock of deposits to the desired level. Hence, in this simple world, banks are just a device to economize on non-interest-bearing cash: only the share δm is held as cash (indirectly and at banks' vaults).

The crisis scenarios are essentially the same as before, except that when m collapses, so do loans. However, since loans were used to accumulate liquid assets (i.e., bank deposits), no financial crisis takes place—all loans are fully repaid without requiring a central bank bailout. Thus the model is still far from yielding the deep financial troubles that we see in practice. In the remainder of the paper I will try to bring some of those issues into focus.

3.4 The Role of Sovereign Governments

A successful theory of international financial crises should be able to rationalize the difference between Orange County, California, and Mexico or Korea. A distinguishing and basic characteristic of *international* financial crises is that as a general rule, countries are sovereign and their governments are subject to loosely defined policy rules. Korea, for example, is much freer to impose taxes on external trade than Orange County is, and both Korea and Mexico can devalue on a moment's notice, while Orange County is bound to fall with the flag (or, rather, the greenback).

The extra degrees of freedom enjoyed by sovereign governments in-

crease the uncertainty about their reaction functions—especially in times of crisis—and enhances the value for the private sector of anticipating future government behavior, inducing present defensive action on the side of the private sector. For example, if in the above models we assume that the government is expected to raise tariffs to stem capital outflows, then anticipated price changes will have real effects, even in the full neutrality case of section 3.2. Actually, as can readily be shown (see Calvo 1986), an increase in expected future tariffs induces a consumption boom—and thus a current account deficit—as capital flows in, and a sharp fall in consumption once tariffs are raised. The resulting intertemporal substitution of consumption is socially inefficient. It is entirely provoked by the expected policy reaction, and the associated social cost will be paid irrespectively of whether higher tariffs are ever carried out. The *threat* of higher tariffs is bad enough. These costs, incidentally, are magnified in the presence of durable goods (see Calvo 1988).

An interesting feature of the above example is that the deterioration in the current account is due to individuals' perception that the government reaction function opens up utility-enhancing intertemporal trade (i.e., speculation). The associated current account deficit is, in the present context, a clear signal of Pareto inefficiency. The example thus shows a case in which current account deficits are undesirable from a social point of view, even though no sustainability issue would be at stake. *Thus, in more general terms, our discussion so far can be summarized by saying that the large leeway enjoyed by sovereign governments may induce strong and socially costly speculative waves.*

In addition, loosely defined policy rules increase the fixed cost of learning about the profitability of projects in a given country. This is especially relevant for so-called emerging markets with a short track record of market-oriented policy making and, oftentimes, with unstable political institutions. A project's profitability depends on fiscal policy, exchange controls, and the like. Sovereign countries have a lot of room to maneuver in this respect, and a potentially attractive project could quickly turn into a loss-making proposition as a result of a policy change. One major problem faced by investors is that in order to keep abreast of the facts for any given country in an effective way, they may have to constantly monitor developments in that country. But perhaps more critical is that macroeconomic-political information—even from the best sources and obtained in a timely fashion—has little predictive power. Thus the expected profitability of investment projects in emerging markets may reflect idiosyncratic factors and be highly sensitive to market “news” and rumors.

As argued in Calvo (1998a) and Calvo and Mendoza (1997), high fixed costs may induce rational herding behavior on the part of investors. This is established by showing that high fixed costs give rise to multiple rational expectations equilibria and, under certain plausible conditions (e.g., limits

on short sales), equilibrium multiplicity would be more likely, the larger the number of emerging markets. Under these conditions, any factor that helps to coordinate expectations may cause a change in the economy's equilibrium position. A phenomenon such as "contagion"—which received ample attention during the "tequila" and the recent Southeast Asia crisis episodes—could just be the result of investors drawing parallels between a country undergoing a financial crisis and other countries that on the surface have similar characteristics. Thus, in attempting to protect themselves from potential crises in the other countries, investors could trigger the very same crises they fear and, as a result, contagion takes place. *In sum, the costs of learning about a given country are raised by the existence of a sovereign government that is not tied to clear-cut policy rules, making the country vulnerable to self-fulfilling financial crises.*

The model in Krugman (1979) and the variants discussed in the sections 3.2 and 3.3 help to explain some of the mechanics involved in financial crises—and, more specifically, currency crises. In a rudimentary way, these models include a sovereign government that issues its own money. However, those models stop short of exploiting other deleterious implications of sovereign governments from a macromanagement point of view. I will discuss these issues in what follows.

3.5 The Dangers of Large Capital Inflows: Sketch of a Theory

Abstracting from errors and omissions, the following is an accounting identity:

$$\begin{aligned} \text{Capital Inflows (KI)} &= \text{Current Account Deficit (CAD)} \\ &+ \text{Accumulation of Reserves } (\dot{b}^{\$}). \end{aligned}$$

In the examples discussed in sections 3.2 and 3.3, $\text{CAD} = 0$, and, hence, capital inflows were fully reflected in reserve accumulation. Under these conditions, a sharp contraction in capital inflows could just be met by a slowdown in the growth (or outright fall in the level) of international reserves, leaving the real economy unscathed. In actuality, however, accumulation of international reserves is also reflected in an expansion of monetary aggregates (see Calvo, Leiderman, and Reinhart 1996) and, consequently, of bank credit. But, as the last model in section 3.3 illustrates, even a large credit expansion may not increase the country's vulnerability to a sudden contraction in capital inflows. This is, however, an unrealistic implication of the model and motivates the ensuing discussion.

Governments and central banks, in particular, are very sensitive to any bank credit contraction and, apparently, even to a fall in monetary aggregates. Figure 3.1 shows the case of Mexico around the December 1994 crisis. Clearly, the central bank expanded domestic credit instead of letting

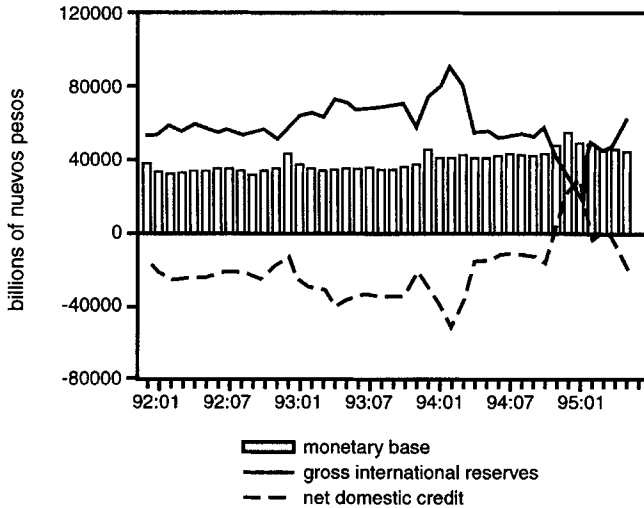


Fig. 3.1 Monetary base, foreign reserves, and net domestic credit of the Bank of Mexico

the monetary base fall as the crisis unfolded. As a result, there was a massive loss of international reserves, which almost ended up in a debt moratorium as short-term debt, which had been accumulated through sterilized intervention, started to come due.¹⁰

Furthermore, central bank sensitivity often reflects the perception that the banking system is highly vulnerable to declining bank deposits or high interest rates, or both. Once again, this would not be the case in the section 3.3 model because loans are used for highly liquid investments. But the existence of central banks that provide liquidity support in case of massive deposit withdrawals may lead commercial banks to issue loans for illiquid projects. Besides, from an *ex ante* point of view, lengthening the maturity structure of loans could be socially desirable (see, e.g., Diamond and Dybvig 1983).¹¹

To develop a useful theory that helps to address the above issues, one has to be able to answer a key question: *What makes it attractive for sovereign governments in emerging markets to stimulate illiquid projects beyond what the free market will generate?*

Diamond and Dybvig (1983) provide an answer that has paved the road for the introduction of banks in macromodels. Their answer is that by pooling risks banks can finance long-term illiquid projects and, at the same time,

10. Why short-term debt was not automatically rolled over, given Mexico's low total debt, is a key question that will be addressed, albeit indirectly, in the following discussion.

11. However, costs would arise *ex post* if deposit withdrawals exceed the capacity of the central bank to provide the funds (international reserves) that would prevent banks from crashing.

ensure the liquidity of bank deposits. Even though this alchemy can be achieved by an unfettered private sector, the government still has a role to play because, otherwise, the economy could land on a “bad” equilibrium in which bank runs are rampant. However, the Diamond-Dybvig answer is not very satisfactory in an international context because, for example, residents of small (in terms of the financial market) countries could have access to large international banks that offer better risk-pooling deals than local banks.¹²

In this paper I will put forward the notion that the very existence of sovereign governments creates a wedge between domestic and international rates of return for the reasons elaborated in the previous section. This “country risk” factor is generated by the presence of a sovereign government, and thus private insurance markets would be unable to eliminate its negative effect fully.¹³ Therefore, governments would have an incentive to offset the country risk factor by, for instance, subsidizing investment and capital inflows, as well as imposing controls on capital outflows (for the experience of East Asian countries in these and other respects, see World Bank 1993). In this connection, a natural policy for a central bank would be to offer deposit guarantees and lower reserve requirements (recall eq. [22]), which leads, in principle, to a higher stock of monetary aggregates and bank credit. Another highly complementary policy would be for the government to offer implicit guarantees on short-term foreign-currency-denominated bonds issued by banks or large firms. Given the important role played by short-term debt and banks in recent crises, I will focus the rest of this section on these guarantees.

To be sure, those guarantees are not a sure recipe for crisis. Under normal circumstances, for example, short-term bonds will automatically be rolled over. However, given the possibly large information costs discussed in the previous section, a change in “market sentiment” may lead to much higher interest rates or outright refusal to roll over short-term debt (including bank deposits). Thus, to the extent that loans take the form of illiquid projects, banks will be unable to honor their debt obligations, and the central bank will be forced to draw on its international reserves (or to obtain fresh funds from the international financial community).

Still, even granting all the above, the question arises, *Why would the government, aware of the above difficulties, stimulate short-term borrowing and deposits?*

In the first place, let us recall that in an expectations-driven world, gov-

12. For recent papers extending the Diamond-Dybvig approach to an international context, see Goldfajn and Valdés (1997) and Chang and Velasco (1998). It is worth noting that this approach regains some of its appeal when domestic residents are prevented from keeping their deposits in offshore banks.

13. The intuition for this is that the presence of a sovereign government is like a tax distortion. As is well known, tax distortions have a negative effect on welfare even in the context of complete markets.

ernment guarantees need not be explicit. It is enough that individuals expect them. As for short-term deposits (e.g., sight deposits), they are an essential part of the “payments system.” Repudiation of these types of deposits would decrease their liquidity and increase the perceived cost of holding money, thus lowering the stock of monetary aggregates.¹⁴ In terms of the last model in section 3.3, a fall in monetary aggregates would result in an output and employment contraction. Therefore, a welfare-maximizing government—not bound by a policy rule like a currency board, for example—will likely be tempted to bail out depositors in case of a bank run.

It should be noted, however, that governments concerned about their credibility and eager to avoid future moral hazard difficulties are unlikely to perform bailouts automatically and without any cost for depositors. Therefore, after a crisis episode, the demand for monetary aggregates is likely to fall, implying at least a transitory negative impact on output and employment.

At this juncture the reader is likely to be asking: *What do large capital inflows have to do with all of this?*

The crisis scenarios discussed above are linked to the existence of multiple equilibria. If the economy exhibits a unique equilibrium, then bank runs and the like would be self-defeating. Under uniqueness, for example, if a set of investors refuses to roll over short-term debt, a new set will quickly spring into action wiping out the excess supply of bonds, and the whole episode would amount to just a little financial “hiccup.” But on the other hand, the mere existence of multiple equilibria does not provide a convincing crisis theory, unless conditions are such that it can be argued that the economy’s agents have developed a distinct feeling that equilibrium multiplicity is in the cards. Here is where large capital inflows have a role to play:

1. Large capital inflows have a strong effect on relative prices (particularly the real exchange rate) and bank credit. This is perceived by everybody.
2. Large capital inflows are usually transitory, leading people to expect that eventually the economy will return to the conditions prevailing before those inflows. The questions are when and how.
3. If individuals are aware of the financial vulnerabilities highlighted above (e.g., large short-term debt), which are magnified by the size of the capital inflows, then they will attach some probability to a sudden reversal (or a “hard landing,” as some market analysts like to say).
4. Actually, individuals do not need much information to sense impending trouble. Big and sudden changes in relative prices should alert

14. Friedman and Schwartz (1963) assert that repudiation schemes such as cessation of payments on bank deposits have had deleterious effects in the United States.

anyone that there is room for a hard landing. Unless the change in relative prices is prompted by strong and clear technical or natural causes, individuals would infer that some kind of transitory distortion is at play.

Notice, incidentally, that the above difficulties could occur even though the current account is virtually in balance. This is not to deny that current account deficits have been a common feature prior to international financial crises. However, recalling the accounting identity at the outset of this section, current account deficits *not accompanied by capital inflows* can only occur if there is an equivalent loss of reserves. This has not been a feature in recent crises. That is why I feel it is a good research strategy to develop crisis scenarios that are free from current account imbalances. In doing so, it becomes obvious that the issues involved have an essentially *financial* component. In our discussion we have identified a key one, namely, a mismatch between the maturity of assets (long) and of financial obligations (short), partly explained by the nature of banking and the existence of sovereign governments.

3.6 The Deeper Anatomy of Self-fulfilling Crises: Output Collapse

So far I have conducted a somewhat casual discussion of the impact of a slowdown in capital inflows. This section will offer a more thorough analysis. I will start by examining the impact of a large and sudden capital flow reversal—that is, capital inflows suddenly turning negative and large in absolute value. Later I will study the impact of a simple slowdown in capital inflows.

3.6.1 Negative Capital Inflows

I will first discuss new classical examples in which prices and wages are fully flexible and then extend the analysis to a sticky price framework.

New Classical Examples

Consider a case similar to that faced by Mexico toward the end of 1994 (see fig. 3.1), in which short-term public debt exceeded available international reserves by a wide margin. Suppose that as in Mexico, creditors refuse to roll over expiring debt. What are the options open to the government? Instant repayment is out of the question because resources are, by assumption, not available.¹⁵ Option 1 is cessation of payments, which could take the form of outright repudiation or involuntary debt rescheduling. Option 2 is obtaining aid from other sovereign countries (an option that requires international cooperation and cannot be taken unilaterally). Option 3 is to persuade the private sector to roll over expiring debt. Leav-

15. In the case of Mexico total reserves (including credit lines from its NAFTA partners) barely exceeded US\$12 billion. See Calvo and Mendoza (1996).

ing option 3 aside for the time being, option 1 is likely to involve direct costs (e.g., lawsuits, strong pressure from creditors' governments, etc.) and indirect costs stemming from more limited access to capital markets.¹⁶ Moreover, option 2 will likely involve tough conditionalities (such as a sharp rise in taxes), which may have deleterious effects on the real economy.

Consequently, in coping with the sudden inability to roll over short-term debt, governments are forced to take actions that have negative effects on output. This sets the stage for self-fulfilling crises.¹⁷ However, I doubt that these effects, by themselves, are quantitatively large enough to generate a "bad" equilibrium that is significantly different from the good one.

Enter the private sector. The government's policies have effects on relative prices. The greater the surprise element in the new policies, the more likely it will be that a significant number of investment projects become unfeasible. And even if feasible, loans contracted to finance such projects may become nonperforming. These unpleasant surprises are also bound to cause reverberations all around the economy. This is so because in most capitalist economies interenterprise credit plays a prominent role (more on this in section 3.8). Thus, once a significant part of the economy runs into financial difficulties, *much of the rest of the economy becomes suspect*. In this new environment, credits that would have automatically been rolled over are conditioned on passing deeper viability tests. The latter, in turn, are time-consuming exercises (especially during crises) because they require information about the interenterprise credit network to which the firm in question is connected, for example. My conjecture is that the resulting "highway congestion" may signify a major negative supply shock.¹⁸ Once the crisis reaches this point, option 3 above—persuade the private sector to refinance expiring loans—is not an option anymore: the crisis itself has created the conditions that make new loans unattractive to the lender.

Sticky Price Examples

The existence of sticky prices may exacerbate the above effects. Firms have fewer degrees of freedom to respond to the negative shock. Besides, potential lenders now need information about the nature of the price or wage contracts that firms have entered into. However, there is an effect that goes in the opposite direction. The existence of sticky prices may give

16. It should be noted, however, that indirect costs would be nil if repudiation or involuntary rescheduling is done in such a clean manner that new lenders do not feel threatened by dealing with a country that resorted to such drastic measures (see Bulow and Rogoff 1989). I think this is an unlikely situation, though. In any other scenario at least short-term lending that is not fully collateralized is likely to dry up.

17. This is the type of example worked out in Calvo (1988) and Cole and Kehoe (1996).

18. Needless to say, these effects would never materialize in a complete market context. That is why this discussion is of special significance for emerging markets.

rise to de facto quasi-monopolistic price setting by firms and, in this fashion, may make them financially less vulnerable in the short run. However, I feel that this positive effect is short lived and unlikely to overturn the negative ones.

3.6.2 Capital Inflow Slowdown: Time to Build

Debt rollover difficulties are typically associated with financial crises. However, this does not imply that ex post, countries engage in massive net debt repayment. This is typically not possible. Hence, the question arises, Why have we witnessed large output losses in recent crises—6.6 percent in Mexico and 4.4 percent in Argentina during 1995, for example?

One answer is linked to the previous discussion, that is, the highway congestion effect. However, another answer is linked to a version of “time to build.” Consider the case in which unfinished projects disintegrate. Thus, if projects were funded on the basis of bank credit lines, for example, an unanticipated capital inflow slowdown could imply a surge of unfinished projects and bankruptcies. This observation helps to explain why the typical bank bailout does not insulate the economy from serious output losses. This is so because a bank bailout provides funds to repay bank *creditors* (e.g., depositors, foreign lenders, etc.) but not to ensure that investment projects are carried to completion. Firms that cannot get the additional funds necessary for that purpose may, therefore, run into serious financial difficulties. This by itself slows growth, while the reverberations from bankruptcies could actually lower output. I will have more to say about this case in sections 3.9 and 3.10.

3.7 Policies to Manage Capital Flows: Current Account Deficits and Dollarization; A Brief Detour

Before proceeding with analytical details, it is worth pausing to discuss some key policy issues. The main result of the section will be to show that taking into account the policies available to deal with a crisis, current account deficits and a dollarized financial sector are more a cause of concern than mere capital inflows (i.e., capital inflows without current account deficits and dollarization).

At the beginning of a capital inflow episode, central banks typically engage in sterilized intervention. In this fashion, the accumulation of reserves is financed by issuing public debt (typically short term). However, sterilization is as a general rule incomplete, and monetary aggregates increase together with bank credit. In the absence of a current account deficit, a sudden unexpected slowdown or fall in capital inflows could be met by an expansion of domestic credit (from the central bank) and a devaluation of the currency. If this is done quickly enough, debtors will benefit from the devaluation, which will give them some extra leeway to negotiate

their financial difficulties. Thus monetary policy could be highly effective in offsetting the negative effects stemming from the capital account. It should be stressed, however, that the move has to be quick and decisive. If the monetary authority is slow to react, devaluation expectations will rise and, with it, nominal interest rates. Thus the real value of debt could increase before the currency is devalued. Moreover, to the extent that the devaluation is anticipated by the public, devaluation would fail to lower the real value of debt, and its effect will mostly be on the price level. Actually, passive and slow reaction by the monetary authority, failing to address the debt problem, could lead to gradually increasing inflation, possibly converging to hyperinflation (Argentina in the 1980s is a good example in this respect; see Fernandez 1991).

However, monetary policy is much less effective if the shock involves a cut in a large current account deficit or if the monetary system is highly dollarized.¹⁹ Clearly, dollarization makes the real value of bank debt impervious to devaluation or domestic inflation, rendering the inflation debt repudiation route totally ineffective. On the other hand, if capital inflows are associated with large current account deficits, then, again, debt is as a general rule specified in terms of foreign exchange, and monetary policy becomes ineffective.

How vulnerable is the economy to a given current account deficit? It depends on a myriad of factors, among which are the level of international reserves, the maturity structure of foreign-exchange-denominated debt, the volume of investment projects that will have to be discontinued if the current account deficit has to be sharply reversed, and so forth. A fuller answer is beyond the scope of this paper. However, it should be clear that countries can be very different in this respect and there is no magical number beyond which any current account deficit should be deemed a sure harbinger of crisis. Of course, if prominent people and institutions insist on calling anything greater than 4 percent of GDP, say, “large,” then there are enough vulnerabilities out there in the emerging market world that the prophesy could become self-fulfilling. The latter may enhance the worldly reputation of such prophets but, I am afraid, will keep them outside the gates of Heaven!

3.8 Vanishing Credit

As noted in section 3.6 I suspect that a major component in emerging market crises has to do with the disarray they create in the private sector and, especially, in the credit and production network of these countries. In this section I will try to illustrate this issue by means of a simple example.

19. Argentina, Bolivia, Peru, and Uruguay are examples of highly dollarized economies. In Uruguay, e.g., dollar-denominated deposits are about 80 percent of the total.

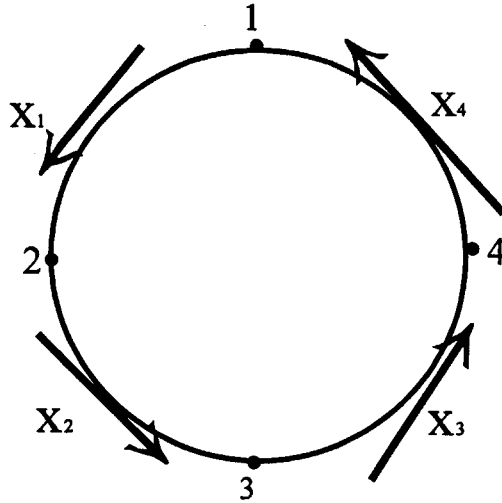


Fig. 3.2 Flow of goods

Let figure 3.2 depict a simple economy in which the numbers around the circle indicate “industries,” each one composed of a multitude of competitive firms. There are, therefore, four types of firms. Each firm in industry i , $i = 1, 2, 3, 4$, is managed by one individual who is endowed with an initial stock z of industry i ’s goods (by normalization, z is the same for all i). Each firm is an “atom,” and we normalize the number of firms in each industry to unity. Individuals in industry i derive utility from their own good and the good of industry $i - 1$ (where, if $i = 1$, $i - 1 = 4$). The amount shipped by industry i to individuals in industry $i + 1$ is denoted by x_i ($x_i \leq z$). This pattern is depicted in figure 3.2, where the arrows indicate the direction in which the goods are shipped.

The utility of an individual in industry i is given by

$$(23) \quad z - x_i + kx_{i-1}, \quad k > 1.$$

Thus the marginal utility of goods produced by the preceding industry (ordered in a counterclockwise manner) exceeds that of goods produced by one’s own industry. This is a simple way of capturing the mutual dependence among firms for production.

Let p_i be the market price of goods produced by industry i . Then it is readily seen that $p_i = 1$, for all i , is a competitive equilibrium price vector. In this equilibrium, nobody consumes his own good, and therefore, $x_i = z$, for all i . Moreover, utility equals kz for all i , and as expected, the competitive equilibrium is a Pareto optimum.

To make the example more useful for our purposes, let us assume that transactions take time and occur in a predetermined sequential order.

First industry 1 ships to 2, then industry 2 ships to 3, and so on. In this context, if all the transactions are contracted “at the beginning of time” and enforced ex post, then the Pareto optimum could be effectively decentralized by a competitive system. Otherwise, these transactions will have to involve some means of payment (money) or credit and trust (C&T), or both. Let us study the workings of C&T since, as will be easy to see, if costless it is likely to dominate money (especially specie money).

Let us take the above equilibrium prices as a reference. Individuals start with zero wealth. Hence, industry 1 ships goods to 2 before industry 2 gets paid by 3. Thus this transaction requires credit in the amount z (i.e., the market value of the goods being shipped). Clearly, the same is true for all the ensuing shipping around the circle. When all shipping is done, each set of individuals has issued and received one IOU in the amount z . But unless there is a market for IOUs, repayment cannot be executed. Individuals in industry 1, for example, will hold IOUs from individuals in industry 4 and will have issued IOUs held by individuals in industry 2.

In the present context, banks can be seen as institutions that facilitate the trading of those IOUs. Actually, a bank can fully substitute for the IOUs by providing credit to individuals in industries 2, 3, and 4. These individuals will later be able to repay the loans from the proceeds of their shipping, which are deposited in their bank accounts.

A fundamental problem arises, however, if individuals realize that it may be optimal for them to consume their own goods after getting credit from the bank. To see the implication of this in a stark way, consider the case in which all the individuals in industry 3 behave that way. If this is anticipated by individuals in industry 1, it is easy to see that they will have no incentive to sell their endowment to those in industry 2 *at any price*. A similar reasoning shows that under those circumstances the only possible equilibrium is full autarky, where utility equals $z < kz$ (the Pareto optimum utility).

Under normal circumstances C&T systems have proved to work smoothly. There are always isolated deviants, but they are as a general rule severely punished. Thus, on the whole, although the Pareto optimum may be hard to achieve, a sufficiently well functioning C&T system could be set in place. A problem arises, though, if the system is subject to a low-probability external (to the system) shock that changes the marginal cost of deviant behavior. Suppose, for example, that industry 3 is forced to repay the principal of an old debt outside the system. If the punishment for not repaying the old debt is high enough, individuals in industry 3 may prefer to use their own goods to effect the repayment. Thus, if anticipated by individuals in industry 1, this behavior will result in full autarky, as before. Interestingly, under these circumstances the potential deviants may not be given the opportunity to default on bank credit because it might instantly dry up for everybody. *Consequently, the above example shows that*

debt rollover difficulties, even when located in one sector of the economy, can spill over the whole economy and result in vanishing credit and a major welfare loss.

In practice, of course, banks are not the only form of credit or system that helps to guarantee settlement enforcement. The above economy could use “cash,” for example, coupled with some cash-in-advance constraint to ensure an equilibrium positive price of cash in terms of commodities. However, banks are likely to creep back into the picture if the opportunity cost of cash is positive (i.e., if Friedman’s optimum quantity of money is not implemented), which is the dominant case in practice.

Another widespread form of credit is “interenterprise credit,” that is, credit extended in connection with regular business among firms (see Ramsey 1992). Thus, in the above economy, sector i would lend to sector $i + 1$, for all i . Firms as creditors have an advantage over banks in that enforcement may be ensured by the threat of keeping the defaulter away from the stream of goods (and thus forcing him to autarky). This kind of advantage explains the coexistence of interenterprise and bank credit.

A full discussion of interenterprise credit falls outside the scope of the present paper (see Calvo and Coricelli 1994). However, it should be clear that this type of credit channel will also come to a full stop if just one of its links breaks. Actually, under those circumstances clearinghouses such as banks become more useful because, at the very least, they help net out interenterprise debt. In this fashion, bankruptcy procedures would involve smaller sums of money and could thus lower the cost of legal settlements.²⁰

In closing, the reader has to beware that this section is not self-contained because it does not provide an explanation for the external shock. This, however, was discussed in previous sections where the existence of a sovereign government was singled out as a major factor in the creation of financial vulnerability. The main value of this section is to show that the credit channel could greatly magnify external shocks.²¹

3.9 Time to Build: A Basic Model

I will now discuss the case in which investment projects take time to come to full fruition, which was identified in subsection 3.6.2 as a possible explanation for the observed high cost of a credit slowdown, as opposed to outright credit cut. To simplify the exposition, I will focus on the non-monetary economy in which, by necessity, $KI = CAD$.

To help fix ideas, consider the case in which it takes two periods to bring

20. Interenterprise debt consolidation, or netting out, has been used in such countries as Russia and Romania on several occasions after interenterprise arrears (or involuntary credit) became large.

21. This is fully in line with the Bernanke-Gertler view of credit in the U.S. economy, although they do not emphasize the interenterprise credit channel.

an investment project to completion, involving half a unit of output per period. Once completed, the project yields β units of output in the third period, and zero later on. However, if the project is discontinued after the first period, no output is forthcoming, and the project becomes completely useless. Assuming that the riskless international rate of interest is zero and that there is no risk of project discontinuation, the project will be undertaken if

$$(24) \quad \beta \geq 1.$$

In a stationary steady state as many projects will be completed as are started. Thus the total amount of credit outstanding at any point in time will be a constant, implying that as long as total credit does not drop, all projects will see their way to full fruition.

Let us now consider a sudden increase in credit in period t . Denoting the outstanding stock of credit by Z and the sudden increase by ΔZ (in terms of output), it follows that $2\Delta Z$ new projects could be started in period t . However, the new projects will be completed in period $t + 1$ only if the stock of credit rises by at least an additional ΔZ units. Thus total credit must be equal to at least $Z + 2\Delta Z$ in period $t + 1$ if all projects that started in period t will be completed. As a result, if the “capital inflow” in period t is temporary and total credit, say, stays at $Z + \Delta Z$ —higher than the level prior to the capital inflow episode, Z , but lower than $Z + 2\Delta Z$ —in period $t + 1$ the equivalent of ΔZ loans will become nonperforming. This illustrates the possibility that a *surge of credit may generate future financial difficulties even though total credit does not shrink and, in fact, continues to rise*. More specifically, financial difficulties could just be caused by an *unexpected slowdown* in external credit.

We now move a step further and ask a natural question: *Under what conditions would credit be taken if there was a possibility of credit discontinuation during the second period of the project?*

Suppose the borrower has enough capital to cover all losses, and let the probability of discontinuation be denoted by q . Under these circumstances, creditors undergo no risk and, hence, continue to charge a zero rate of interest. On the other hand, expected return from the project is now

$$(25) \quad (\beta - 1)(1 - q) - \frac{q}{2}.$$

Therefore, the project will be undertaken by a risk-neutral firm if

$$(26) \quad \beta \geq \frac{2 - q}{2(1 - q)} \geq 1.$$

As expected, condition (26) is more stringent than condition (24), but given $\beta > 1$, there are positive values (in fact, an open interval) that the

probability of credit discontinuation q could take for which condition (26) is satisfied and, thus, for which the project will be undertaken.

The above example could be criticized on the grounds that the firm undertaking the project could have used its own capital to bring the project to fruition, instead of using it to repay the project's first-period loan. This problem can easily be taken care of by making the realistic assumption that although the firm will eventually be able to repay creditors in full, it cannot liquidate its other assets quickly enough to prevent a meltdown of the project.

In more realistic situations, especially following a big surge of credit (large KI), the firm's capital is not enough to finish all projects. To see the effect of this, let us examine the polar case in which the firm has no capital. Thus, if the project is discontinued during its second period, first-period credit goes unpaid. We will now show that condition (26) still holds if creditors are risk neutral.

We assume that uncertainty is resolved during the project's second period. Thus the only credit subject to risk is that granted during the first period. Let r_{13} denote the interest rate on a loan that is granted during the project's first period and is due for repayment in the project's third period (i.e., when it becomes fully operative). Since repayment occurs with probability $1 - q$, we have

$$(27) \quad (1 - q)(1 + r_{13}) = 1.$$

Moreover, expected net return from the project is

$$(28) \quad (1 - q) \left(\beta - \frac{1}{2} r_{13} - \frac{1}{2} \right).$$

The project will be undertaken if the expression in large parentheses is greater than or equal to zero—which combined with equation (27) implies condition (26). This result is perfectly intuitive. If creditors foresee any chance of default they will charge it on the interest rate paid when there is no default. Since both creditors and borrowers are risk neutral, they value these transfers equally. Hence, the borrower ends up paying the same in expected value. This neutrality proposition can be easily extended to situations of partial default (i.e., when the firm partially shares in the total loss).

3.10 Time to Build: Large Capital Inflows, Banks, and Financial Vulnerability

The previous section assumed that firms could not secure future financial commitments to bring a project to completion. If capital markets were perfect, however, such a commitment could be secured at the beginning of

a project. As a result, expected profits would be $\beta - 1$, which is higher than in any of the other options considered so far. It is interesting to note, however, that in all serious financial crises of the past twenty years, banks have played a prominent role. Thus there are no serious recent balance-of-payments crises in which banks have not suffered heavy losses and the fiscal authority has not borne a significant share of the cost (see Kaminsky and Reinhart 1995).

The conjecture we explore here is that banks can borrow cheaply because their liabilities provide liquidity services (as in the monetary models of sections 3.2 and 3.3). In turn, the *quality* of those services is enhanced by implicit or explicit deposit insurance. This allows banks to offer *their clients* interest rates below the bond market, especially for small and medium-size firms and during a surge of capital inflows.

The preceding paragraph contains several implicit assumptions that we need to flesh out. In the first place, we assume that a bank has much better information about its clients than about the rest of potential borrowers.²² Thus, if bank deposits surge, the bank will in the short run have incentives to lend to its own clients. In the medium term these incentives will tend to subside as the bank has more time to acquire information about other potential borrowers. However, if bank deposits continue to exhibit strong growth, old clients may continue to have the upper hand with the bank (although loans will start spreading to new clients).

Suppose that on account of the associated liquidity services, the international deposit interest rate is lower than the pure international rate, assumed to be equal to zero. Thus the real rate of interest on deposits is negative. We will denote it by $-\kappa$, for some $\kappa > 0$. Let us assume, for the sake of simplicity, that each firm is a client of several banks, so competition will bring down the loan interest rate to its marginal cost.²³ We assume that banks expect to be fully bailed out in case of an economy-wide financial crisis (thus the government plays a key role in the story). Thus a project's first-period rate of interest for a loan that will be repaid in its third period (if no financial crisis occurs), r_{13} , satisfies

$$(29) \quad r_{13} = 1 - \kappa.$$

The latter assumes no transactions costs of extending the loan to the client firm. The "catch" is, however, that banks cannot ensure second-period financing at those rates. Under normal circumstances, depositors have the highest priority claim to a bank's assets. Thus even liquid funds that have been set aside for a customer would have to be used to repay deposits. The best a bank can normally do for a client is to open a credit line, which is,

22. Therefore, we are imbuing banks with a new feature as compared to our earlier discussion about the role of banks; recall section 3.3.

23. This is in sharp contrast with the model at the end of section 3.3, in which the loan interest rate is equal to the pure international interest rate.

however, instantly closed if the bank undergoes financial stress. This is a key *institutional* assumption.

For the sake of concreteness, let us consider the case in which the firm can either (1) fund the project's first period through a bank and ensure completion by a forward loan contract in the capital market or (2) finance the entire project through a bank, running the risk of having to stop the project if there is a financial crisis.²⁴ Expected profit during the third period of option 1 would be

$$(30) \quad \beta - \frac{1 - \kappa}{2} - \frac{1}{2}.$$

Expected profit from option 2, the risky one, would be

$$(31) \quad (1 - q)[\beta - (1 - \kappa)].$$

Therefore, a necessary and sufficient condition for risky option 2 to dominate riskless option 1 is that expression (31) exceed expression (30)—equivalently, that

$$(32) \quad \frac{1}{2}\kappa - q(\beta - 1 + \kappa) > 0.$$

If $\beta \geq 1$, inequality (32) would never hold if banks could not offer a better deal than the bond market, that is, $\kappa = 0$. However, once $\kappa > 0$, no matter how small, there is always an interval of small enough probabilities of financial collapse q (or, more specifically, probabilities that the project cannot be carried to completion) for which inequality (32) holds.

Consequently, we have presented a framework in which the special nature of banks and the treatment they receive from the fisc may induce a sizable share of new deposits to be lent for projects that would not come to fruition in the event of a freeze in the level of bank deposits. Since in such a case all the new loans will become nonperforming, the fisc will be called in to implement a bailout, triggering the series of negative shocks through the economy that we have amply discussed before.

References

Bulow, Jeremy I., and Kenneth Rogoff. 1989. Sovereign debt: Is to forgive to forget? *American Economic Review* 79 (March): 43–50.

24. Thus we are excluding the possibility of financing the project's first period by a bank loan and, if the bank does not extend credit to finance the project's second period, doing it through the bond market. This exclusion captures, in an admittedly crude way, a situation in which being cut off from bank credit to complete the project sends a negative signal to the market about the quality of the project. Under the above assumptions, therefore, the project will not be funded if lenders require one period of time to evaluate it.

- Calvo, Guillermo A. 1986. Temporary stabilization: Predetermined exchange rates. *Journal of Political Economy* 94 (December): 1319–29.
- . 1988. Costly trade liberalizations: Durable goods and capital mobility. *IMF Staff Papers* 35 (September): 461–73.
- . 1998a. Varieties of capital-market crises. In *The debt burden and its consequences for monetary policy*, ed. G. A. Calvo and M. King. Proceedings of a conference held by the International Economic Association at the Deutsche Bundesbank. London: Macmillan.
- . 1998b. The “unforgiving” market and the *tequilazo*. In *Financial reform in developing countries*, ed. Jose M. Fanelli and Rohinton Medhore. New York: St. Martin’s.
- Calvo, Guillermo A., and Fabrizio Coricelli. 1994. Interenterprise arrears in economies in transition. *Empirica* 21:37–54.
- Calvo, Guillermo A., Leonardo Leiderman, and Carmen M. Reinhart. 1996. Inflows of capital to developing countries in the 1990s. *Journal of Economic Perspectives* 10, no. 2 (spring): 123–40.
- Calvo, Guillermo A., and Enrique G. Mendoza. 1996. Mexico’s balance of payments crisis: A chronicle of death foretold. *Journal of International Economics* 41 (November): 235–64.
- . 1997. Rational herding and the globalization of securities markets. College Park: University of Maryland. Manuscript.
- Calvo, Guillermo A., Carmen M. Reinhart, and Carlos A. Végh. 1995. Targeting the real exchange rate: Theory and evidence. *Journal of Development Economics* 47:97–133.
- Chang, Roberto, and Andrés Velasco. 1998. Financial fragility and the exchange rate regime. Atlanta: Federal Reserve Bank of Atlanta, January. Mimeograph.
- Cole, Harold L., and Timothy J. Kehoe. 1996. A self-fulfilling model of Mexico’s 1994–1995 debt crisis. *Journal of International Economics* 41 (November): 309–30.
- Diamond, Douglas W., and Philip H. Dybvig. 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy* 91 (June): 401–19.
- Eichengreen, Barry, Andrew Rose, and Charles Wyplosz. 1995. Exchange market mayhem: The antecedents and aftermath of speculative attacks. *Economic Policy* 21:249–312.
- Fernandez, Roque B. 1991. What have populists learned from hyperinflation? In *The macroeconomics of populism in Latin America*, ed. R. Dornbusch and S. Edwards. Chicago: University of Chicago Press.
- Friedman, Milton, and Anna J. Schwartz. 1963. *A monetary history of the United States, 1867–1960*. Princeton, N.J.: Princeton University Press.
- Goldfajn, Ilan, and Rodrigo Valdés. 1997. Capital flows and the twin crises: The role of liquidity. IMF Working Paper no. 97/87. Washington, D.C.: International Monetary Fund.
- Kaminsky, Graciela L., and Carmen M. Reinhart. 1995. Twin crises: The causes of banking and balance of payments problems. Paper presented at conference Speculative Attacks in the Era of the Global Economy: Theory, Evidence, and Policy Implications, Center of International Economics, University of Maryland, College Park, December.
- Krugman, Paul R. 1979. A model of balance-of-payments crises. *Journal of Money, Credit, and Banking* 11 (August): 311–25.
- Kumhof, Michael. 1997. Balance of payments crises: The role of short-term debt. College Park: University of Maryland. Manuscript.
- Obstfeld, Maurice. 1994. The logic of currency crises. *Cahiers Economiques et Monétaires* (Bank of France) 43:189–213.

- Obstfeld, Maurice, and Kenneth Rogoff. 1995. The mirage of fixed exchange rates. *Journal of Economic Perspectives* 9:73–96.
- Ramey, Valery. 1992. The source of fluctuations in money: Evidence from trade credit. *Journal of Monetary Economics* 30 (November): 171–94.
- World Bank. 1993. *The East Asian miracle: Economic growth and economic policy*. New York: Oxford University Press.

Comment Roberto Rigobon

I enjoyed reading this paper. It is well written and worth spending time on. It is the first attempt (as far as I know) to explain the output collapse that we observed in the recent Asian turmoil.

Calvo's paper is motivated by four empirical facts distinctive of recent currency crises: These attacks have been accompanied by large output collapses. The financial sector has played an important role in the transmission of the crises. The crises were not predicted. Capital flows seemed to overreact to the fundamentals. In addition to these empirical facts, the paper has three theoretical motivations: First, Calvo models the financial sector as a transmission channel of external shocks, and not as the residual. Second, he studies the relation between prior capital inflows and output collapse. Third, he asks, What is the relevance of the current account sustainability literature to the crises?

This paper is an example of a pure Calvo paper. It has, as expected, a continuum of sections, each of them with a continuum of interesting insights. Hence, it is impossible to summarize in a finite number of pages. In this discussion, I concentrate on the aspects that I find either more interesting or weak.

The paper can be divided in two broad parts: First, sections 3.2 and 3.3 study extensions of the standard speculative attack model. This part has two main objectives—to show that a currency crisis is possible in the absence of a prior current account deficit and to study the interaction between sovereignty and capital flows. The main results indicate that the introduction of sovereignty into a model of speculative attacks raises the possibility of multiple equilibria and self-fulfilling attacks. More important, these events can occur even in the absence of a current account deficit.

Second, in sections 3.4 to 3.10, given the previous framework, the model is extended to introduce the banking sector along with another ingredient, either time to build or trade credit. The objective is to explore the causes

Roberto Rigobon is assistant professor at the Sloan School of Management of the Massachusetts Institute of Technology and a faculty research fellow of the National Bureau of Economic Research.

of the output collapse. In these sections, Calvo explains the loss in output as either the halting of investment in a time-to-build model or in the vanishing of trade credit. Both channels can account for important output losses. The paper treats them separately in simple and intuitive frameworks.

Balance-of-Payments Crises in the Absence of Current Account Deficits

The paper starts by extending the standard speculative attack model to show that it is possible to have a balance-of-payments crisis even if there is no current account deficit prior to the attack. Calvo's motive is to show that this possibility exists at least theoretically. The main implication of this finding is that the current account by itself is an imperfect measure of the true fundamentals. This casts doubts on the usefulness of the current account sustainability literature. I tend to agree with this general conclusion. I do not, however, share Calvo's assumptions that drive the result.

The intuition of this result is summarized easily in a model in which there is Ricardian equivalence. Assume the only available tax is inflation, or assume it is the marginal instrument that the government uses to collect taxes. In this case, when the central bank pegs the currency, it reduces current taxation, which will have to be offset by future increases in the inflationary tax. Agents anticipate this and therefore save what the government is dissaving. At the aggregate level, there is no change in total savings, the current account remains in equilibrium, and a perfectly predictable change in the peg is anticipated. Hence, a currency crisis.

Formally, in a standard neoclassical framework with money in the utility function, the government solves the following maximization problem:

$$\begin{aligned} \max \int e^{-\rho t} u(c_t, m_t), \\ \dot{b}_t = \rho b_t + y + g - c_t - i_t m_t, \end{aligned}$$

where output and expenditure are assumed to be exogenous (for simplicity, assume they are constant). Additionally, assume that there is perfect capital mobility, that all goods are tradable, and that the law of one price holds.

In this model, the interest rate (i) is equal to the rate of depreciation plus the international interest rate (assumed to be equal to the discount rate, ρ). The first-order conditions of this model are

$$\begin{aligned} u_c &= \lambda, \\ u_m &= i_t \lambda. \end{aligned}$$

By total differentiation it is possible to solve for the change in consumption due to a change in the peg (remember that a change in the peg involves a one-to-one change in the domestic nominal interest rate):

$$\frac{\partial c_t}{\partial i_t} = - \frac{u_c u_{cm}}{u_{mm} u_{cc}} \frac{1}{1 - (u_{cm})^2 / (u_{mm} u_{cc})}$$

As can be seen, if the cross derivative (u_{cm}) is zero, then the level of consumption is not affected by the choice of monetary policy. This is the case because, under a strong separable utility, the inflationary tax is non-distortionary; only the equivalent annuity of expected taxes is relevant to the consumer's decision, not their path. The intuition is as follows: A reduction in the peg reduces tax collections. The fiscal deficit increases, and it is financed with reserves. Agents know that when reserves reach zero, a change in regime is required because the source of financing is no longer there. Agents anticipate the change in regime, and a speculative attack (à la Krugman) occurs, cleaning out the reserves of the central bank. From then on, the interest rate is higher, which implies that taxes are higher too. In this model, reserves and government debt have the same interest rate (ρ); thus the change in the path of taxes generates the same net present value of tax collections. Therefore, there is neither an income nor a substitution effect.¹

First, if inflation is a distortionary tax, and in particular, if money and consumption are complements, then all currency crises are accompanied by current account deterioration. This is because a decrease in the nominal domestic interest rate implies an increase in consumption. Given that output and expenditure are constant, this increase in consumption causes a current account deficit. The second assumption is that expenditure is exogenous or does not depend on the peg. However, in reality, both primary and secondary fiscal budgets are indeed affected by the depreciation rate. In general, if this assumption is relaxed, a current account deficit should be expected.² Finally, the model assumes that there are perfect credit markets. Relaxing this assumption will also drive a current account deficit. For example, if there are problems of credibility of the peg, the interest rate faced by the government is higher than the discount rate. The reduction in the depreciation rate generates a substitution effect against future consumption.

The question, then, would not be whether there exists a model that can account for a balance-of-payments crisis without a current account imbalance, but whether there exists such a model whose underlying assumptions are relevant to explain the observed events. In this sense, Calvo's assumptions are not realistic.

I tend to agree, however, with Calvo's conclusion that in recent attacks

1. The same result is obtained for more general models in which nontradable goods are considered. Again, if there is strong separability between money and composite consumption, inflation is a nondistortionary tax and Ricardian equivalence prevails.

2. In fact, later in the paper Calvo relaxes this assumption and endogenizes policy to model self-fulfilling crises.

the current account deficits, prior to the crises, did not reflect the required adjustment these economies had to make after abandoning their currency regimes: the current account was a noisy signal of the true fundamental.³ The challenge posed by the paper is to explain what makes the current account such a poor signal. The model developed in the paper provides an answer, which is nevertheless preliminary. Other types of informational problems might have the same implications and could be based on more realistic assumptions. Further research in this area is therefore required.⁴

Calvo finishes these sections by studying the relation between sovereign governments, capital flow reversals, and balance-of-payments crises. He shows that the fact sovereign governments can implement any policy they like makes multiple equilibria possible. The intuition is that the sovereignty of governments increases the risk of long-term debt, generating a portfolio reallocation toward short-term instruments. This increases the exposure of both the government and the financial sector. And more important, it increases the chances of a self-fulfilling attack because it makes the country, as a whole, more vulnerable to capital outflows.

In the model, flexibility on the side of the government always goes in one direction: it is always bad. This is an assumption and not a result of the model. In principle, we could conjecture that in a pure neoclassical framework, a benevolent government with more instruments is likely to smooth external shocks better than one with fewer instruments; for example, a devaluation might avoid an unnecessary financial crisis.⁵ Thus it is crucial for the results that the government have a different objective function than consumers. This is not modeled in the paper. It is important to improve the understanding of the circumstances in which this possibility can arise in order to model this problem explicitly.

Financial Sector, Capital Flows, and Output Collapse

Calvo's motive in sections 3.4 to 3.7 is to study the interaction between the credit market and output collapse. The idea is that the credit market is an amplifier of external shocks, along the lines of the financial accelerator literature (Kiyotaki and Moore 1997).

3. E.g., a current account deficit of x percent was expected and only y percent was observed (where y is smaller than x).

4. Rigobon (1998) is an attempt to formalize the effects of informational problems on the path of speculative attacks. There I assume that the current account is an imperfect signal, and I study the implications of this problem for the path of capital flows.

5. An interesting example is the case of the financial crises in the mid-1980s in Texas. In 1986, oil dropped to historical lows, and most of the banks in Texas had problems. At the same time, Venezuela, which has an economy similar to Texas's in terms of size and dependence on oil, devalued and avoided a financial crisis. I am sure the reason why the banks in Venezuela survived is *not* better regulation. Evidence has shown the contrary (1994). In this case, the fact that the country could devalue and recognize the losses due to the external shocks reduced the pressure on the financial sector.

Calvo starts by looking at the consequences of capital flow reversals in the framework previously developed. The first implication is the possibility of self-fulfilling crisis, à la Diamond and Dybvig (1983). Capital flows are the source of a liquidity shock that generates a bank run.

A liquidity shock can take several forms. It can be reflected in a creditor's unwillingness to roll over debt, or in the endogenous repudiation of debt (Cole and Kehoe 1996). Or more specifically, it can cause the elimination of trade credit, in the spirit of Kiyotaki and Moore (1996), Blanchard and Kremer (1997), and Calvo and Coricelli (1994). In all these cases, capital outflows can have large output effects.

The paper develops a simple model based on the time-to-build aspect of investment. This model accounts for the concurrence of output collapse, currency crisis, and financial crisis. The intuition is that a capital flow reversal dries up liquidity, generating a bank run. The fall in credit forces to a stop investment in projects that were financed before. The liquidation value of those projects is low (or zero), which generates a loss in output. In this instance, there is a current account deficit that requires a real depreciation to return to equilibrium; hence, a currency devaluation occurs. The intuition is clear and appealing.

The model is interesting because it gives a framework in which other questions can be asked: How much of the output collapse can the financial crisis explain? What else is required to account for the fall in output? What are the policy implications for recoveries and for managing external flows? And so on.

In the rest of this comment I offer some preliminary evidence on the model. I concentrate on its financial accelerator implications. The model makes two predictions: First, all things equal, the financial accelerator in developing economies should be larger than in developed economies. Second, crises are different from tranquil periods in the sense that the financial accelerator is larger under attack. This is the same point regarded from two different perspectives. The intuition is as follows: Calvo's model (sections 3.6 and 3.7) implies that during periods of capital outflow, the change to the bad equilibrium is reflected in a more than proportional change in credit. In a time-series view, countries that have had this type of crisis should experience larger financial accelerators.

Measuring the Financial Accelerator

One way to test the model is to measure the financial accelerator directly as the elasticity of domestic credit with respect to changes in capital flows. However, there are two main problems with this formulation: First, there is a problem of endogeneity between domestic credit and capital inflows. Second, these variables are likely to have spurious correlation if the country is going through a process of financial reform. The first problem is known and not discussed. The second, however, requires some explana-

tion. The process of financial reform usually involves measures that are intended to free currency denominations of liabilities, as well as restrictions on credit. The first measure tends to increase capital inflows, while the second tends to increase credit as a whole. In this sense, there is no causal relation between the expansion of credit and the recomposition of liabilities.

An alternative is to test the dual of this quantity multiplier: other things equal, countries that have larger financial multipliers should have larger real exchange rate appreciations for the same capital inflows. This specification does not solve the problem of endogeneity. However, it helps with the second problem. Financial liberalization increases capital inflows and generates a more efficient use of resources. The first effect generates a real exchange rate appreciation, while the second can generate a real exchange rate depreciation if it is biased toward the nontradable sector.⁶ The specification does not fully solve the problem, but it diminishes it.

The following real exchange rate equation is estimated:

$$\begin{aligned}\Delta RER_t &= \beta_0 + \beta_1 \Delta RER_{t-1} + \beta_2 TOT_t + \beta_{3,i} CF_t + \beta_4 G_t \\ &\quad + \beta_5 \Delta GDP_t + \varepsilon_t, \\ \beta_{3,i} &= \alpha_{11} + \alpha_{12} Cre_i \quad \text{if } i \in A_c, \\ \beta_{3,i} &= \alpha_{21} + \alpha_{22} Cre_i \quad \text{if } i \notin A_c,\end{aligned}$$

where ΔRER is the change in the real exchange rate, TOT is the logarithm of the terms of trade, CF is capital flows as a proportion of GDP , G is government expenditure divided by GDP , Cre is domestic credit expansion divided by GDP , and ΔGDP is GDP growth.

The sample is divided in two: developing countries (A_c) and developed countries. The regression is estimated using yearly data from *International Financial Statistics*, for forty-one countries, 1965–96. The data were divided in two ways: first, OECD versus not OECD and, second, the groups were constructed to maximize the maximum likelihood estimation. The results are shown in table 3C.1.

The first implication of the model is that the elasticity should be larger in developing economies. As can be seen, this hypothesis is rejected at the 5 percent confidence level.⁷ The estimates show that $\alpha_{21} - \alpha_{11} > 0$. This means that developed economies have higher elasticities.

The second hypothesis is that the fragility of the banking sector increases the elasticity of the real exchange rate with respect to capital flows.

6. The evidence shows that this is the sector that has had the largest growth after financial liberalization.

7. This test has a mean value of 0.866 and a standard deviation of 0.438 in the first grouping.

Table 3C.1 Results from Estimation

Coefficient	OECD	MLE
α_{11}	0.389 (1.630)	0.352 (1.736)
α_{12}	1.581 (2.041)	1.922 (3.219)
α_{21}	1.255 (6.274)	0.766 (2.215)
α_{22}	-0.398 (-1.354)	0.075 (0.183)

Note: Numbers in parentheses are *t*-statistics.

In this case, table 3C.1 shows that in developing economies, when there is a credit expansion there is an increase in the elasticity. If credit expansions are interpreted as signals of financial fragility, as a large literature on the subject has suggested, then this evidence is consistent with Calvo's model. Note that $\alpha_{12} > 0$ while $\alpha_{22} < 0$ —which is exactly what the model predicts. The results are similar in both groupings. Moreover, the results are robust to the inclusion of dummies related to reforms.

Measuring the Asymmetry

The second implication of the model is that the financial accelerator changes during periods of crisis. This is the consequence of the time-to-build aspect of the model. Liquidation value is only lost during periods of crisis, and it is not regained during periods of boom. Again, the test is done looking at the real exchange rate instead of at output directly or at credit due to the same reasons explained above.

One easy procedure to check this empirical implication is to test for asymmetries in the capital flow coefficient. The following regression is estimated:

$$\begin{aligned} \Delta RER_t = & \beta_0 + \beta_1 \Delta RER_{t-1} + \beta_2 TOT_t + \beta_3 CF_t + \beta_{3a} |CF| \\ & + \beta_4 G_t + \beta_5 \Delta GDP_t + \varepsilon_t. \end{aligned}$$

In this procedure the elasticity of the real exchange rate with respect to a positive capital flow is $\beta_3 + \beta_{3a}$, while the elasticity (in absolute value) is $\beta_3 - \beta_{3a}$ for negative capital flows. The test in this case is to check the sign of β_{3a} . If it is positive, then the real exchange rate is more sensitive to capital inflows, and if it is negative, the real exchange rate is more sensitive to capital outflows. The prediction of the model is that the real exchange rate has to be more sensitive to capital inflows. The estimate of β_{3a} is -0.112 (with a *t*-statistic of -2.097).

Conclusions

This paper is worth reading and investing time in. In these brief lines, I concentrated on those aspects of the paper that I found more interesting; thus several insightful sections were unfortunately left out. The paper offers a basic framework in which more questions can be asked and from which further understanding of recent speculative attacks can be drawn.

It is clear from my discussion that further research is required in several areas. First, the paper casts important doubts on the current account sustainability literature. I share this concern, even though I do not agree with the modeling device Calvo uses to achieve it. The assumptions are not realistic. Alternative routes should be explored. Second, the model with the financial accelerator has mixed empirical performance, on a first look. The results are preliminary but suggestive. I take this as positive performance of the model; in future research, richer implications with better data might increase support for the model. Finally, and probably a deeper concern with the model, is that the paper explains speculative attacks as a result of self-fulfilling prophecies. Recent evidence on the Asian crashes seems to suggest (at least by my reading) that there was something deeply wrong with those economies and that an attack was going to occur with probability one, the *timing* of which might have been driven by market sentiments (see Corsetti, Pesenti, and Roubini 1998). In this sense, Calvo's transmission mechanism continues exist, although what changes is the reason for the crises.

References

- Blanchard, Olivier, and Michael Kremer. 1997. Disorganization. *Quarterly Journal of Economics* 112, no. 4 (November): 1091–1126.
- Calvo, G., and F. Coricelli. 1994. Inter-enterprise arrears in economies in transition. *Empirica* 21:37–54.
- Cole, H., and T. Kehoe. 1996. A self-fulfilling model of Mexico's 1994–95 debt crisis. Minneapolis: Federal Reserve Bank of Minneapolis. Mimeograph.
- Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini. 1998. What caused the Asian currency and financial crisis? New York: New York University, March. Mimeograph.
- Diamond, Douglas W., and Philip Dybvig. 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy* 91, no. 3 (June): 401–19.
- Kiyotaki, Nobuhiro, and John Moore. 1996. Trade credit. NBER Working Paper. Cambridge, Mass.: National Bureau of Economic Research.
- . 1997. Credit cycles. *Journal of Political Economy* 105, no. 2 (April): 211–48.
- Rigobon, R. 1998. Informational speculative attacks: Good news is no news. Cambridge: Massachusetts Institute of Technology. Mimeograph.

The Onset of the East Asian Financial Crisis

Steven Radelet and Jeffrey Sachs

Yet it is also true that small events at times have large consequences, that there are such things as chain reactions and cumulative forces. It happens that a liquidity crisis in a unit fractional reserve banking system is precisely the kind of event that can trigger—and often has triggered—a chain reaction. And economic collapse often has the character of a cumulative process. Let it go beyond a certain point, and it will tend for a time to gain strength from its own development as its effects spread and return to intensify the process of collapse. Because no great strength would be required to hold back the rock that starts a landslide, it does not follow that the landslide will not be of major proportions. —Milton Friedman and Anna Schwartz, *A Monetary History of the United States, 1867–1960*

4.1 Introduction

The East Asian financial crisis is remarkable in several ways. The crisis hit the most rapidly growing economies in the world and prompted the largest financial bailouts in history. It is the sharpest financial crisis to hit the developing world since the 1982 debt crisis. It is the least anticipated financial crisis in years. Few observers gave much chance in early 1997 that East Asian growth would suddenly collapse.¹ The search is on for

Steven Radelet is a fellow at the Harvard Institute for International Development and a lecturer on economics at Harvard University. Jeffrey Sachs is director of the Center for International Development and the Galen L. Stone Professor of International Trade at Harvard University.

The authors are grateful for excellent research assistance from Mumtaz Hussain, Dilip Parajuli, and Amar Hamoudi, and for comments from David Cole, Malcolm McPherson, Jay Rosengard, and Betty Slade. This research was partially sponsored by the Office of Emerging Markets, Economic Growth Center, Bureau for Global Programs, Field Support and Research, U.S. Agency for International Development (USAID) under the Consulting Assistance on Economic Reform (CAER) II Project (contract no. PCE-0405-C-00-5015-00). The views and interpretations in this paper are those of the authors and should not be attributed to USAID.

1. Yung-Chul Park (1996) is a notable exception, but voices such as his were rare and generally went unheeded. Paul Krugman's (1994) provocative critique of East Asian growth suggested a slowdown in growth, not a collapse, a point that Krugman himself made clear in the fall of 1997, at the start of the financial crisis.

culprits within Asia—corrupt and mismanaged banking systems, lack of transparency in corporate governance, the shortcomings of state-managed capitalism. At least as much attention, if not more, should be focused on the international financial system. The crisis is a testament to the shortcomings of the international capital markets and their vulnerability to sudden reversals of market confidence. The crisis has also raised serious doubts about the International Monetary Fund's (IMF's) approach to managing financial disturbances originating in private financial markets. Perhaps most important, the turmoil demonstrates how policy missteps and hasty reactions by governments, the international community, and market participants can turn a moderate adjustment into a financial panic and a deep crisis.

One ironic similarity between the Mexican (1995) and Korean (1997) crises is that both countries joined the OECD on the eve of their financial catastrophes. There is a hint of explanation in that bizarre fact. Both countries collapsed after a prolonged period of market euphoria. In the case of Mexico, a high-quality technocratic team had led the country through stabilization, privatization, liberalization, and even free trade with the United States. Indeed, the supposed cornerstone of Mexico's coming boom was admission to the North American Free Trade Agreement which occurred in November 1993, just months before the collapse. In Korea, a generation-long success story of industrial policy and export-led growth had culminated in Korea's admission to the exclusive club of advanced economies. Korea had even succeeded in democratization without jeopardy to its enviable growth record. In both countries, collapse came not mainly because of a prolonged darkening economic horizon but because of a euphoric inflow of capital that could not be sustained.²

In this sense, the Asian crisis can be understood as a "crisis of success," caused by a boom of international lending followed by a sudden withdrawal of funds. At the core of the Asian crisis were large-scale foreign capital inflows into financial systems that became vulnerable to panic. However, this is more than the bursting of an unwanted bubble (cf. Krugman 1998). Much of the economic activity supported by the capital inflows was highly productive, and the loss of economic activity resulting from the sudden and enormous reversal in capital flows has been enormous. There were few, if any, expectations of a sudden break in capital flows. By early 1997, markets expected a slowdown—even a devaluation crisis—in Thailand, but not in the rest of Asia. Indicators as late as the third quarter of 1997 did not suggest a financial meltdown of the sort

2. A member of the Bundesbank board has reported to us his own discussions with German banks. He asked these banks why they extended such large loans to Korea in 1997, just on the verge of the financial collapse. Several banks replied that Korea's new membership in the OECD had given them confidence that Korean economic performance would continue to be strong (private communication, February 1997).

that subsequently occurred. A combination of panic on the part of the international investment community, policy mistakes at the onset of the crisis by Asian governments, and poorly designed international rescue programs have led to a much deeper fall in (otherwise viable) output than was either necessary or inevitable.

This paper, originally written in early 1998, provides an early diagnosis of the financial crisis in Asia. It builds on existing theories and focuses on the empirical record in the lead-up to the crisis. The main goal is to emphasize the role of financial panic as an essential element of the Asian crisis. To be sure, significant underlying problems beset the Asian economies, at both a macroeconomic and a microeconomic level (especially within the financial sector). But these imbalances were not severe enough to warrant a financial crisis of the magnitude that took place in the latter half of 1997. In our view, certain policy choices and events along the way exacerbated the panic and unnecessarily deepened the crisis. We explore this possibility by examining the initial imbalances and weaknesses, the build-up to the crisis, and the events that led to the financial panic in the latter part of the year. The paper covers the period only till the end of 1997, and it does not aim to provide policy recommendations for the future, either regarding the Asian crisis or the reorganization of the international financial system to reduce the likelihood of such crises in the future. These goals are left for a companion study (Radelet and Sachs 1998).

The argument proceeds in six sections. In section 4.2 we provide a general overview of financial crises and their diagnosis. Section 4.3 gives a description of recent macroeconomic and financial events in the crisis countries. In section 4.4 we show that the crisis was not anticipated by key market participants, at least till the end of 1996, and in general not until mid-1997, following the devaluation of the Thai baht. Section 4.5 describes the triggering events of the crisis. Section 4.6 discusses, and critiques, the early IMF role in policy management in the Asian crisis (up to December 1997). Section 4.7, the concluding section, offers some observations about future directions of research.

4.2 Diagnosing Financial Crises

Not all financial crises are alike, even though superficial appearances may deceive. Only a close historical analysis, guided by theory, can disentangle the key features of any particular financial crisis, including the Asian crisis. We identify five main types of financial crises, which may in fact be intertwined in any particular historical episode.

1. *Macroeconomic Policy-Induced Crisis.* Following the canonical Krugman (1979) model, a balance-of-payments crisis (currency depreciation, loss of foreign exchange reserves, collapse of a pegged exchange rate)

arises when domestic credit expansion by the central bank is inconsistent with the pegged exchange rate. Often, as in the Krugman model, the credit expansion results from the monetization of budget deficits. Foreign exchange reserves fall gradually until the central bank is vulnerable to a sudden run, which exhausts the remaining reserves and pushes the economy to a floating rate.

2. *Financial Panic.* Following the Diamond-Dybvig (1983) model of a bank run, a financial panic is a case of multiple equilibria in the financial markets. A panic is an adverse equilibrium outcome in which short-term creditors suddenly withdraw their loans from a solvent borrower. In general terms, a panic can occur when three conditions hold: short-term debts exceed short-term assets, no single private market creditor is large enough to supply all of the credits necessary to pay off existing short-term debts, and there is no lender of last resort. In this case, it becomes rational for each creditor to withdraw its credits if the other creditors are also fleeing from the borrower, even though each creditor would also be prepared to lend if the other creditors were to do the same. The panic may result in large economic losses (premature suspension of investment projects, liquidation of the borrower, creditor grab race, etc.).

3. *Bubble Collapse.* Following Blanchard and Watson (1982) and others, a stochastic financial bubble occurs when speculators purchase a financial asset at a price above its fundamental value in the expectation of a subsequent capital gain. In each period, the bubble (measured as the deviation of the asset price from its fundamental price) may continue to grow or may collapse with a positive probability. The collapse, when it occurs, is unexpected but not completely unforeseen since market participants are aware of the bubble and the probability distribution regarding its collapse. A considerable amount of modeling has examined the conditions in which a speculative bubble can be a rational equilibrium.

4. *Moral Hazard Crisis.* Following Akerlof and Romer (1994), a moral hazard crisis arises because banks are able to borrow funds on the basis of implicit or explicit public guarantees of bank liabilities. If banks are undercapitalized or underregulated, they may use these funds in overly risky or even criminal ventures. Akerlof and Romer argue that the “economics of looting,” in which banks use their state backing to purloin deposits, is more common than is generally perceived and played a large role in the U.S. savings and loan crisis. Krugman (1998) similarly argues that the Asian crisis is a reflection of excessive gambling and indeed stealing by banks that gained access to domestic and foreign deposits by virtue of state guarantees on these deposits.

5. *Disorderly Workout.* Following Sachs (1995), a disorderly workout occurs when an illiquid or insolvent borrower provokes a creditor grab race and a forced liquidation even though the borrower is worth more as an ongoing enterprise. A disorderly workout occurs especially when markets operate without the benefit of creditor coordination via bankruptcy law. The problem is sometimes known as a “debt overhang.” In essence, coordination problems among creditors prevent the efficient provision of working capital to the financially distressed borrower and delay or prevent the eventual discharge of bad debts (e.g., via debt-equity conversions or debt reduction).

The theoretical differences among these five types of crises are significant at several levels: diagnosis, underlying mechanisms, prediction, prevention, and remediation. For example, to the extent that panic is important, policymakers face a condition in which viable economic activities are destroyed by a sudden and essentially unnecessary withdrawal of credits. The appropriate policy response, then, is to protect the economy through lender-of-last-resort activities. Alternatively, if the crisis results from the end of a bubble or the end of moral-hazard-based lending, it may be most efficient to avoid lender-of-last-resort operations, which simply keep the inefficient investments alive. Unfortunately, in real-life conditions, these various types of financial crisis can become intertwined and therefore are difficult to diagnose. The end of a bubble, for example, may trigger a panic, or a panic may trigger insolvency and a disorderly workout. Attentiveness to these kinds of possibilities is extremely important for policy design.

Table 4.1 outlines four major considerations in the differential diagnosis and treatment of financial crises. Key distinguishing features are (1) whether the crisis is anticipated at least in probabilistic terms (e.g., in cases of policy inconsistency, bubble collapse, or disorderly workout) or whether the crisis is essentially unanticipated (financial panic); (2) whether the crisis destroys real economic value (e.g., a financial panic or disorderly workout) or instead brings to a close a period of resource misallocation (e.g., a collapse of a bubble); (3) whether the crisis mostly involves debtors backed by official resources (e.g., as in moral-hazard-induced banking crises) or debtors that lack state guarantees (e.g., panics that undermine non-bank corporate borrowers); and (4) whether there is a case for official intervention (e.g., as lender of last resort).

Financial panic is rarely the favored interpretation of a financial crisis. The essence of a panic is that a “bad” equilibrium occurs that did not have to happen. Market analysts and participants are much more prone to look for weightier explanations than simply a bad accident. Once in a while, though, a relatively clean test of the panic interpretation occurs. Perhaps the best recent case is the Mexican crisis in 1995. After the

Table 4.1 Distinguishing among Financial Crises

Feature	Policy-Induced Crisis	Financial Panic	Bubble Collapse	Moral Hazard Crisis	Disorderly Workout
Anticipation of crisis by market participants and analysts	High	Low	Market participants and analysts understand probability of collapse	High. Creditors are lending based on state guarantees rather than fundamental values	High. Market participants understand the lack of coordination among creditors
Destruction of real economic activity	Not necessarily	High	Low. The end of the bubble may improve resource allocation	Low. The end of moral-hazard-based lending improves resource allocation	High. Creditor grab race; liquidity crisis of the borrower; premature liquidation of the borrower
Lending induced by moral hazard	No	Not necessarily	Possibly	Yes. Most or all creditors are protected by explicit or implicit guarantees	Not necessarily
Case for official intervention	Macroeconomic adjustment, especially budgetary reduction	Lender of last resort	No. Delaying the bursting of the bubble can lead to a deeper crisis later	No. State guarantees prolong the misallocation of resources	Yes. Public institutions may provide framework for an orderly workout

Mexican devaluation in December 1994, the Mexican government was unable to roll over its short-term dollar-denominated debts (Tesobonos). The government was thrown to the brink of default. An emergency lender-of-last-resort operation led by the U.S. government and the IMF provided the Mexican government with up to \$50 billion to repay the short-term debts. The Mexican government avoided default, repaid the emergency loans early, and resumed economic growth in 1996. Ex post, it is difficult to understand the market's failure to roll over \$28 billion in Tesobonos due in 1995 as anything other than panic in the face of a currency devaluation.

In the following sections, we will point out several reasons to suppose that the Asian financial crisis also has substantial elements of panic and disorderly workout. First, the crisis was largely unanticipated. Although a small number of market participants were concerned *ex ante*, the vast majority of players did not view the Southeast Asian economies as bubbles waiting to burst. Second, the crisis involved considerable lending to debtors who were not protected by state guarantees, and those loans are now going bad in large numbers. To be sure, many borrowers did have explicit or implicit guarantees (or thought they did), but a substantial number of purely private banks and firms without such insurance are now facing bankruptcy. Third, the crisis has led to a seizing up of bank credits to viable enterprises, especially through the lack of working capital for exporters. Fourth, the market has reacted most positively to initiatives that bring creditors and debtors together for orderly workouts, such as in Korea. Fifth, the triggering events of the crisis involved the sudden withdrawal of investor funds to the region, rather than simply a deflation of asset values (although falling land and stock prices contributed to the crisis, especially in Thailand).

4.3 Macroeconomic and Financial Processes in the Asian Crisis

The Asian financial crisis has involved several interlinked phenomena. The single most dramatic element—perhaps the defining element—of the crisis has been the rapid reversal of private capital inflows into Asia. Table 4.2, reproduced from a January 1998 report by the Institute of International Finance (IIF), gives an estimated breakdown of the reversal of flows for the five East Asian countries hit hardest by the crisis (Indonesia, Korea, Malaysia, the Philippines, and Thailand, hereafter referred to as the Asian-5). According to these estimates, net private inflows dropped from \$93 billion to -\$12.1 billion, a swing of \$105 billion on a combined pre-shock GDP of approximately \$935 billion, or a swing of 11 percent of GDP. Of the \$105 billion decline in inflows \$77 billion came from commercial bank lending. Direct investment remained constant at around \$7 billion. The rest of the decline has come from a \$24 billion fall in portfolio equity and a \$5 billion decline in nonbank lending.

Table 4.2 Five Asian Economies: External Financing, 1994–98 (billion dollars)

	1994	1995	1996	1997 ^a	1998 ^b
<i>Current account balance</i>	-24.6	-41.3	-54.9	-26.0	17.6
<i>External financing, net</i>	47.4	80.9	92.8	15.2	15.2
Private flows, net	40.5	77.4	93.0	-12.1	-9.4
Equity investment	12.2	15.5	19.1	-4.5	7.9
Direct equity	4.7	4.9	7.0	7.2	9.8
Portfolio equity	7.6	10.6	12.1	-11.6	-1.9
Private creditors	28.2	61.8	74.0	-7.6	-17.3
Commercial banks	24.0	49.5	55.5	-21.3	-14.1
Nonbank private creditors	4.2	12.4	18.4	13.7	-3.2
Official flows, net	7.0	3.6	-0.2	27.2	24.6
International financial institutions	-0.4	-0.6	-1.0	23.0	18.5
Bilateral creditors	7.4	4.2	0.7	4.3	6.1
<i>Resident lending/other, net^c</i>	-17.5	-25.9	-19.6	-11.9	-5.7
<i>Reserves excluding gold^d</i>	-5.4	-13.7	-18.3	22.7	-27.1

Source: Institute of International Finance (IIF 1998).

Note: The five Asian economies are South Korea, Indonesia, Malaysia, Thailand, and the Philippines.

^aEstimate.

^bIIF forecast.

^cIncluding resident net lending, monetary gold, and errors and omissions.

^dNegative numbers denote increase.

The sudden drop in bank lending followed a sustained period of large increases in cross-border bank loans, as shown in tables 4.3 and 4.4. Again taking the Asian-5 countries as our point of reference, total foreign bank lending to these countries expanded from \$210 billion at the end of 1995 to \$261 billion at the end of 1996, an increase of 24 percent in a single year. Between the end of 1996 and mid-1997, bank lending expanded further to \$274 billion, or an increase of 10 percent at an annual rate. The growth in bank loans clearly slowed during the first half of 1997 and actually declined slightly in the case of Thailand. Nonetheless, the continued increase in bank lending till mid-1997 is an important piece of evidence: outside of Thailand, foreign banks were not running until the last moment, though the pace of bank lending was abating somewhat. Since net outflows of bank loans reached \$21 billion for 1997 as a whole according to the IIF, and since inflows during the first half of the year were \$13 billion according to the Bank for International Settlements (BIS), we can surmise that outflows during the second half of the year were approximately \$34 billion (note that BIS data for the second half of 1997 have not yet been released). With a combined preshock GDP of around \$935 billion, net inflows of bank loans amounted to around 5.9 percent of GDP in 1996, 2.8 percent of GDP in the first half of 1997, and -3.6 percent of GDP in the second half of 1997. Thus the swing in bank loans between 1996 and the second half of 1997 is a remarkable 9.5 percent of GDP. It is very difficult

Table 4.3 International Claims Held by Foreign Banks: Distribution by Maturity and Sector, 1995–97 (billion dollars)

Year and Country	Total Outstanding	Claims by Sector			Short Term	Reserves	Short Term/ Reserves
		Banks	Public Sector	Nonbank Private			
<i>End 1995</i>							
Indonesia	44.5	8.9	6.7	28.8	27.6	14.7	1.9
Malaysia	16.8	4.4	2.1	10.1	7.9	23.9	0.3
Philippines	8.3	2.2	2.7	3.4	4.1	7.8	0.5
Thailand	62.8	25.8	2.3	34.7	43.6	37.0	1.2
Korea	77.5	50.0	6.2	21.4	54.3	32.7	1.7
Total	209.9	91.3	20.0	98.4	137.5		
<i>End 1996</i>							
Indonesia	55.5	11.7	6.9	36.8	34.2	19.3	1.8
Malaysia	22.2	6.5	2.0	13.7	11.2	27.1	0.4
Philippines	13.3	5.2	2.7	5.3	7.7	11.7	0.7
Thailand	70.2	25.9	2.3	41.9	45.7	38.7	1.2
Korea	100.0	65.9	5.7	28.3	67.5	34.1	2.0
Total	261.2	115.2	19.6	126.0	166.3		
<i>Mid-1997</i>							
Indonesia	58.7	12.4	6.5	39.7	34.7	20.3	1.7
Malaysia	28.8	10.5	1.9	16.5	16.3	26.6	0.6
Philippines	14.1	5.5	1.9	6.8	8.3	9.8	0.8
Thailand	69.4	26.1	2.0	41.3	45.6	31.4	1.5
Korea	103.4	67.3	4.4	31.7	70.2	34.1	2.1
Total	274.4	121.8	16.7	136.0	175.1		
<i>Memo item</i>							
Mexico							
End 1994	64.6	16.7	24.9	22.8	33.2	6.4	5.2
End 1995	57.3	11.5	23.5	22.3	26.0	17.1	1.5

Source: Bank for International Settlements (1998).

Table 4.4 International Claims Held by Foreign Banks: Distribution by Country of Origin, 1995–97 (billion dollars)

Year and Country	Total Outstanding	Claims by Country			
		Japan	United States	Germany	All Others
<i>End 1995</i>					
Indonesia	44.5	21.0	2.8	3.9	16.8
Malaysia	16.8	7.3	1.5	2.2	5.8
Philippines	8.3	1.0	2.9	0.7	3.7
Thailand	62.8	36.9	4.1	5.0	16.8
Korea	77.5	21.5	7.6	7.3	41.1
Subtotal	209.9	87.7	18.9	19.1	84.2
Total, all reporting countries ^a		429.3	132.6	264.0	
<i>End 1996</i>					
Indonesia	55.5	22.0	5.3	5.5	22.7
Malaysia	22.2	8.2	2.3	3.9	7.8
Philippines	13.3	1.6	3.9	1.8	6.0
Thailand	70.2	37.5	5.0	6.9	20.8
Korea	100.0	24.3	9.4	10.0	56.3
Subtotal	261.2	93.6	25.9	28.1	113.6
Total, all reporting countries ^a		389.4	165.7	292.3	
<i>Mid-1997</i>					
Indonesia	58.7	23.2	4.6	5.6	25.3
Malaysia	28.8	10.5	2.4	5.7	10.2
Philippines	14.1	2.1	2.8	2.0	7.2
Thailand	69.4	37.7	4.0	7.6	20.1
Korea	103.4	23.7	10.0	10.8	58.9
Subtotal	274.4	97.2	23.8	31.7	121.7
Total, all reporting countries ^a		404.4	166.3	301.2	

Source: Bank for International Settlements (1998).

^aReporting countries include the G-10 plus Austria, Denmark, Finland, Ireland, Luxembourg, Norway, and Spain, plus fifteen financial centers.

to attribute a reversal of this magnitude in such a short period of time to changes in underlying economic fundamentals.

Bank lending went to both domestic banks and domestic nonbank borrowers during this period, as shown in table 4.3. In Korea, lending was heavily to banks; in Indonesia, lending was heavily to nonbank corporate borrowers. In all countries except Korea, bank lending to nonbanks exceeded lending to banks. We might suppose that international banks assumed that *lending to banks* was at least partly protected by lender-of-last-resort facilities, both domestic (e.g., from the central bank) and international (e.g., from the IMF). The same might be true for a portion of private sector firms with particularly strong political connections. There is no reason to suppose, however, that foreign banks expected such guarantees on lending to the majority of nonbank private corporations. Nota-

bly, lending to nonbanks as well as to banks continued to increase strongly until mid-1997.

The withdrawal of foreign capital has had several interlocking macroeconomic and microeconomic effects. Most immediately and dramatically, exchange rates depreciated, after a defense of a pegged exchange rate (as in Thailand and the Philippines)³ or a crawling peg (as in Indonesia, Malaysia, and Korea). Domestic interest rates soared on the withdrawal of foreign credits, leading directly to a tightening of domestic credit conditions even before central banks reacted to the crisis.⁴ Since the withdrawal of credits immediately led to a sharp reduction of absorption (which had been financed by foreign capital inflows), not only the nominal exchange rate but also the real exchange rate (defined as the ratio of tradable to nontradable goods prices) depreciated.

The combination of real exchange rate depreciation and sharply higher interest rates led to a rapid rise in nonperforming loans in the banking sectors of the Asian economies, especially as real estate projects went into bankruptcy. In many cases, real estate developers had borrowed in unhedged dollar-denominated loans from domestic banks to finance real estate projects. These projects failed under the weight of currency depreciation. Moreover, to the extent that banks had open short positions in dollars (i.e., were net dollar borrowers), the exchange rate depreciation led to a sudden loss of bank capital. The combination of sharply rising nonperforming loans and direct balance sheet losses due to currency depreciation has wiped out a substantial portion of the market value of bank capital in Indonesia, Thailand, and Korea.

The sudden withdrawal of foreign financing was itself an enormous contractionary shock. The resulting collapse of domestic bank capital added sharply to the contraction by severely restricting bank lending. Banks cut back their own lending both because the banks themselves were illiquid (as a result of the withdrawal of foreign credits and, in some cases, deposits) and because they were decapitalized. The decapitalized banks restricted their lending in order to move toward capital adequacy ratios required by bank supervisors and reinforced by the IMF. The rush to improve bank capital adequacy took on urgent proportions in Indonesia, Korea, and Thailand, after the IMF threatened to require the closure of undercapitalized banks. This threat was credible in view of the moves to suspend or close financial companies and banks throughout the region at the start of each of the IMF adjustment programs.

As described below, the IMF programs up until the end of 1997 apparently added both to the panic and to the contractionary force of the fi-

3. Technically, the Philippine peso operated under a floating regime, but there was so little variation in the exchange rate that it was perceived to be effectively pegged to the dollar by market participants.

4. As we note later, central banks augmented the rise in interest rates by a further tightening of domestic credit in the context of IMF-supported adjustment programs.

nancial crisis. The IMF programs generally called for six key actions: immediate bank closures, quick restoration of minimum capital adequacy standards (especially in the first Thai and Indonesian programs), tight domestic credit, high interest rates on central bank discount facilities, fiscal contraction, and nonfinancial sector structural changes. Of all of these measures, the bank closures, capital adequacy enforcement, and tight credit were probably the most consequential in that they probably added to the virulence of the banking panics that were already under way in these economies. Domestic bank lending stopped abruptly in the three countries with IMF programs (Indonesia, Korea, and Thailand). There were widespread anecdotes about firms unable to obtain working capital, even in support of confirmed export orders from abroad.

On 22 December 1997, Moody's downgraded the sovereign debt of all three of these countries, putting them below investment grade. The "junk bond" status of these countries immediately applied to the banking and nonbank corporate sectors as well, by virtue of the "sovereign ceiling" doctrine, according to which all domestic enterprises must have a credit rating no higher than the sovereign. The downgrade had two major immediate implications. First, most of the commercial banks in these countries could no longer issue internationally recognized letters of credit for domestic exporters and importers, since the banks were all rated as below investment grade. Second, the downgrading immediately prompted a further round of debt liquidations, since many portfolio managers are required by law to maintain investments only in investment grade securities. Moreover, the downgrade triggered various put options linked to credit ratings, enabling borrowers to call in loans immediately on the downgrade.

As a result of the creditor panic, the bank runs, and the sovereign downgrades, Korea, Indonesia, and Thailand were thrown into partial debt defaults. In the case of Korea, these defaults were initially handled by an emergency standstill of debt repayments, followed by a concerted rollover of the short-term debt into longer term instruments backed by Korean government guarantees. This rollover applies to around one-third of the Korean external debt falling due in 1998. In the case of Indonesia, the defaults were unilateral and have not been followed to this point by any negotiated arrangements. In Thailand, the extent of outright default remains unclear, though certain payments by nonbank borrowers are clearly in effective default.

4.4 Why the Asian Crisis Was Not Predicted

4.4.1 Capital Flows into Southeast Asia

We have stressed that at the core of the Asian financial crisis were the massive capital inflows attracted into the region during the 1990s. Capital inflows increased from an average of 1.4 percent of GDP over 1986–90 to

6.7 percent over 1990–96. In Thailand, capital inflows averaged a remarkably high 10.3 percent of GDP over 1990–96. The bulk of Thailand's inflows came in the form of offshore borrowing by banks and private corporations, which together averaged 7.6 percent of GDP in the 1990s. Portfolio capital inflows (1.6 percent of GDP) and foreign direct investment (FDI—1.1 percent of GDP) were substantially smaller. Although Thailand was the most extreme case, across the region the bulk of the capital inflows were from offshore borrowing by banks and the private sector. Malaysia is the only exception, where extraordinarily large FDI inflows (6.6 percent of GDP) were larger than bank and private sector borrowing (3.6 percent of GDP). In each country, net portfolio capital inflows averaged less than 2 percent of GDP. In Malaysia, where short-term foreign investors have been harshly criticized, net portfolio inflows were either very small or actually negative in each year of the 1990s. Importantly, net government borrowing was less than half a percent of GDP in each country, except in the Philippines, where it averaged 1.3 percent of GDP. Banks (in Thailand and Korea) and private corporations (in Indonesia) were the main forces behind the capital inflows, not the government.

The surge in capital inflows had its roots in changes in both internal economic policies and world markets. Internationally, capital market liberalization in the industrialized countries facilitated a greater flow of funds to emerging markets around the globe, including the Philippines. New bond and equity mutual funds, new bank syndicates, increased Eurobond lending, and other innovations allowed capital to flow across borders quickly and easily. In addition, low interest rates in the United States and Japan favored increased outward investment from these countries to Southeast Asia and other emerging markets. Domestically, five broad factors contributed to the capital flows:

- Continuing, and in some cases increasing, high economic growth gave confidence to foreign investors.
- Wide-ranging financial deregulation made it much easier for banks and domestic corporations to tap into foreign capital to finance domestic investments.
- Financial sector deregulation was not accompanied by adequate supervision, especially in Thailand. Lax supervision created an environment conducive to high rates of foreign borrowing, since it allowed banks to take on substantial foreign currency and maturity risks.
- Nominal exchange rates were effectively pegged to the U.S. dollar, with either limited variation (Thailand, Malaysia, Korea, and the Philippines) or very predictable change (Indonesia). Predictable exchange rates reduced perceived risks for investors, further encouraging capital inflows.
- Governments gave special incentives that encouraged foreign borrowing, even after concern arose about “hot money” flows in the early 1990s.

Banks operating in the Bangkok International Banking Facility (BIBF), which operated exclusively in borrowing and lending foreign currencies, received special tax breaks. In the Philippines, banks are subject to a tax rate of 10 percent for onshore income from foreign exchange loans, whereas other income is subject to the regular corporate income tax rate of 35 percent. Philippine banks also face no reserve requirements for foreign currency deposits, while for peso deposits the reserve requirement currently is 13 percent, down from 15 percent in 1996 (IMF 1997b).

Capital flows from abroad can be an important engine for growth if they are channeled to productive investment activities. However, foreign capital flows can make macroeconomic management much more complex when they are large, volatile, unsustainable, or poorly utilized. Macroeconomic pressures tend to manifest themselves through two channels:

Capital inflows lead to a real appreciation of the exchange rate, and to an expansion of nontradable sectors at the expense of tradable sectors. Even though this real appreciation tends to be temporary (since it is reversed when the net foreign borrowing is serviced in future years), new investments tend to be drawn toward nontradables, partly as a result of myopic expectations regarding real exchange rate trends.

High levels of capital inflow place new pressures on underdeveloped financial systems. In both commercial banks (which are intermediating rapidly growing levels of foreign financing) and central banks (which are trying to regulate and supervise rapidly growing activities), institutional change generally cannot keep pace with the high levels of international capital flow. There are ample conditions for excessive risk taking, poor banking judgment, and even outright fraud.

Both of these kinds of pressures, over time, contribute to increasing financial risk. Following a liberalization and a rapid inflow of capital, some slowdown of foreign borrowing is to be expected. The most profitable investment opportunities are seized early; overinvestment in nontradables (e.g., real estate) becomes evident; and a slowdown in export growth gives pause to both foreign and domestic investors. There is no reason, however, to expect a sudden and sharp reversal of capital flows. The preceding inflow of foreign funds into Asia was a precondition for the subsequent crisis, but the capital inflows do not, by themselves, explain the crisis that followed.

4.4.2 Signs That the Crisis Was Unpredicted

One of the most unusual aspects of the Asian crisis is the extent to which it was unpredicted by market participants and market analysts. Although some observers did anticipate the possibility of a crisis (see, e.g., Park 1996), such warnings were rare. This actually tells us a lot. Just as

the silence of the hound alerted Sherlock Holmes to the real culprit in "The Silver Blaze," the fact that the financial markets did not signal alarm helps us to understand the real nature of the crisis. All signs point to a very recent and dramatic shift in expectations. For example, capital inflows remained strong through 1996, and in most cases until mid-1997. The only exception to this is found in the equity markets in Thailand and Korea, where foreign investors became uneasy in 1996. In Malaysia, both bank and equity investors showed optimism until 1997. Equity markets began a rather steep decline in March 1997, while bank inflows continued to be very strong at least until midyear. In Indonesia, both the stock market and bank lending remained strong until mid-1997.

Another indicator of market sentiment is the risk premiums attached to loans to emerging market economies. To the extent that markets anticipated the growing risks of capital inflow, lending terms and conditions would have tightened in advance of the onset of the crisis. In fact, the evidence suggests just the opposite. A study by William Cline and Kevin Barnes (1997) at the Institute of International Finance found that bond spreads (i.e., the interest rate premium over U.S. Treasury securities) fell in emerging markets, including Southeast Asia, between mid-1995 (as the Mexico crisis came to a close) and mid-1997 to levels well below what could be justified by economic fundamentals in these countries. Similarly, syndicated loan spreads were also low and falling before the crisis. In Indonesia, Malaysia, the Philippines, and Korea, syndicated loan spreads were lower in early 1997 than they had been in 1996. Only in Thailand did spreads begin to rise somewhat in early 1997, but from a very low base. The spread on Thai sovereign bonds stood at an extremely low 39 basis points in the second quarter of 1996 and was just 43 basis points at the end of 1996. The spread began to rise in early 1997 but was still just 79 basis points in August, a month after the crisis had begun.

Credit-rating agencies such as Standard & Poor's and Moody's provide an ongoing assessment of credit risk in emerging markets. We may therefore examine, directly, whether increasing risk in these markets was recognized. If the markets expected a financial crisis and public sector bailouts, the ratings of sovereign bonds should have fallen in the run-up to the crisis. Instead, on examining data such as those in table 4.5, we find that the rating agencies did not signal increased risk until after the onset of the crisis itself. Long-term sovereign debt ratings remained unchanged throughout 1996 and the first half of 1997 for each of the Asian countries except the Philippines, where debt was actually *upgraded* in early 1997. In each country, the outlook was described as "positive" or "stable" through June 1997. Only many weeks after the crisis had begun did these rating agencies downgrade the region's debt. At that point, rather than helping creditors assess future risk, the downgrades simply pushed interest rates higher and added to the panic.

Aside from credit-rating agencies, a number of independent firms

Table 4.5 Market Creditworthiness: Moody's and Standard and Poor's Long-Term Debt Ratings, 1996–97

Agency and Country	15 January 1996		2 December 1996		24 June 1997		12 December 1997 ^a	
	Rating	Outlook	Rating	Outlook	Rating	Outlook	Rating	Outlook
<i>Moody's foreign currency debt</i>								
Indonesia	Baa3		Baa3		Baa3		Baa3	
Malaysia	A1		A1		A1		A1	
Mexico	Ba2		Ba2		Ba2		Ba2	
Philippines	Ba2		Ba2		Ba1		Ba1	
South Korea	A1		A1	Stable			Baa2	Negative
Thailand	A2		A2		A2		Baa1	Negative
<i>Standard & Poor's</i>								
Indonesia								
Foreign currency debt	BBB	Stable	BBB	Stable	BBB	Stable	BBB–	Negative
Domestic currency debt			A+		A+		A–	Negative
Malaysia								
Foreign currency debt	A+	Stable	A+	Stable	A+	Positive	A+	Negative
Domestic currency debt	AA+		AA+		AA+		AA+	Negative
Philippines								
Foreign currency debt	BB	Positive	BB	Positive	BB+	Positive	BB+	Stable
Domestic currency debt	BBB+		BBB+		A–		A–	Stable
South Korea: foreign currency debt	AA–	Stable	AA–	Stable				
Thailand								
Foreign currency debt	A	Stable	A	Stable	A	Stable	BBB	Negative
Domestic currency debt			AA		AA		A	Negative
Mexico								
Foreign currency debt	BB		BB		BB			
Domestic currency debt	BBB+	Negative	BBB+	Stable	BBB+	Positive		

Note: Rating systems, from highest to lowest: Moody's: Aaa, Aa1, Aa2, Aa3, A1, A2, A3, Baa1, Baa2, Baa3, Ba1, Ba2, Ba3. S&P's: AAA, AA+, AA, AA–, A+, A, A–, BBB+, BBB, BBB–, BB+, BB, BB–.

^aOctober 1997 for S&P's ratings.

Table 4.6 Euromoney Country Risk Ratings, 1993–97 (country rank out of approximately 180)

Country	March 1993	March 1995	March 1997	September 1997	December 1997
Indonesia	41	40	43	43	49
Malaysia	33	28	28	28	35
Philippines	71	60	54	49	57
Thailand	34	30	34	46	51
South Korea	32	26	22	27	30
Singapore	14	8	3	11	16
Japan	1	2	13	13	18
Hong Kong	25	24	27	25	25

provide ongoing risk analysis. One widely circulated assessment is the Euromoney Country Risk Assessment, shown in table 4.6. We can trace the changes in risk attached to the key Asian economies according to the Euromoney rankings. In most cases, Asia's country rankings changed little or even improved (in the cases of the Philippines and South Korea) between March 1993 and March 1997, providing little warning of the growing risks to investors. Even in September 1997, after the crisis had begun, the Philippines' ranking continued to improve, and Indonesia's and Malaysia's remained steady. Only Thailand's and South Korea's rankings fell sharply. Rankings for the other countries did not tumble until December, five months after the onset of the crisis. Note that the country rankings for Singapore (from 3 in March 1997 to 16 in December 1997) and Japan (from 1 in March 1993 to 18 in December 1997) have both fallen sharply.

The leading investment banks also provide ongoing forecasts of overall economic performance and market returns. Therefore, we can look at the major forecasts to see whether there were growing indications of risk in the lead-up to the crisis. Table 4.7 shows export and exchange rate forecasts as produced by Goldman Sachs, perhaps the most capable of all the investment banks in the region. These forecasts show the extent to which the dramatic slowdown in export growth in 1996 and 1997 was unanticipated. Even after the poor 1996 performance, analysts expected a rebound in 1997 (except in Thailand), which was not forthcoming (except in the Philippines). With regard to exchange rates, no one in the markets anticipated the extent to which currencies would depreciate, even once the crisis began. The August 1997 exchange rate forecasts—produced one month after the crisis had begun in Thailand—show little expectation of the slide that took place in the following months.

Another measure of expectations for the region may be found in IMF reports on the Asian economies. The IMF makes two kinds of public assessments: overall market forecasts, as presented in its periodic *World Ec-*

Table 4.7 Export Growth and Exchange Rate Expectations

Country	Export Growth ^a				Exchange Rate	
	Expected 1996	Outcome 1996	Expected 1997	Revised 1997	August 1997 Forecast: Three-Month Horizon	29 October 1997 Rate ^b
Indonesia	14.3	4.9	15.0	10.0	2,500	3,610 (44.4)
Malaysia	18.0	7.3	15.0	7.4	2.75	3.40 (23.6)
Philippines	25.0	17.7	23.0	22.8	28.00	35.1 (25.3)
Thailand	22.0	-1.7	7.7	-0.5	32.00	39.1 (22.2)

Sources: August 1997 forecast, Goldman Sachs, *Asian Economic Quarterly*, August 1997, p. 12. 29 October 1997 rate, *Economist*, 1 November 1997.

^aExpected 1996 from December 1995 forecast, expected 1997 from December 1996 forecast, and revised 1997 from August 1997 forecast.

^bNumbers in parentheses are expectation errors as percentage of August 1997 forecast.

onomic Outlook, and country assessments, generally contained in the reports of Executive Board discussions of Article IV consultations with member countries. With regard to the market forecasts, the IMF gave very little indication of a sense of macroeconomic risk to the Asian region. As late as the October 1997 *World Economic Outlook* (IMF 1997c), the IMF predicted 6.0 percent growth for Korea in 1998 and 7.4 percent for developing Asia (or 5.4 percent for developing Asia excluding China and India). These marked a predicted slowdown of about 1.5 percentage points relative to 1995.

With regard to the Article IV consultations, the 1997 IMF *Annual Report* (IMF 1997a) contains summaries of IMF Executive Board discussions on Indonesia, Korea, and Thailand that took place during the second half of 1996. Since the *Annual Report* is not completed until much later (transmitted in July 1997), the IMF staff may update the summary with an additional paragraph in the event of dramatic changes in policies or economic circumstances. Thus we may interpret the summaries as conveying the basic attitude of the IMF up to the date of the *Annual Report*, that is, until mid-1997. In general, the IMF Executive Board expressed concerns about the Asian economies, but in the context of overall optimism. There are several common features in the analysis of the three countries. The IMF recommends (1) more flexible exchange rates, (2) improved banking sector supervision, (3) tightened fiscal policy, and (4) increased openness to capital flows. The most explicit concerns were raised in the case of Indonesia; the least, in the case of Korea. But in no case did the

board express major concerns. Some excerpts from the board discussions are included in the appendix.

Stock prices provide the only indication of growing concern among market participants in the months preceding the crisis. The Thai stock market fell continuously after January 1996, a full eighteen months before the crisis began. The main index fell 40 percent in 1996 alone and dropped an additional 20 percent in the first six months of 1997 as concern grew over the health of property companies and financial institutions. The Seoul bourse also fell sharply during 1996 and early 1997. In the case of Thailand, the stock market decline was matched by a slight decline in foreign bank lending in the first half of 1997. In the case of Korea, foreign bank lending continued to rise in the first half of 1997, albeit at a slower rate than in 1996. In Indonesia, by contrast, both the stock market and bank lending show continued confidence until mid-1997. In Malaysia, the stock market began to turn down in March, while foreign bank lending rose very strongly in the first half of 1997 (increasing by a remarkable 29.7 percent in the six-month period).

4.4.3 Why Did No Alarm Bells Ring?

One reason the crisis was largely unanticipated by international lenders and most market observers was that many of the signals analysts normally associate with impending problems showed little sign of deterioration. Most fundamental aspects of macroeconomic management remained sound throughout the early 1990s. Government budgets, which were at the center of economic crises in Latin America in the 1980s, registered regular surpluses in each country. This will be an important fact to remember when we turn to appropriate solutions for addressing the crisis. While governments may have been too enthusiastic in promoting large-scale infrastructure investment financed by foreign inflows, and while there are no doubt important fiscal liabilities outside of the formal budget, all five countries maintained fairly responsible budgetary positions between 1990 and 1996, as shown in table 4.8. Thailand's budget reportedly deteriorated markedly in late 1996 and early 1997, partly in response to the crisis itself,

Table 4.8 Overall Central Government Budget Balance, 1990–96 (percent of GDP)

Year	Indonesia	Malaysia	Philippines	Thailand	Korea	Mexico
1990	0.4	-3.0	-3.5	4.5	-0.7	-2.8
1991	0.4	-2.0	-2.1	4.7	-1.6	-0.2
1992	-0.4	-0.8	-1.2	2.8	-0.5	1.5
1993	0.6	0.2	-1.5	2.1	0.6	0.3
1994	0.9	2.3	1.1	1.9	0.3	-0.7
1995	2.2	0.9	0.5	2.9	0.3	-0.6
1996	1.2	0.7	0.3	2.3	-0.1	n.a.

rather than as an independent cause. Partly as a result of budgetary prudence, inflation rates have been below 10 percent across the region during the 1990s. Sovereign debt remained at prudent levels and had been steadily falling in the Philippines and Indonesia, the two countries in the region with historically high levels of sovereign foreign debt.

Similarly, domestic saving and investment rates were very high throughout the region, suggesting that even if foreign capital flows slowed, robust growth could continue. Moreover, while current account deficits were large, capital inflows were even larger, so foreign exchange reserves were actually growing across the region (except in Malaysia, where they leveled off after 1993). Foreign exchange reserves at the end of 1996 were well over four months of imports in each country except South Korea, where they were equivalent to 2.8 months of imports. In Thailand, official figures suggest that reserves reached a seemingly very healthy \$38.6 billion at the end of 1996, equivalent to over 7 months of imports (although it was apparently around this time that Thailand began to take forward positions in the foreign exchange market, so the official figures may overstate the actual level of net reserves).

At the same time, world market conditions did not portend a crisis, as they had in Latin America when world interest rates rose, commodity prices were highly volatile, and industrial country growth rates were slow. Indeed, world interest rates have been unusually low in recent years, so that the burden of repaying foreign obligations did not seem onerous. Although some important prices (e.g., semiconductors) slumped, key commodity prices have been relatively stable, so external terms of trade changed little. Of course, the Japanese economy has been very sluggish throughout the 1990s, but the U.S. economy, which is the major market for most of Asia's exports, has been very robust. In sum, the macroeconomic fundamentals across Asia seemed sound, and the usual alarm bells were not ringing. As a result, the crisis was not easily predictable.

4.4.4 Some Signs of Growing Risk

There were, however, several signs of growing financial vulnerability during 1996 and early 1997. In some cases (e.g., growing current account deficits, overvalued exchange rates, and slowing export growth), these signs seemed merely to suggest growing imbalances and the need for a modest adjustment, but not an impending major crisis. In other cases, important indicators appear to have been missed by the market (e.g., rapid expansion of commercial bank credit and growing short-term foreign debt).

In line with the high levels of capital inflow, current account deficits were growing increasingly large across the region in the early 1990s and were far higher than they had been in the late 1980s. Between 1985 and 1989, current account deficits averaged just 0.3 percent of GDP in the five countries (table 4.9). In fact, South Korea and Malaysia had current account *surpluses* of 4.3 and 2.4 percent of GDP, respectively. The largest

Table 4.9 **Balance of Payments, 1985–96 (percent of GDP)**

	Korea		Indonesia		Malaysia		Philippines		Thailand	
	1985–89	1990–96	1985–89	1990–95	1985–89	1990–95	1985–89	1990–96	1985–89	1990–95
<i>Current account</i>	4.3	-1.7	-2.5	-2.5	2.4	-5.6	-0.5	-3.3	-2.0	-6.8
Balance of trade	3.6	-1.2	5.9	4.5	13.7	3.2	-2.9	-8.7	-2.2	-4.7
Exports	30.7	25.0	21.9	24.2	56.1	73.2	17.1	17.4	22.9	29.6
Imports	-27.2	-26.2	-15.9	-19.7	-42.5	-70.0	-20.0	-26.1	-25.1	-34.3
<i>Capital and financial account</i>	-2.5	2.5	3.5	4.1	0.5	9.6	1.4	5.5	4.2	10.2
Direct investment, net	-0.1	-0.3	0.5	1.2	2.4	6.9	1.0	1.1	1.1	1.5
Portfolio investment, net	0.2	1.9	-0.0	0.9	1.0	-1.0	0.2	0.3	1.2	1.5
Equity securities	0.0	0.8	0.0	0.5	0.0	0.0	0.0	0.0	0.8	0.7
Debt securities	0.1	1.1	-0.0	0.4	1.0	-1.0	0.2	0.3	0.4	0.9
Other investment, net	-2.4	1.0	3.0	2.0	-2.8	3.8	0.2	4.0	2.0	7.1
Monetary authorities	-0.0	-0.0	0.0	0.0	0.0	0.0	-0.6	0.0	0.0	0.0
General government	-1.2	-0.3	2.6	0.5	-1.7	-0.3	2.3	1.1	0.2	-0.4
Banks	-0.8	0.1	0.0	0.4	-1.0	1.8	-0.2	1.4	0.2	3.5
Other sectors	-0.4	1.2	0.4	1.2	-0.0	2.4	-1.2	1.6	1.5	4.0
<i>Financing</i>	-1.7	-0.6	-0.1	-1.1	-2.9	-5.0	-1.8	-1.8	-3.0	-3.6
Reserve assets	-1.4	-0.6	-0.2	-1.0	-2.7	-5.0	-1.0	-1.7	-2.7	-3.5

deficit was Indonesia's 2.5 percent of GDP, which resulted primarily from the fall in world petroleum prices in the mid-1980s. By contrast, between 1990 and 1996, current account deficits averaged 4.0 percent of GDP and in most countries were rising. Only Indonesia's deficit remained basically unchanged relative to the earlier period, although it rose slightly to 3.5 percent of GDP in 1995 and 1996. Korea's current account position shifted by 6 percentage points of GDP, which is a very large change, but the deficit still averaged less than 2 percent of GDP, which appeared prudent. However, in 1996 the deficit abruptly grew to 4.8 percent of GDP. Malaysia's deficit increased by 8 percentage points of GDP, Thailand's by nearly 5 percentage points, and the Philippines' by about 3 percentage points (though in this case, the actual increase was probably larger, since certain Philippines' inflows are probably misclassified as current account receipts). But the current account deficit is not always a good predictor: Indonesia and South Korea, with the smallest deficits, have arguably been the hardest hit countries, while Malaysia's deficit was much larger in 1995 (8.6 percent of GDP) than it was in 1996 (5.3 percent) or early 1997.

In line with the current account deficits and large capital inflows, exchange rates appreciated significantly in real terms between 1990 and the first quarter of 1997. It is difficult to precisely measure real exchange rates in these countries, since there are no accurate, direct data on the prices of tradable and nontradable goods, or on labor productivity or labor costs. In table 4.10, we show a common approximation in which the real exchange rate is calculated as the ratio $(EP)^*/P$, where P is the home country consumer price index (CPI) and $(EP)^*$ is the foreign country wholesale price index (WPI) expressed in the local currency by converting the foreign WPI to the domestic currency using the contemporaneous nominal exchange rate.⁵ $(EP)^*$ is calculated using a geometric average of prices for the major developed country trading partners.⁶ (We calculated alternative measures of the real exchange rate using foreign consumer and import price indexes in the numerator, as well as a simple ratio of domestic wholesale to consumer price indexes, with similar results.)

In table 4.10, we observe a significant real appreciation between 1990 and 1997: Q1 in all five countries. The real appreciation exceeds 25 percent in each of the four Southeast Asian nations and was especially rapid after 1994, when the U.S. dollar began to appreciate against other major world currencies. Indeed, in many ways the appreciation of the dollar against the yen marked a turning point for Southeast Asia and the beginning of the stage of overvaluation. The appreciation in Korea was a more modest 12 percent (but amounted to over 30 percent between 1987 and 1997). In

5. The idea of using the CPI in the denominator and the WPI in the numerator is that the CPI is heavily weighted toward nontradable goods, while the WPI is heavily weighted toward tradables.

6. Specifically, we use all trading partners that are members of the OECD, except Mexico and Korea.

Table 4.10 Real Exchange Rate Index, 1988–97 (1990 = 100)

Month and Year	Indonesia	Malaysia	Philippines	Thailand	China	Korea	Argentina	Brazil	Chile	Mexico
December 1988	98	98	90	102	80	102	156	159	94	106
December 1989	93	94	85	98	85	95	692	175	99	107
December 1990	100	100	100	100	100	100	100	100	100	100
December 1991	99	99	82	97	103	99	66	112	91	85
December 1992	92	87	69	90	98	94	49	119	74	74
December 1993	88	88	71	88	86	93	42	148	71	67
December 1994	92	86	62	89	109	91	44	53	66	111
December 1995	89	84	63	87	95	88	46	39	65	123
December 1996	80	78	56	80	84	88	44	35	61	95
March 1997	75	72	53	75	79	89	42	33	55	81
June 1997	78	75	54	76	80	89	42	33	55	79
September 1997	99	92	66	104	77	88	42	33	53	75
December 1997	150	108	75	124	74	157	41	33	53	75

Note: Table reports end-of-period exchange rates based on WPI. Estimates are based on trade weights of OECD countries excluding Mexico and Korea. An increase means depreciation.

fact, the actual real appreciations may have been even larger than these indexes indicate, since our proxy for nontradable prices (the domestic CPI) does not include property, real estate, and other nontradable sectors that were booming in the early 1990s.

Despite their simplicity, these indexes are informative. Such large appreciations in a relatively short period of time have often been associated with a subsequent balance-of-payments crisis. Nevertheless, we should be careful not to overstate the magnitude of the appreciations. While they signaled the need for some kind of correction, the appreciations were not nearly as large as those in Latin America. Mexico's exchange rate appreciated in real terms by 40 percent between 1988 and 1993, just before its most recent crisis. Several other countries around the world experienced even larger real appreciations without the kind of crisis seen in either Mexico or Southeast Asia.

As expected with the real appreciation, export growth rates fell sharply in 1996 and 1997. Export growth, as measured in nominal dollar terms, fell from an average of 24.8 percent in the five countries in 1995 to just 7.2 percent in 1996 and fell further in early 1997. In Thailand, exports were actually lower (by 2 percent) in nominal dollar terms in 1996 than they had been in 1995. (In fact, the slowdown in Thailand's exports was ultimately a critical factor in the reversal of expectations in mid-1997 that launched the crisis.) Broadly speaking, the export slowdown should have provided some indication that investment quality was weakening and that firms would be less able to repay foreign exchange obligations. Nevertheless, the slowdown was thought to be very short term and accounted for by specific commodities (e.g., semiconductors) rather than a sign of an impending crisis.

Probably the biggest signs of growing risk were in the financial sector. Financial institutions were becoming increasingly fragile throughout the 1990s. Banks strained to keep up with both rapidly growing incomes (and the concurrent demand for more sophisticated financial services) and the huge amounts of capital flowing in from abroad. Credit to the private sector expanded very rapidly, with much of it financed by offshore borrowing by the banking sector. Financial sector claims on the private sector jumped from around 100 percent of GDP in 1990 to over 140 percent in Malaysia, Thailand, and Korea (table 4.11). In the Philippines, the stock of credit was much smaller (reaching just 49 percent of GDP in 1996), but credit grew by an average of over 40 percent per year from 1993 to 1996. Only in Indonesia did credit growth remain comparatively modest. Both the commercial banks and their supervisors at the central banks had difficulty adapting to these changes.⁷

7. Earlier studies have stressed the role of rapid increases in bank lending as a predictor of subsequent financial crisis (e.g., Sachs, Tornell, and Velasco 1996).

Table 4.11 Money and Credit, 1990–96

Country	1990	1991	1992	1993	1994	1995	1996
<i>Indonesia</i>							
M2							
Share of GDP	43.3	43.7	45.8	43.4	44.9	48.3	52.5
Annual growth rate		17.5	19.8	20.2	20.0	27.2	27.2
Claims on private sector							
Share of GDP	50.6	50.7	49.5	48.9	51.9	53.7	55.8
Annual growth rate		16.7	11.4	25.5	23.0	22.6	21.4
<i>Malaysia</i>							
M2							
Share of GDP	66.2	69.3	78.9	90.6	88.9	92.7	97.8
Annual growth rate		16.9	29.2	26.6	12.7	20.0	21.8
Claims on private sector							
Share of GDP			111.4	113.3	115.0	129.6	144.6
Annual growth rate				12.1	16.5	29.7	28.9
<i>Philippines</i>							
M2							
Share of GDP	34.1	34.5	36.2	42.1	45.7	50.4	54.0
Annual growth rate		17.3	13.6	27.1	24.4	24.2	23.2
Claims on private sector							
Share of GDP	19.3	17.8	20.6	26.4	29.1	37.5	48.6
Annual growth rate		7.3	25.4	39.6	26.5	45.2	48.7
<i>Thailand</i>							
M2							
Share of GDP	69.8	72.7	74.8	78.9	78.5	80.8	79.9
Annual growth rate		19.8	15.6	18.4	12.9	17.0	12.6
Claims on private sector							
Share of GDP	83.1	88.6	98.4	110.8	128.1	142.0	141.9
Annual growth rate		22.7	24.8	26.3	31.2	26.0	13.7
<i>South Korea</i>							
M2							
Share of GDP	38.3	38.8	40.0	42.0	43.5	43.7	45.7
Annual growth rate		21.9	14.9	16.6	18.7	15.6	15.8
Claims on private sector							
Share of GDP	102.5	103.1	110.7	121.3	128.8	133.5	140.9
Annual growth rate		20.9	19.6	21.8	21.6	19.2	17.0

Apparently much of this credit headed for speculative investments in real estate markets rather than into increasing productive capacity for manufactured exports as in earlier periods. Although official data show only a small share of private bank credit for real estate, these figures probably understate the true amount, as firms apparently diverted their own working capital and other loans toward real estate. The weaknesses of these financial systems were widely recognized and discussed, both in and out of official circles. We note, for example, the cover story of an April 1993 edition of the *Far East Economic Review*—published more than four years before the crisis—which wondered aloud whether Indonesia's new

cabinet would “fix the banks.” But little action was taken to strengthen the banks, and some policy changes (e.g., the establishment of the BIBF) actually weakened the system further.

At least part of the expansion in private credit was ultimately financed by commercial bank offshore borrowing. Partial financial liberalization in the late 1980s and early 1990s gave banks much more latitude to act as financial intermediaries and channel foreign money into domestic enterprises. In the Philippines, foreign liabilities of commercial banks skyrocketed from 5.5 to 17.2 percent of GDP between 1993 and 1996 and continued to grow rapidly through the middle of 1997 (table 4.12). In Thailand, these liabilities jumped even more sharply, from 5.9 percent of GDP in 1992 to 28.4 percent of GDP in 1995. Indeed, the net foreign assets of the Thai banking system fell from 14 percent in 1993 to zero in 1995. In Malaysia, foreign liabilities of the banking sector grew rapidly to peak at 19.5 percent of GDP in 1993, before falling off sharply by 1996. These liabilities did not grow as rapidly in Indonesia, where much of the offshore borrowing was undertaken directly by private firms, without using domestic banks as intermediaries (hence the somewhat smaller build-up in commercial bank credit to the private sector in Indonesia). Nonetheless, the risks to the Indonesian economy were similar: rupiah revenue streams were expected to repay dollar liabilities, leaving these firms exposed to significant exchange rate risks.

The sharp increase in foreign borrowing by domestic banks and private corporations is evident from data from the BIS, as we saw earlier in table 4.3. Total obligations to foreign banks of the five countries grew from \$210 billion to \$260 billion in 1996 alone. Obligations by the banking sector jumped from \$91 billion to \$115 billion, even after foreign bank lending to Thai banks had leveled off because of growing concerns about the Thai financial system. Particularly significant is the sharp increase in short-term debt, especially in Indonesia, Thailand, and Korea. Short-term debts owed to banks by these three countries reached \$147 billion in 1996. Of course, the actual amount of short-term liabilities were even larger, since these data do not include offshore issues of commercial paper and other nonbank liabilities. The use of short-term foreign currency borrowing to finance domestic investments in real estate and other nontradable activities was particularly dangerous. Banks became increasingly vulnerable for at least two reasons. First, by borrowing in foreign exchange and lending in local currencies, the banks were exposed to the risk of foreign exchange losses from a depreciation. Even if the domestic loans were denominated in dollars, borrowers who were not earning foreign exchange (e.g., real estate) faced bankruptcy in the event of depreciation. Second, to the extent that banks borrowed offshore in short-term maturities and lent onshore with longer payback periods, they were exposed to the risk of a run.

A particularly telling indicator of these risks is the ratio of short-term debt to foreign exchange reserves. Essentially, this measure compares a

Table 4.12 Net Foreign Assets of Banking System, 1990–96 (share of GDP)

Country	1990	1991	1992	1993	1994	1995	1996
<i>Indonesia</i>							
Foreign assets of banking system, net	5.4	7.6	11.4	8.6	6.4	6.7	9.6
Monetary authorities, net	5.9	8.0	12.6	11.4	9.5	8.9	11.3
Deposit money banks, net	-0.5	-0.4	-1.2	-2.8	-3.1	-2.2	-1.7
Foreign assets	6.0	4.9	5.0	3.4	3.4	3.8	3.9
Foreign liabilities	6.5	5.2	6.2	6.2	6.5	6.0	5.6
<i>Malaysia</i>							
Foreign assets of banking system, net	22.1	18.7	23.0	34.3	33.2	27.2	23.7
Monetary authorities, net	23.3	23.5	32.2	47.3	36.7	29.8	28.2
Deposit money banks, net	-1.3	-4.8	-9.2	-13.0	-3.5	-2.6	-4.9
Foreign assets	5.8	4.3	3.6	6.5	5.7	4.8	4.4
Foreign liabilities	7.0	9.1	12.7	19.5	9.2	7.4	9.2
<i>Philippines</i>							
Foreign assets of banking system, net	-9.1	-1.5	2.6	7.4	7.4	6.2	3.2
Monetary authorities, net	-13.0	-5.5	-0.6	3.8	5.4	6.2	10.6
Deposit money banks, net	4.0	4.0	3.1	3.5	2.0	-0.0	-7.4
Foreign assets	10.2	8.4	8.7	9.0	8.7	8.8	9.8
Foreign liabilities	6.2	4.4	5.6	5.5	6.7	8.8	17.2
<i>Thailand</i>							
Foreign assets of banking system, net	14.0	16.4	15.9	14.3	4.1	0.0	-1.7
Monetary authorities, net	16.5	18.5	19.0	20.4	21.0	22.7	21.2
Deposit money banks, net	-2.4	-2.0	-3.2	-6.1	-16.9	-22.6	-22.9
Foreign assets	2.6	2.9	2.7	5.0	4.7	5.8	3.9
Foreign liabilities	5.0	4.9	5.9	11.1	21.6	28.4	26.8
<i>Korea</i>							
Foreign assets of banking system, net	5.7	3.8	5.1	6.6	6.7	6.4	5.2
Monetary authorities, net	6.0	4.9	5.7	6.2	6.8	7.2	7.2
Deposit money banks, net	-0.3	-1.1	-0.6	0.4	-0.1	-0.8	-2.0
Foreign assets	3.8	3.8	4.2	4.9	5.4	6.1	7.3
Foreign liabilities	4.1	4.9	4.8	4.5	5.5	6.9	9.3

country's short-term foreign liabilities to its liquid foreign assets available to service those liabilities in the event of a creditor run. Table 4.13 shows this ratio for a large number of countries in mid-1994 (on the eve of the Mexican crisis) and mid-1997 (the onset of the Asian crisis). Mexico and Argentina each had short-term debt in excess of foreign exchange reserves in 1994, indicating their vulnerability to a crisis. In mid-1997 in Indonesia, Thailand, and Korea—the three countries most severely afflicted by the crisis—short-term debt also exceeded available foreign exchange reserves. It is also instructive to note that the ratio exceeded 1.0 in several other countries that were not affected by the crisis (including the Asian countries in 1994). This suggests that short-term debt in excess of reserves does not

Table 4.13 Short-Term Debt and Reserves, 1994 and 1997 (million dollars)

Country	June 1994			June 1997		
	Short-Term Debt	Reserves	Short-Term Debt/Reserves	Short-Term Debt	Reserves	Short-Term Debt/Reserves
Argentina	17,557	13,247	1.325	23,891	19,740	1.210
Brazil	28,976	41,292	0.702	44,223	55,849	0.792
Chile	5,447	10,766	0.506	7,615	17,017	0.447
Colombia	3,976	7,718	0.515	6,698	9,940	0.674
India	5,062	16,725	0.303	7,745	25,702	0.301
Indonesia	18,822	10,915	1.724	34,661	20,336	1.704
Jordan	647	1,291	0.501	582	1,624	0.358
Korea	35,204	21,685	1.623	70,182	34,070	2.060
Malaysia	8,203	32,608	0.252	16,268	26,588	0.612
Mexico	28,404	16,509	1.721	28,226	23,775	1.187
Pakistan	1,708	2,307	0.740	3,047	1,249	2.440
Peru	2,157	5,611	0.384	5,368	10,665	0.503
Philippines	2,646	6,527	0.405	8,293	9,781	0.848
South Africa	7,108	475	14.964	13,247	4,241	3.124
Sri Lanka	511	1,983	0.258	414	1,770	0.234
Taiwan	17,023	90,143	0.189	21,966	90,025	0.244
Thailand	27,151	27,375	0.992	45,567	31,361	1.453
Turkey	8,821	4,279	2.061	13,067	16,055	0.814
Venezuela	4,382	5,422	0.808	3,629	13,215	0.275
Zimbabwe	704	534	1.319	731	447	1.635

Sources: Bank for International Settlements (1998) and International Monetary Fund (various issues).

necessarily cause a crisis but renders a country *vulnerable* to a financial panic. Once a crisis starts, each creditor knows that there are not enough liquid foreign exchange reserves for each short-term creditor to be fully paid, so each rushes to be the first in line to demand full repayment. Under normal circumstances, short-term debts can be easily rolled over. However, once creditors begin to believe that the other creditors are no longer willing to roll over the debt, each of them will try to call in their loans ahead of other investors, so as not to be the one left without repayment out of the limited supply of foreign exchange reserves. Even sound corporations may be unable to roll over their debts. Countries with large foreign exchange reserves relative to short-term debt (e.g., Taiwan) are much less vulnerable to panics since each creditor can rest assured that sufficient funds are available to meet his claims.

4.4.5 Predictability and Explanation of the Crisis

Summarizing the findings of this section, we note the following. First, the crisis was not predicted by most market participants and analysts. This

fact is supported by data on capital flows, risk premiums, credit ratings, IMF reports, and other indicators. The biggest warnings came in Thailand, where the expectations of currency depreciation grew markedly in 1996 and early 1997. Korea also gave off increasing warnings. There were few if any alarm bells in Indonesia, Malaysia, or the Philippines. Second, traditional warning signs (current account deficits, overvalued exchange rates, export growth) gave some reasons for concern, but the signals were muted and generally ignored (see table 4.14). While East Asian currencies had appreciated in real terms in the 1990s, the real appreciation was considerably less than in most of Latin America. Current account deficits were very high in Thailand and Malaysia in 1996, but considerably lower in Indonesia and Korea. Malaysia's current account deficit had declined markedly in 1996 compared with the preceding year.

The biggest indicators of risk were financial but were generally ignored. Short-term debts to international banks had risen to high levels relative to foreign exchange reserves in Indonesia, Korea, and Thailand. Domestic claims on the private sector (measured as a percentage of GDP) had also risen significantly, suggesting growing strains in the banking sector. This was especially the case in Malaysia, the Philippines, and Thailand, and much less so in Indonesia and Korea. These indicators show some growing weaknesses and point to the need for moderate adjustments in the Asian economies. These imbalances, however, were not large enough to warrant a crisis of the magnitude that has been seen in Asia.

Perhaps the most notable fact, however, is that these financial indicators show the vulnerability to crisis but do not guarantee the onset of crisis. They seem to be, in short, necessary but not sufficient conditions. In 1994, Indonesia, Korea, and Thailand already had ratios of short-term debt to foreign exchange reserves well in excess of 1.0, but they were not hit by the "tequila" shock. In 1997, South Africa evinces major vulnerabilities to panic but, fortunately, without an episode of panic. These patterns may indeed be the best confirmation of the multiple-equilibrium character of financial panics: we can identify conditions of vulnerability, and the need for modest adjustments, but we cannot predict the actual onset of crisis, since the crisis requires a triggering event that leads short-term creditors to expect the flight of other short-term creditors.

4.5 The Evolution of the Crisis

4.5.1 Triggering Events

The cracks began to appear at almost the same time in Korea and Thailand in early 1997. In January, Hanbo Steel collapsed under \$6 billion in debts. Hanbo was the first bankruptcy of a Korean *chaebol* in a decade. In the months that followed, Sammi Steel and Kia Motors suffered a similar

Table 4.14 Selected Crisis Indicators

Country	Current Account/ GDP (%)	Capital Account/ GDP (%)	Real Exchange Rate (1990 = 100)	Financial Institution Claims on Private Sector/GDP (%)		Short-Term Debt/ Reserves	
	1996	1996	1996	1990	1996	June 1994	June 1997
Argentina	-1.4	2.5	44	15.6	15.4	1.3	1.2
Brazil	-2.7	4.4 ^a	20	40.8	30.7	0.7	0.8
Chile	-4.1	8.8	61	47.0	57.0	0.5	0.4
Colombia	-5.5	7.9	-	30.8	41.2	0.5	0.7
India	-1.6	3.1 ^a	-	26.8	24.7	0.3	0.3
Indonesia	-3.5	4.9	80	50.6	55.4	1.7	1.7
Jordan	-3.1	5.4	-	64.4	65.3	0.5	0.4
Korea	-4.8	4.8	88	56.8	65.7	1.6	2.1
Malaysia	-5.3	9.4	78	71.4	144.6	0.3	0.6
Mexico	-0.6	1.2	95	22.7	21.6	1.7	1.2
Pakistan	-5.6	4.1 ^a	-	27.7	26.7	0.7	2.4
Peru	-5.9	5.1	-	10.1	19.6	0.4	0.5
Philippines	-4.3	11.0	70	19.3	48.4	0.4	0.8
South Africa	-1.6	2.1	-	85.0	137.7	15.0	3.1
Sri Lanka	-4.7	4.2	-	19.6	25.2	0.3	0.2
Taiwan	4.4	-4.0	-	97.0	165.0	0.2	0.2
Thailand	-8.0	10.6	80	83.1	141.9	1.0	1.5
Turkey	5.5	5.0	-	16.7	23.5	2.1	0.8
Venezuela	13.1	-2.6	-	25.4	9.6	0.8	0.3
Zimbabwe	-	-	-	23.0	31.2	1.3	1.6

Sources: Bank for International Settlements (1998), International Monetary Fund (various issues), authors' calculations.

^a1995 data.

fate. These bankruptcies, in turn, put several merchant banks under significant pressure, since much of the foreign borrowing of these companies had been, in effect, channeled through (and in some cases guaranteed by) the merchant banks. In Thailand, Samprasong Land missed payments due on its foreign debt in early February, signaling the fall in the property markets and the beginning of the end of the financial companies that had lent heavily to property companies. During the ensuing six months, the Bank of Thailand lent over Bt 200 billion (\$8 billion) to distressed financial institutions through its Financial Institutions Development Fund (FIDF). As concerns began to mount, the Bank of Thailand also committed almost all of its liquid foreign exchange reserves in forward contracts, much of it to speculators who correctly guessed that the combination of slow export growth and financial distress would ultimately require a devaluation. By late June, net forward sales of reserves approximately equaled gross reserves. This does not mean that the central bank had run out of usable reserves (since the open forward positions could be closed at a partial, not complete, loss), but usable reserve levels had fallen sharply. In late June 1997, the Thai government removed support from a major finance company, Finance One, announcing that creditors (including foreign creditors) would incur losses, contrary to previous announcements and market expectations. This shock accelerated the withdrawal of foreign funds and prompted the currency depreciation on 2 July 1997. In turn, the Thai baht devaluation triggered the capital outflows from the rest of East Asia.

The proximate causes of the withdrawal differed somewhat across the region:

Bank failure. The failures of finance companies in Thailand and the bank closures in Indonesia helped set off the exodus.

Corporate failure. In Korea, the withdrawal of funds was based on concerns about the health of the corporate sector.

Political uncertainty. In Korea, Thailand, the Philippines, and Indonesia, political uncertainty hastened the credit withdrawals, since each country faced a potential change in government. (Korea and Thailand have both changed governments since the onset of the crisis. A new president will be elected in the Philippines in May 1998. Elections are scheduled for mid-March 1998 in Indonesia, though with no chance of a change through the ballot box. Suharto's weakening health, along with the absence of a clear successor, and growing discomfort with the economic role played by the president's family—rather than the president's electoral vulnerability—are the notable features of Indonesian political uncertainty.)

Contagion. Many creditors appeared to treat the region as a whole and assumed that if Thailand was in trouble, the other countries in the region probably had similar difficulties. Part of the contagion effect was

the sudden loss of government credibility throughout the region. After all, the Thai government had pledged for months that Finance One was in good shape, that plenty of foreign exchange reserves were available, and that the baht would not be devalued. Malaysia, the Philippines, and Indonesia were all hit hard by contagion effects.

International interventions. Although at times the IMF can help restore confidence in battered economies, it can also send a signal to creditors of impending crisis, leading to an accelerated outflow of foreign funds. This depends especially on the specific measures that the IMF recommends. In the case of the Asian programs, the IMF recommended immediate suspensions or closures of financial institutions, measures that actually helped to incite panic.

The withdrawal of foreign funds triggered a chain reaction that quickly developed into a financial panic. The exchange rate depreciations associated with the withdrawals themselves sparked new withdrawals of foreign exchange, as domestic borrowers with unhedged currency positions rushed to buy dollars. Throughout Southeast Asia, few firms had hedged their exposure, since they believed that their governments would retain stable exchange rates. In addition, most central banks required that firms seek prior approval before undertaking any hedging, making it somewhat more burdensome for firms to cover their risks (this was not the case, however, in Indonesia). At the same time, as currencies depreciated, foreign lenders became more concerned that their customers would be unable to repay their debts and began to call in their loans, reinforcing the depreciation.

The withdrawal of funds also set off a liquidity squeeze and a sharp rise in interest rates. As a result, firms that were profitable before the crisis found it difficult to obtain working capital or to remain profitable with significantly higher interest rates. Offshore creditors became concerned about the profitability of their customers and grew increasingly reluctant to roll over short-term loans. The lack of clear bankruptcy laws and work-out mechanisms added to the withdrawal of credit, since foreign lenders feared they would have little recourse to collect on bad loans. The banking system quickly came under intense pressure. Nonperforming loans rose quickly, and depositors withdrew their funds either out of concern over the safety of the banking system or in order to meet pressing foreign exchange obligations. The losses on foreign exchange exposure and the rise in nonperforming loans eroded the capital base of the banks, adding to their stress. In Korea, the fall in the stock market exacerbated the erosion of the capital base, since banks were allowed to hold some of the capital as equity in other companies. As a result, even liquid banks were constrained in their ability to make loans, as they struggled to stay ahead of the minimum capital adequacy standards.

The rapid evolution into panic was aided by policy misjudgments and mistakes across the region. Had Thailand responded to the fall in property

prices in early 1997 by floating the baht and moderately tightening monetary and fiscal policies, the Asian financial crisis could have been largely avoided. Thailand and Korea, of course, made the paramount mistake of trying to defend their exchange rate pegs until they had effectively exhausted a substantial proportion of their foreign exchange reserves. In Indonesia, state enterprises were instructed to withdraw a sizable portion of their deposits from the banking system and to purchase central bank notes, adding to the intense liquidity squeeze and driving up interest rates. Large investment projects of dubious economic value were postponed, then given the go-ahead, then postponed again in both Indonesia and Malaysia, adding to the confusion. Malaysia and Thailand introduced mild controls on foreign exchange transactions. Malaysia announced the formation of a large fund to be used to prop up stock prices then abandoned the plan a few days later. Thailand and Korea injected large sums into failing financial institutions, opening a large hole into what had previously been prudent fiscal positions. Inflammatory statements by government officials and market participants alike (especially the well-known exchanges between the Malaysian prime minister and George Soros) further frayed nerves and added to the panicked withdrawal of funds.

Once the trigger was pulled, several powerful feedback mechanisms amplified the withdrawal into a panic. Undercapitalized Japanese banks with heavy exposure in the rest of Asia felt further downward pressure on their balance sheets as a result of the emerging crisis and therefore began to call in loans. Similarly, Korean banks with extensive exposure in Southeast Asia began to call in loans as a result of the Korean crisis. Downgrades by the major rating agencies led to new rounds of withdrawals.

The regional crisis intensified and threatened to spread when the Hong Kong dollar came under attack in November as a result of currency depreciations in the rest of Asia and the consequent loss of trade competitiveness in Hong Kong itself. Hong Kong banks faced steeply rising interest rates on liabilities, and it is likely that they reacted in part by calling in loans from the rest of Asia (data on Hong Kong bank loans to the rest of Asia are not publicly available). Moreover, the attack on Hong Kong strongly indicated the potential for the crisis to cross international borders, and fears rose that the problems would spread through the rest of Asia and beyond. Indeed, the New Taiwan dollar also came under pressure and fell sharply, despite Taiwan's huge stock of reserves. These events almost certainly accelerated withdrawals from Southeast Asia, and especially Korea.

4.5.2 Contagion, Panic, and Crisis in Indonesia

The extent of the crisis in Indonesia calls for special comment, since at this writing it is the country that has been hardest hit in the region. This outcome is in many ways ironic, since at the outset many observers thought it would be the least affected country, and in the early stages Indo-

nesia was praised for taking quick and concerted action.⁸ Indonesia appears to be the clearest case of contagion in the region. Of course, there were many problems and weaknesses in the Indonesian economy before the crisis, including undersupervised banks, extensive crony capitalism, corruption, monopoly power, and growing short-term debt, some of which at least one of us has discussed previously.⁹ Yet by most measures, Indonesia's imbalances were among the least severe in the region and clearly were much less dramatic than those in Thailand. Consider the following:

The current account deficit, at 3.5 percent of GDP, was the lowest of the Asian-5 countries.

Export growth in 1996 of 10.4 percent, while down from the 1995 level of 13 percent, was the second highest in the region.

The budget had been in surplus by an average of over 1 percent of GDP for four years.

Credit growth had remained at more modest levels than elsewhere in the region.

Foreign liabilities of the commercial banks, at 5.6 percent of GDP, were substantially below those of the other affected economies (although corporate foreign debts were high).

There had been no major corporate bankruptcies, and the stock market continued to rise strongly through early 1997 until the onset of the crisis in Thailand.

Indonesia was applauded early on for first widening the rupiah's trading band to 12 percent and then moving to a float without spending its foreign exchange reserves in a futile defense of the currency. When the rupiah did come under severe attack in August, problems arose when the government abruptly raised interest rates, which had the effect of intensifying short-run pressure. The government's decision to cancel 150 investment projects was designed to be a bold attempt to restore international confidence, but the reversal of the decision just a few days later for 15 of the largest projects undermined the strategy and simply added to the confusion. By early September Indonesia had joined Thailand, Malaysia, and the Philippines in the crisis.

Nonetheless, since reserve levels remained strong at well over \$20 billion, Indonesia did not seem an obvious candidate for an IMF program.¹⁰ When Indonesia signed its first IMF program on 31 October, the rupiah

8. See, e.g., "In Battle for Investors, This Is No Contest: Amid a Crisis, Indonesia Opens Up and Thrives as Malaysia Stumbles," *Asian Wall Street Journal*, 5–6 September 1997.

9. Radelet (1995) raises concerns about "quasi-public sector" foreign liabilities of well-connected Indonesian firms and rising short-term debt, while Radelet (1996) documents the overvaluation of the rupiah.

10. McLeod (1997) argues that an IMF program was not necessary, a conclusion with which we agree.

immediately strengthened as a result of large concerted interventions by Japan and Singapore. Yet the boost in the rupiah was very short lived. As the impact of abrupt bank closures and the ensuing bank runs (discussed in the next section), higher interest rates, and decapitalization of the banks set in, the rupiah depreciated by 23 percent and the stock market fell by 19 percent (in rupiah terms) between 3 November and 4 December. The slide was augmented by confusion over the bank closures, since two of the president's relatives publicly balked (and threatened legal action) when their banks were ordered closed. (This event illustrates one of the dangers of hasty bank closures—such abrupt institutional changes are almost always poorly thought through and badly implemented, thereby creating a sense of confusion and panic rather than building confidence.) Quite suddenly, within a couple of weeks of the start of the IMF program, Indonesia began to look even weaker than its neighbors.

In December, the effects of the severest drought in many years set in, with food prices rising and food shortages emerging in some parts of the archipelago. The drought complicated the task of crisis management enormously (both economically and politically), since food prices jumped sharply, the foreign exchange costs of food imports rose, and displaced urban day laborers could not easily return to rural areas to find work. At the same time, world petroleum prices fell, sharply reducing Indonesia's export receipts, adding to pressure on the exchange rate.

On 4 December, Korea signed its IMF program, adding a new round of uncertainty to the entire region. Then, on 5 December, it was announced that President Suharto was ill and had to cancel a foreign trip. Markets dropped precipitously, accelerating a fall that had been under way for a month. The prospect of a severe illness or death of Suharto, with no clear presidential successor in sight, added to the ongoing panic. By early January, Indonesia had become the pariah of the region, with the IMF and industrialized country governments publicly blasting a proposed budget (which, on later inspection, turned out to be far less onerous than initially described).¹¹ Indonesia's waffling on promised structural reforms and its flirtation with the ill-advised notion of introducing a currency board only added to negative perceptions of the country. At this point, the crisis in Indonesia has become as much political as economic. (Note that both Thailand and Korea each received a boost from a change in government, whereas there seemed little prospect of political change in Indonesia.) The economic and political issues have fed off each other, adding a whole new dimension to the dynamics of the panic.

11. The international community severely criticized the proposed 32 percent increase in spending as indicating that Indonesia was not serious about reform, which sent markets reeling. However, all of the increase was simply due to exchange rate movements. Within three weeks the Fund had quietly approved a new budget with a 46 percent increase in spending, but the damage to market perceptions had been done.

Indonesia's extensive meltdown is far more severe than can be accounted for by flaws in economic fundamentals, since those were not especially bad. The "moral hazard cum bubble" model seems to be even less appropriate for Indonesia than for Thailand and Korea (where it is also an exaggeration of fundamental weaknesses). To reiterate in the case of Indonesia, most foreign lending was to private firms, and not to banks. While many of these companies may have been assumed to have implicit government backing, much of the lending to corporations was surely unprotected by government guarantees and was seen in that light. There was also no sign of market concern about a growing crisis, since the stock market and other indexes performed very strongly right up until early July. International credit ratings remained high and positive, and international banks continued to lend, well after they had cut back on loans to Thailand and Korea. In short, Indonesia seems to be a clear case of contagion leading to panic, and ultimately to a severe, unnecessary economic contraction.

4.6 The IMF Programs

One month after Thailand floated the baht, it announced on 5 August a policy reform package that had been formulated in cooperation with the IMF. The thirty-four-month, \$17.2 billion standby arrangement was approved by the Fund board on 20 August. The IMF contributed \$4 billion, the World Bank and Asian Development Bank (ADB) \$2.7 billion, and individual governments the balance of \$10.5 billion (including \$3.5 billion from neighboring Southeast Asian countries). Japan contributed \$4 billion; the United States did not contribute to the package. Indonesia followed suit by signing a thirty-six-month, \$40 billion package on 31 October. The IMF contributed \$10 billion, the World Bank and the ADB \$8 billion, and other governments the balance (including \$5 billion and \$3 billion in a "second line of defense" from Japan and the United States, respectively). Somehow, the official figure of \$40 billion includes \$5 billion of "assistance" from Indonesia's own reserves! Korea signed its \$57 billion three-year standby on 4 December, with \$21 billion from the IMF, \$14 billion from the World Bank and the ADB, and \$22 billion from a group of industrial countries. With the Philippines continuing its previously signed standby program, four of the five afflicted economies came under the tutelage of the IMF.

The IMF programs have had nine main declared goals:

- Prevent outright default on foreign obligations.
- Limit the extent of currency depreciation.
- Preserve a fiscal balance.
- Limit the rise in inflation.

- Rebuild foreign exchange reserves.
- Restructure and reform the banking sector.
- Remove monopolies and otherwise reform the domestic nonfinancial economy.
- Preserve confidence and creditworthiness.
- Limit the decline of output.

To achieve these objectives, the programs have been based on six key policy components:

Fiscal policy. The IMF placed fiscal contraction at the very heart of the programs. For example, the official press release on the Thai program states that “fiscal policy is the key to the overall credibility of the program.” The press release on Indonesia similarly put fiscal policy at the forefront: “First, the authorities will maintain tight fiscal and monetary policies.” The objectives of fiscal contraction were to (1) support the monetary contraction and defend the exchange rate and (2) provide funds necessary to inject into the financial system.

Bank closures. In Thailand, 58 out of 91 finance companies were immediately suspended, and 56 of these were eventually liquidated. In Indonesia, 16 commercial banks were closed. In Korea, 14 (of 30) merchant banks were suspended. The goals of these actions were to limit the losses being accumulated by these institutions and to send a strong signal that governments were serious about implementing reforms in order to restore confidence in the banking system.

Enforcement of capital-adequacy standards. While banks were facing rapid decapitalization because of losses on foreign exchange exposure and an increase in nonperforming loans, the initial Fund programs pushed for a rapid recapitalization. The goal was to return the banking system to a solid footing as quickly as possible.

Tight domestic credit. Through contractionary base money targets, the IMF programs raised interest rates and reduced domestic credit availability. The purpose was to defend the exchange rate.

Debt repayment. Foreign exchange targets in each program provide for full payment of foreign debt obligations, backed by “bailout funds” mobilized by the IMF.

Nonfinancial structural changes. In each program, structural reforms were included that aimed at reducing tariffs, opening sectors to foreign investment, and reducing monopoly powers.

The three original programs failed to meet their objectives, and none of the programs lasted in its original form for more than a few weeks. New letters of intent were signed with Thailand, Korea, and Indonesia on 25 November, 24 December, and 15 January, respectively. Currency depreciation and stock market collapse continued long after the programs were

signed, and there was no sign of an immediate restoration of confidence. Bank closures in Thailand and Indonesia added to the sense of financial panic, rather than stemming the outflow. Output is now projected to fall much more sharply than originally targeted, and the original targets for inflation and exchange rates have been revised. Credit ratings collapsed in each country after the agreements were in place.

The Fund has attributed this continuing decline mainly to unexpected contagion effects, political uncertainty, and poor implementation of the programs by the governments in the region. There is clearly some truth in these observations. Korea's collapse made matters worse in Indonesia and Thailand, Suharto's health and the elections in Korea created market jitters, and each government has stopped short of full implementation of agreed reforms. But there are several reasons to believe that the underlying design of the programs added to, rather than ameliorated, the panic. Four areas, in particular, are open to question.

1. *Bank Closures.* There is no question that many financial institutions in the region were unviable and needed to be merged or liquidated. The appropriate question is, How should this be done, and over what time frame, in the midst of a financial panic? Abruptly shutting financial institutions without a more comprehensive program for financial sector reform, as was done in Thailand and Indonesia, only served to deepen the panic. With no deposit insurance in place, the hastily arranged closures predictably ignited bank runs, with depositors in other institutions fearing that their banks would be next in line.¹² The closures added to the ongoing liquidity squeeze, making it more difficult for banks to continue their normal lending operations. Since it was not immediately clear how the foreign liabilities of these banks would be handled, foreign creditors of other banks became more reluctant to roll over their loans, adding to the squeeze.

Kindleberger offers some close historical analogies:

Apart from lags and mistakes of discount policy, the authorities may precipitate panic by brusque action in early stages of distress. In the summer of 1836, with credit extended in acceptances drawn by American houses on British joint-stock banks, the Bank of England refused to discount any bills bearing the name of a joint-stock bank, and specifically instructed its Liverpool agent not to rediscount any paper

12. Two aspects of the bank closures added to the panic. First, regarding deposits at the sixteen banks closed in early November, the Indonesian government announced that accounts would be protected in the closed banks only up to 20 million rupiah (or around \$7,000 at the time). This protection was not extended to deposits in banks that remained open. Second, the very fact that the president's son's bank was one that was closed quickly gave rise to the view in Indonesia that no bank was safe. The attempt to show "toughness" and political resolve backfired, by dramatically undermining confidence in the entire banking system.

of the so-called "W banks" (Wiggins, Wildes, and Wilson) among the seven American banks in Britain, an action that "seemed vindictive" and led immediately to panic. As it turned out, the Bank of England had to reverse its policies. It had long conferences with the "W banks" in October, extended them lines of discount in the first quarter of 1837, but failed to prevent their failure in June of that year. The Bank's instinct was right: to frustrate the extension of dangerous credit. But credit is a dangerous thing. Expectations can quickly be altered. Something, sometimes almost nothing, causes a shadow to fall on credit, reverses expectations, and the rush for liquidity is on. (1996, 96)

The vulnerability of expectations to such sharp shifts from "almost nothing" results from the condition of multiple equilibria that we have stressed throughout this essay. Creditor runs are self-fulfilling.

A far better approach would have been to implement a longer term, more comprehensive strategy for bank restructuring, rather than a quick show of force designed simply to demonstrate resolve. Problem banks could have been put under some form of receivership, which would have protected depositors and allowed good borrowers continued access to credit.

The IMF appears to have recognized the error in its bank closure strategy. According to press reports, a confidential IMF document reviewing the first standby arrangement with Indonesia concluded that "these closures, however, far from improving public confidence in the banking system, have instead set off a renewed 'flight to safety.'" The report found that Indonesians had withdrawn \$2 billion from the banking system and shifted funds from private to state-owned banks, which depositors felt offered stronger guarantees. The report concluded that by the end of November, two-thirds of Indonesia's banks "had experienced runs on their deposits."¹³ The text of Indonesia's second agreement with the Fund reinforced the point:

Following the closure of 16 insolvent banks in November last year, customers concerned about the safety of private banks have been shifting sizeable amounts of deposits to state and foreign banks, while some have been withdrawing funds from the banking system entirely. These movements in deposits have greatly complicated the task of monetary policy, because they have led to a bifurcation of the banking system. By mid-November, a large number of banks were facing growing liquidity shortages, and were unable to obtain sufficient funds in the interbank market to cover this gap, even after paying interest rates ranging up to 75 percent.¹⁴

13. "IMF Now Admits Tactics in Indonesia Deepened the Crisis," *New York Times*, 14 January 1998.

14. "Indonesia—Memorandum of Economic and Financial Policies," *Jakarta Post*, 17 January 1998.

The memorandum continues at a later stage by observing that “the continued depreciation of the rupiah, the slowdown in growth, and high interest rates since then have led to a marked deterioration of the financial condition of the remaining banks. This deterioration has been exacerbated by deposit runs and capital flight, forcing many banks to increasingly resort to central bank liquidity support.”

The Fund program in Korea focused on merchant banks (which do not take household deposits) rather than commercial banks. Nonetheless, the sudden closure of fourteen merchant banks and the IMF’s insistence on a rapid tightening of bank capital adequacy ratios added to the sense of panic over the financial system. As in Indonesia, depositors and foreign lenders accelerated their withdrawals from the banking system, while the banks cut back on their loans in order to enhance their balance sheets. The second-round programs in Thailand and Indonesia include more comprehensive financial restructuring plans, although even here the plans are not complete.

2. *Bank Recapitalization.* There is no question that after the crisis, many banks needed to be recapitalized. As mentioned previously, the combination of a sharp increase in nonperforming loans at the onset of the crisis and the effect of exchange rate movements on the banks’ foreign liability positions quickly eroded the capital bases of even the strongest banks. The question is, How quickly should banks be pushed to recapitalize, especially during times of widespread economic distress? Pushing banks to recapitalize within an unrealistic time frame can cause them to sharply curtail lending, including otherwise strong banks. This, in turn, can lead to a more severe credit crunch, increased distress for private firms, and a further rise in nonperforming loans. This seems to be exactly what took place in the last few months of 1997. The first two IMF programs, in particular, pushed hard for quick recapitalization of the banks. For example, the first Indonesian program required that “the instruction issued by the central bank to raise capital adequacy to 9 percent by end-1997, and 12 percent by end-2001, will be strictly enforced.” Thus banks were initially expected not only to return to their previous capital adequacy level of 8 percent but actually to *add* to their capital. The first Thai program stated that “commercial banks and remaining finance companies will be required to raise capital in anticipation of possible further deterioration in their asset quality. . . . Severely under-capitalized institutions that cannot raise their capital to the legally required level will be taken over by the FIDF (performance criterion as of November 15, 1997).” The second programs in these countries eased the requirements somewhat but were still quite strict. The second Thai program required the government to establish “timetables for the recapitalization of all undercapitalized financial institutions during 1998,” while the second Indonesian program stated

that “capital adequacy rules are being enforced within the context of the bank restructuring strategy.”¹⁵ Only the Korean program initially provided for a longer time frame for full enforcement of the capital adequacy standards. Private discussions with several bankers in the region revealed uncertainty as to how fully and over what time frame these standards would be applied, with the result that banks substantially curtailed lending. Had more forbearance been given on the capital adequacy ratios early in the crisis, with a clear and longer term schedule for otherwise strong banks to return to full compliance, the extent of the credit squeeze would have been much less severe.

3. *Monetary Policy.* There are really two aspects to the IMF’s monetary policy, which have not been carefully disentangled. The first is quantitative domestic credit targets. In most programs, there are limits to high-powered money or central bank credit. The second is interest rate targets, or floors on interest rates, which are usually added as prior actions to an IMF program. Both types of policies are highly problematical. The problem with quantitative credit targets is that they may directly interfere with the central bank’s lender-of-last-resort function. If the central bank is instructed not to provide domestic credit, market participants will know that the lender-of-last-resort mechanism has been switched off. Thus a tightening of quantitative credit limits may actually trigger panic by short-term creditors who come to doubt the ability or willingness of the central bank to provide liquidity. As H. S. Foxwell put it in 1908, “To refuse accommodation altogether is always held to be dangerous. . . . The Bank [of England] was responsible for the solvency of this crowd of small, ill-managed institutions [country banks], but dared not call them to account, on peril of provoking a general collapse of credit” (quoted in Kindleberger 1996, 95).

A closely related but distinct issue is interest rate policy. There is no question that following the withdrawal of foreign capital, interest rates had to rise. After all, capital flows equivalent to 9 percent were reversed in a matter of weeks, leading to an immediate elimination of current account deficits across the region. As a result, interest rates rose sharply at the outset of the crisis. A sharp economic contraction was inevitable. The problem was the IMF’s insistence on raising interest rates even higher and demanding a fiscal surplus (see below) on top of the huge withdrawal of funds (and shrinking current account deficit) that was already under way. These steps led to an unnecessarily harsh economic contraction.

The IMF instructed the central banks of Indonesia, Korea, and Thailand to drain reserves from the system in order to maintain interest rates above certain floors. There is little question that higher interest rates have undermined the profitability of banks and private firms in the short run

15. Bank of Thailand website; *Jakarta Post*, 17 January 1998.

and added to the economic downturn. (Indeed, the passage from the second Indonesian program cited above states that high interest rates contributed to a marked deterioration in the financial condition of the banks.) The policy question is the effect that higher interest rates might have on the exchange rate, and whether any benefits with respect to the exchange rate would outweigh the negative effects on short-run production. The Fund assumes that higher interest rates will lead to stability or appreciation of the currency and that the benefits of currency stabilization outweigh the short-run output costs. For example, Deputy Managing Director Shigemitsu Sugisaki (1998) stated that “we know that higher interest rates are likely to hurt the corporate sector, but an appreciation of the currency that follows a tightening of monetary conditions would greatly benefit those corporations indebted in foreign currency. There is no alternative in the short term. A relaxation of monetary policy would only lead to further depreciations of the currencies.”

Despite sharply higher interest rates, currencies have not appreciated, so the supposed benefits of this policy are in question. It is entirely possible that in the unique conditions of the midst of a financial panic, raising interest rates could have the perverse effect in the very short run of weakening the currency. Kindleberger has made this point clearly, based on historical experience: “Tight money in a given financial center can serve either to attract funds or to repel them, depending on the expectations that a rise in interest rates generates. With inelastic expectations—no fear of crisis or of currency depreciation—an increase in the discount rate attracts funds from abroad, and helps to provide the cash needed to ensure liquidity; with elastic expectations of change—of falling prices, bankruptcies, or exchange depreciation—raising the discount rate may suggest to foreigners the need to take more funds out rather than bring new funds in” (1996, 8).

There is little evidence indeed that higher interest rates have succeeded in supporting Southeast Asian currencies during the panic phase of the crisis. As figure 4.1 shows, exchange rates continued to plummet after the signing of IMF programs (see also fig. 4.2). The exchange rate targets in these programs were breached in a matter of days in all three countries. Part of the problem was not the interest rate policy but accompanying measures: the bank closures almost surely helped to induce a panic that simply overwhelmed short-term interest rates. It is possible, though, that the interest rate policy itself had the adverse effects that Kindleberger notes. Creditors understood that highly leveraged borrowers (whether Indonesian conglomerates, Korean *chaebols*, or banks in all countries) could quickly be pushed to insolvency as a result of several months of high interest rates. Moreover, many kinds of interest-sensitive market participants, such as bond traders, are simply not active in Asia’s limited financial markets. The key participants were the existing holders of short-term debts,

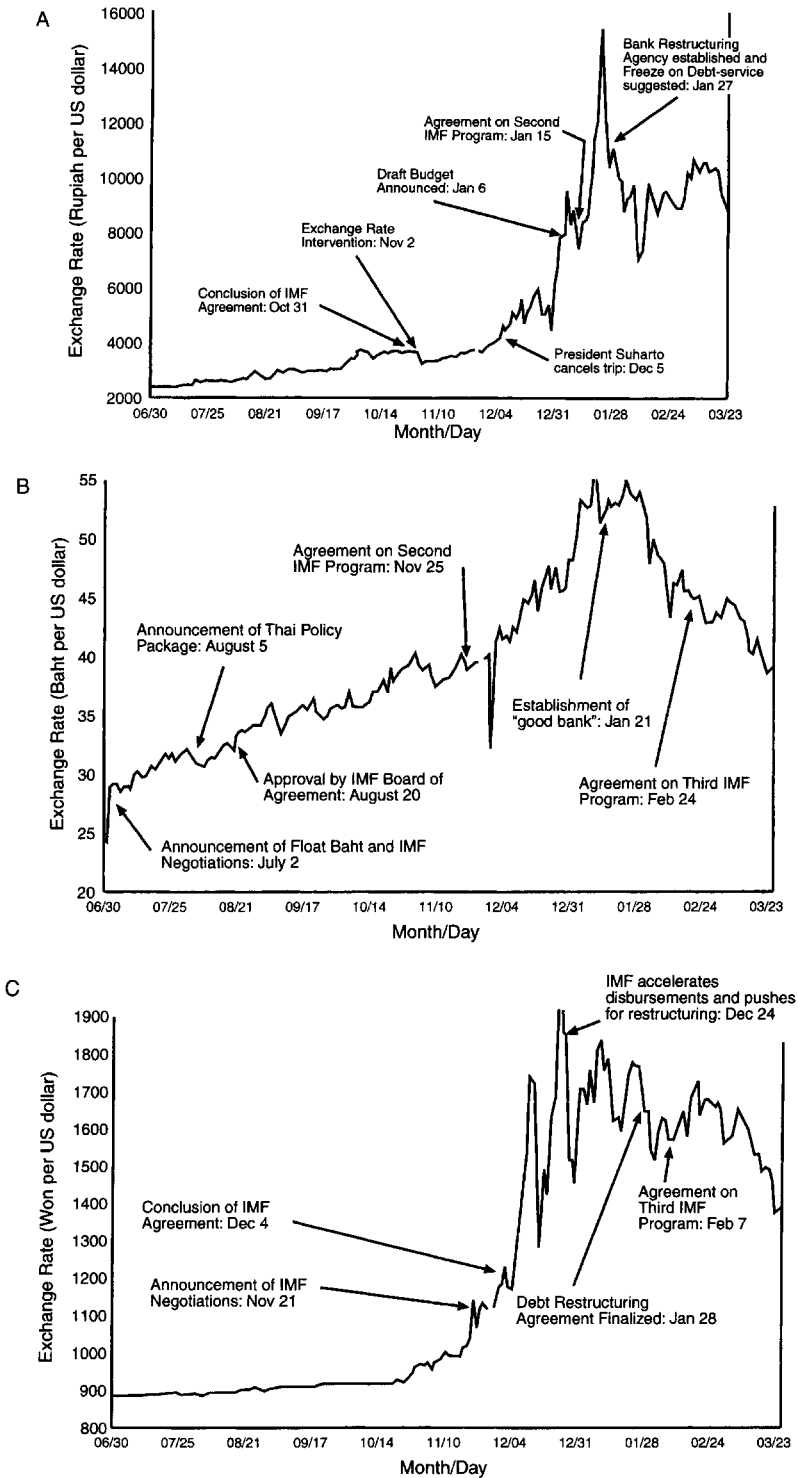


Fig. 4.1 Exchange rate: (A) Indonesia, (B) Thailand, and (C) Korea

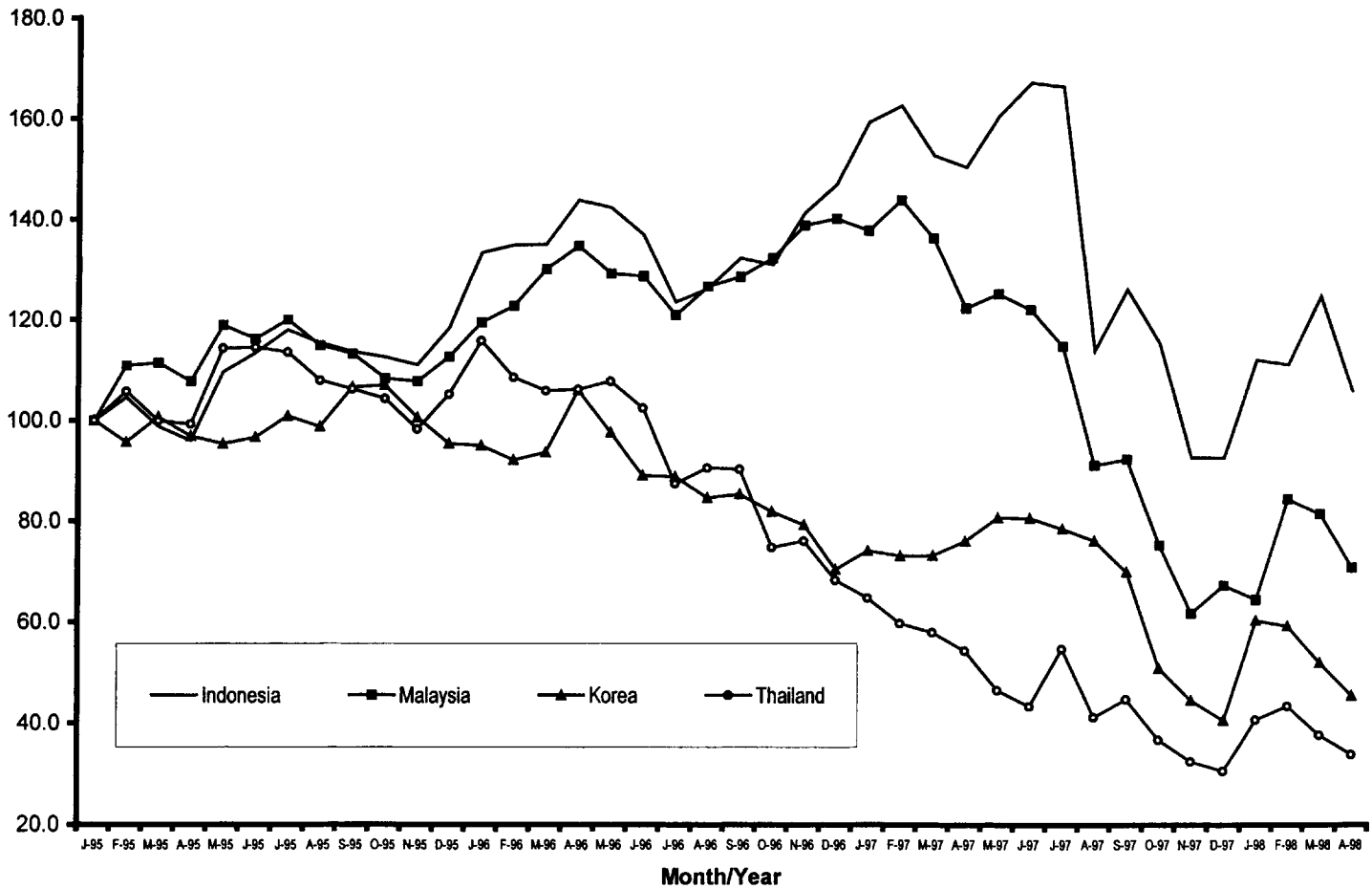


Fig. 4.2 Stock market indexes (January 1995 = 100, domestic currency)

and the important question was whether they would or would not roll over their claims. Higher interest rates did not feed directly into these existing claims (which were generally floating interest rate notes based on a fixed premium over the London Interbank Offer Rate). It is possible, however, that by undermining the profitability of their corporate customers, higher interest rates discouraged foreign creditors from rolling over their loans.

4. *Fiscal Policy.* The Fund initially demanded a fiscal surplus of 1 percent of GDP in each country. It is not clear why government budgets were made so central to the programs, since fiscal policy had been fairly prudent across the region and budget profligacy was clearly not the source of the crisis. Moreover, while the Fund argued that fiscal contraction was necessary to reduce the current account deficit, there was no clear rationale provided for why additional contraction was necessary on top of the massive contraction that was already automatically taking place in the region. The fiscal targets simply added to the contractionary force of the crisis. Nor was there any clear analytic basis for the precise figure of 1 percent of GDP (indeed, the figure appears to have been largely arbitrary). Under the circumstances, a small deficit would seem to have been more appropriate, funded entirely by foreign exchange inflows in support of the program. The Fund also appears to have recognized the inappropriateness of the fiscal surplus demanded in the first round of programs. The second programs in Indonesia and Korea target a 1 percent deficit and a balanced budget, respectively, and recent reports suggest the IMF has rethought its position in Thailand and will allow the government to run a small deficit.¹⁶

4.7 Conclusions and Extensions

In our interpretation, the East Asian crisis resulted from vulnerability to financial panic that arose from certain emerging weaknesses in these economies (especially growing short-term debt), combined with a series of policy missteps and accidents that triggered the panic. Since we view the crisis as a case of multiple equilibria, our hypothesis is that the worst of the crisis could have been largely avoided with relatively moderate adjustments and appropriate policy changes. Explanations that attribute the entire massive contraction to the inevitable consequences of deep flaws in the Asian economies—such as Asian crony capitalism—seem to us to be strongly overstated. Without question, there were macroeconomic imbalances, weak financial institutions, widespread corruption, and inadequate legal foundations in each of the affected countries. These problems needed attention and correction, and they clearly contributed to the vulnerability

16. "IMF Concedes Its Conditions for Thailand Were Too Austere," *New York Times*, 11 February 1998.

of the Asian economies. However, most of these problems had been well known for years, and the Asian-5 countries were able to attract \$211 billion of capital inflows between 1994 and 1996, under the widely known conditions of Asian capitalism. To attribute the crisis fully to fundamental flaws in the precrisis system is to judge that the global financial system is prone to sheer folly or somehow expected to avoid losses despite the fundamental flaws. Paul Krugman's initial explanation of the crisis—that investors knew their investments were going to weak borrowers but felt protected by explicit and implicit guarantees—also seems to us to be only a partial explanation. One obvious reason is that much of the lending was directed to private firms that did not enjoy these guarantees. Approximately half of the loans by international banks and almost all of the portfolio and direct equity investments went to nonbank enterprises for which state guarantees were far from assured. This comes to around three-fifths of total capital flows to the region.

Moreover, the actual market participants, by their statements and actions (e.g., decisions on credit ratings), while recognizing the flaws in these economies, simply did not foresee a crisis, with or without bailouts. It is difficult, therefore, to make the case that a crisis of this depth and magnitude was simply an accident waiting to happen. We do not believe that such a vicious crisis was necessary nor that its depth should be interpreted as an indication of the extent of the underlying economic problems in the region. Instead, we believe that a much more moderate adjustment would have been possible had appropriate steps been taken in the early stages of the crisis.

We have stressed the role of financial panic to make several points of significance for policy analysis. First, capital markets are subject to multiple equilibria. Second, credit collapses such as those in Asia are not simply the end of socially destructive bubbles but also (or even mainly) result in the destruction of socially productive output. Third, because of the vulnerability to panic in international markets, there may be a role for an international lender of last resort. Fourth, because of the possibility of panic, small events can have large consequences (as in the epigraph at the start of the paper). In particular, abrupt actions by domestic and international policymakers can gravely worsen an incipient crisis, by helping to trigger capital outflow.

This paper has not addressed several highly pertinent issues in the Asian crisis, which are left for a companion paper and future work. First, can we say more about the balance between socially productive and unproductive investments in Asian in the run-up to the crisis? This involves a detailed look at the sectoral allocation of credit and investment. Second, do the moral hazards that result from IMF-led bailouts undermine the broad social value of such operations? In particular, did the Mexican bailout help to prepare the base for the subsequent Asian crisis? Third, how should an

incipient financial crisis, centered on weak banks, be managed in order to avoid inciting a financial panic? When and how should bad banks be closed? Fourth, can orderly workout mechanisms (e.g., rollover negotiations directly between creditors and debtors, as in the case of Korea) substitute for IMF loans, or are loans and orderly workouts in fact complementary actions? Fifth, what should be done now in Asia, especially in view of the decapitalization of banks throughout the region, which is hindering production and trade finance throughout the region? Sixth, what institutional steps could be taken in the future to reduce the likelihood of financial crises of this sort? Is there a case for controls on short-term capital movements, and if so, should these be applied country by country or also through international mechanisms?

Appendix

Summaries of IMF Executive Board discussions on Indonesia, Korea, and Thailand follow.

Indonesia: Board Discussion, July 1996. “The Board strongly endorsed the authorities’ aim to reduce broad money growth in 1996. Directors agreed with the authorities’ emphasis on maintaining an open capital account and welcomed the steps already taken to widen the exchange-rate band and give greater flexibility to exchange rate policy. . . .

“In the Board’s view, further substantial reforms, including financial sector reforms and the development of a strong capital market, were essential for maintaining rapid, sustained growth. Directors urged the authorities to address weaknesses in the banking sector, and in particular to act decisively to resolve the problem of insolvent banks and recover non-performing loans. They considered these actions as critical to reduce the vulnerability of the economy to shocks and to lessen moral hazard.”

Korea: Board Discussion, November 1996. “In their discussion, Directors welcomed Korea’s continued impressive macroeconomic performance: growth had decelerated from the unsustainably rapid pace of the previous two years, inflation had remained subdued notwithstanding some modest pickup in the months prior to the consultation, and the widening of the current account deficit largely resulted from a temporary weakening of the terms of trade.

“Directors praised the authorities for their enviable fiscal record and suggested that fiscal policy could best contribute to strengthening medium-term macroeconomic performance by maintaining a strong budgetary position as much-needed spending on social overhead capital was under-

taken. They also welcomed the recent acceleration of capital account liberalization; although some Directors agreed with the authorities' gradual approach to capital market liberalization, a number of Directors considered that rapid and complete liberalization offered many benefits at Korea's stage of development."

Thailand: Board Discussion, July 1996. "Directors strongly praised Thailand's remarkable economic performance and the authorities' consistent record of sound macroeconomic fundamentals. They noted that financial policies had been tightened in 1995 in response to the widening of the external current account deficit and the pickup of inflation, and this had begun to bear results, but they cautioned that there was no room for complacency. . . .

"The recent increase in the current account deficit had increased Thailand's vulnerability to economic shocks and adverse shifts in market sentiment. On the one hand, Directors noted, economic fundamentals remained generally very strong, characterized by high saving and investment, a public sector surplus, strong export growth in recent years, and manageable debt and debt-service returns. On the other hand, the level of short-term capital inflows and short-term debt were somewhat high. Also, the limitations of present policy instruments constrained the authorities' ability to manage shocks. Caution in the use of foreign saving was warranted, Directors observed, and early action was required to reduce the current account deficit. While fiscal policy could play a role in the short term, over the medium term the emphasis should be on measures to increase private saving."

References

- Akerlof, George, and Paul Romer. 1994. Looting: The economic underworld of bankruptcy for profit. NBER Working Paper no. 1869. Cambridge, Mass.: National Bureau of Economic Research, April.
- Bank for International Settlements (BIS). 1998. The maturity, sectoral, and nationality distribution of international bank lending. Basel: Bank for International Settlements, January.
- Blanchard, Olivier, and Mark Watson. 1982. Bubbles, rational expectations, and financial markets. In *Crises in the economic and financial structure*, ed. Paul Wachtel. Lexington, Mass.: Lexington.
- Cline, William R., and Kevin J. S. Barnes. 1997. Spreads and risks in emerging markets lending. Institute of International Finance Research Paper no. 97-1. Washington, D.C.: Institute of International Finance, November.
- Diamond, Douglas, and Phillip Dybvig. 1983. Bank runs, liquidity, and deposit insurance. *Journal of Political Economy* 91:401-19.
- Friedman, Milton, and Anna Schwartz. 1963. *A monetary history of the United States, 1867-1960*. Princeton, N.J.: Princeton University Press.

- Institute of International Finance (IIF). 1998. Capital flows to emerging market economies. Washington, D.C.: Institute of International Finance, 29 January.
- International Monetary Fund (IMF). 1997a. *Annual report*. Washington, D.C.: International Monetary Fund.
- . 1997b. Philippines: Recent economic developments. Staff Country Report no. 97/28. Washington, D.C.: International Monetary Fund, April.
- . 1997c. *World economic outlook*. Washington, D.C.: International Monetary Fund, October.
- . Various issues. *International financial statistics*. Washington, D.C.: International Monetary Fund.
- Kindleberger, Charles. (1978) 1996. *Manias, panics, and crashes: A history of financial crises*, 3d ed. New York: Wiley.
- Krugman, Paul. 1979. A model of balance of payments crises. *Journal of Money, Credit, and Banking* 11:311–25.
- . 1994. The myth of Asia's miracle. *Foreign Affairs* 73, no. 6 (November/December): 62–78.
- . 1998. What happened to Asia? Cambridge: Massachusetts Institute of Technology, January. Unpublished manuscript.
- McLeod, Ross. 1997. On causes and cures for the rupiah crisis. *Bulletin of Indonesian Economic Studies* 33, no. 3 (December): 35–52.
- Park, Yung Chul. 1996. East Asian liberalization, bubbles, and the challenges from China. *Brookings Papers on Economic Activity*, no. 2:357–71.
- Radelet, Steven. 1995. Indonesian foreign debt: Headed for a crisis or financing sustainable growth? *Bulletin of Indonesian Economic Studies* 31, no. 3 (December): 39–72.
- . 1996. Measuring the real exchange rate and its relationship to exports: An application to Indonesia. HIID Discussion Paper no. 529. Cambridge, Mass.: Harvard Institute for International Development, May.
- Radelet, Steven, and Jeffrey Sachs. 1998. The East Asian financial crisis: Diagnosis, remedies, prospects. *Brookings Papers on Economic Activity*, no. 1:1–74.
- Sachs, Jeffrey. 1995. Do we need an international lender of last resort? Paper presented as Frank D. Graham Lecture, Princeton University, April.
- Sachs, Jeffrey, Aaron Tornell, and Andrés Velasco. 1996. Financial crises in emerging markets: The lessons from 1995. *Brookings Papers on Economic Activity*, no. 1:147–98.
- Sugisaki, Shigemitsu. 1998. Economic crises in Asia. Address to the Harvard Asia Business Conference, Harvard Business School, 30 January. Available at <http://www.imf.org/external/np/speeches/1998/013098.htm>.

Comment Frederic S. Mishkin

The paper by Radelet and Sachs is a very useful discussion of the events in the East Asian financial crises. In my comment, I will present my own view of the East Asian crisis using an asymmetric information framework

Frederic S. Mishkin is the A. Barton Hepburn Professor of Economics at the Graduate School of Business, Columbia University, and a research associate of the National Bureau of Economic Research.

Any views expressed in this comment are those of the author only and not those of Columbia University or the National Bureau of Economic Research.

outlined in Mishkin (1996, 1997) that applies not only to the East Asian crisis but also to earlier crises such as those in Mexico in 1994–95 and Chile in 1982. The asymmetric information analysis of the East Asian crisis has many elements in common with the Radelet and Sachs discussion, but it has a somewhat different emphasis and a tighter focus. Using this framework, I sometimes find agreement with the views on policy expressed by Radelet and Sachs but also come to some different conclusions.

An Asymmetric Information View of the East Asian Crisis

An asymmetric information view of financial crises defines a financial crisis to be a nonlinear disruption to financial markets in which the asymmetric information problems of adverse selection and moral hazard become much worse, so that financial markets are unable to efficiently channel funds to those who have the most productive investment opportunities. In most financial crises, and particularly in the East Asian crisis, the key factor that causes asymmetric information problems to worsen and launch the financial crisis is a deterioration in balance sheets, particularly those in the financial sector. This perspective suggests that microeconomic factors are the root causes of the crisis, and it should therefore not be surprising that as Radelet and Sachs point out, it was very hard to predict this type of crisis from the macroeconomic factors many market analysts and economists typically focus on. It also suggests that successful resolution of the crisis dictates a focus on fixing microeconomic rather than macroeconomic fundamentals.

The key initiating factor in the East Asian crisis was financial liberalization resulting in the lending boom documented in the Radelet-Sachs paper. Once restrictions are lifted on both interest rate ceilings and the type of lending allowed, lending will surely increase. The problem is not that lending expands but that it expands so rapidly that excessive risk taking is the result, with large losses on loans in the future. There are two reasons that excessive risk taking takes place after financial liberalization. The first is that managers of banking institutions often lack the expertise to manage risk appropriately when new lending opportunities open up after financial liberalization. In addition, with rapid growth of lending, banking institutions cannot add the necessary managerial capital (well-trained loan officers, risk assessment systems, etc.) fast enough to enable these institutions to screen and monitor these new loans appropriately.

The second reason that excessive risk taking occurs is the inadequacy of the regulatory and supervisory system. Even if there is no explicit government safety net for the banking system, there clearly is an implicit safety net that creates a moral hazard problem. Depositors and foreign lenders to the banks, knowing that there are likely to be government bailouts to protect them, have little incentive to monitor banks, with the result that these institutions have an incentive to take on excessive risk by aggres-

sively seeking new loan business. In order to prevent this moral hazard problem, adequate government regulation needs to be in place to restrict excessive risk taking. Such measures include the adoption of adequate accounting and legal standards, disclosure requirements, restrictions on certain holdings of assets, and capital standards. Adequate government supervision is also needed in order to monitor compliance with the regulations and to assess whether the proper management controls are in place to limit risk.

Emerging market countries, and particularly those in East Asia, are notorious for weak financial regulation and supervision. When financial liberalization yields new opportunities to take on risk, these weak regulatory and supervisory systems cannot limit the moral hazard created by the government safety net, and excessive risk taking is the result. This problem is made even more severe by the rapid credit growth in the lending boom, which stretches the resources of bank supervisors. Bank supervisory agencies are also unable to add to their supervisory capital (well-trained examiners and information systems) fast enough to enable them to keep up with their increased responsibilities both because they have to monitor new activities of the banks and because these activities are expanding at a rapid pace.

Capital inflows can make this problem even worse. Once financial liberalization is adopted, foreign capital flows into banks in emerging market countries because it earns high yields but is likely to be protected by a government safety net, whether it is provided by the government of the emerging market country or by international agencies such as the IMF. The result is that capital inflows can fuel a lending boom, which leads to excessive risk taking on the part of banks. Folkerts-Landau et al. (1995), for example, find that emerging market countries in the Asia Pacific region with large net private capital inflows also experienced large increases in their banking sectors.

The outcome of the lending boom arising after financial liberalization is huge loan losses and a subsequent deterioration of bank balance sheets. The deterioration in bank balance sheets is the key fundamental that drives emerging market countries into their financial crises, and this was particularly true for East Asia. It does this in two ways. First, the deterioration in the balance sheets of banking firms can lead them to restrict their lending in order to improve their capital ratios or can even lead to a full-scale banking crisis that forces many banks into insolvency, thereby directly removing the ability of the banking sector to make loans.

Second, the deterioration in bank balance sheets can promote a currency crisis because it becomes very difficult for the central bank to defend its currency against a speculative attack. Any rise in interest rates to keep the domestic currency from depreciating has the additional effect of weakening the banking system further because the rise in interest rates hurts

bank balance sheets. This negative effect of a rise in interest rates on bank balance sheets occurs because of their maturity mismatch and their exposure to increased credit risk when the economy deteriorates. Thus, when a speculative attack on the currency occurs in an emerging market country, if the central bank raises interest rates enough to defend the currency, the banking system may collapse. Once investors recognize that a country's weak banking system makes it less likely that the central bank will take the steps to successfully defend the domestic currency, they have even greater incentives to attack the currency because expected profits from selling the currency have now risen. Thus, with a weakened banking sector, a successful speculative attack is likely to materialize and can be triggered by any of many factors, a large current account deficit being just one of them. In this view, the deterioration in the banking sector is the key fundamental that causes the currency crisis to occur.

Two special institutional features of credit markets in emerging market countries explain why a devaluation in the aftermath of the currency crisis then helps to trigger a full-fledged financial crisis. Because of past experience with high and variable inflation rates these countries have little inflation-fighting credibility, and debt contracts are therefore of very short duration and are often denominated in foreign currencies. This structure of debt contracts is very different from that in most industrialized countries, which have almost all of their debt denominated in domestic currency, with much of it long term, and it explains why there is such a different response to a devaluation in emerging market countries than there is in industrialized countries.

There are three mechanisms through which a currency crisis causes a financial crisis to occur in emerging market countries. The first involves the direct effect of currency devaluation on the balance sheets of firms. With debt contracts denominated in foreign currency, when there is a devaluation of the domestic currency the debt burden of domestic firms increases. On the other hand, since assets are typically denominated in domestic currency, there is no simultaneous increase in the value of firm assets. The result is that a devaluation leads to substantial deterioration in firm balance sheets and a decline in net worth, which, in turn, worsens the adverse selection problem because effective collateral has shrunk, thereby providing less protection to lenders. Furthermore, the decline in net worth increases moral hazard incentives for firms to take on greater risk because they have less to lose if the loans go sour. Because lenders are now subject to much higher risks of losses, there is now a decline in lending and hence a decline in investment and economic activity. The damage to balance sheets from devaluation in the aftermath of the foreign exchange crisis is a major source of the contraction of the economies in East Asia, as it was in Mexico in 1995.

A second mechanism linking currency crises with financial crises in

emerging market countries is that devaluation can lead to higher inflation. Because many emerging market countries have previously experienced both high and variable inflation, their central banks are unlikely to have deep-rooted credibility as inflation fighters. Thus a sharp depreciation of the currency after a speculative attack that leads to immediate upward pressure on prices can lead to a dramatic rise in both actual and expected inflation. Indeed, Mexican inflation surged to 50 percent in 1995 after the foreign exchange crisis in 1994, and we have seen a similar phenomenon in East Asian countries such as Indonesia. A rise in expected inflation after the currency crisis exacerbates the financial crisis because it leads to a sharp rise in interest rates. The interaction of the short duration of debt contracts and the interest rate rise leads to huge increases in interest payments by firms, thereby weakening their cash flow positions and further weakening their balance sheets. Then, as we have seen, both lending and economic activity are likely to undergo sharp declines.

A third mechanism linking financial crises and currency crises arises because the devaluation of the domestic currency can lead to further deterioration in the balance sheets of the banking sector, provoking a large-scale banking crisis. In emerging market countries, banks have many liabilities denominated in foreign currency, which increase sharply in value when a depreciation occurs. On the other hand, the problems of firms and households mean that they are unable to pay their debts, also resulting in loan losses on the asset side of bank balance sheets.¹ The result is that bank balance sheets are squeezed from both the asset and liability sides, and the net worth of banks therefore declines. An additional problem for banks is that much of their foreign-currency-denominated debt is very short term, so that the sharp increase in the value of this debt leads to liquidity problems for them because this debt needs to be paid back quickly. The result of the further deterioration in bank balance sheets and their weakened capital base is that they cut back lending. In the extreme case in which the deterioration of bank balance sheets leads to a banking

1. An important point is that even if banks have matched portfolios of foreign-currency-denominated assets and liabilities and so appear to avoid foreign exchange market risk, a devaluation can nonetheless cause substantial harm to bank balance sheets. The reason is that when a devaluation occurs, the offsetting foreign-currency-denominated assets are unlikely to be paid off in full because of worsening business conditions and the negative effect that these increases in the value in domestic currency terms of these foreign-currency-denominated loans have on the balance sheets of borrowing firms. Another way of saying this is that when there is a devaluation, the mismatch between foreign-currency-denominated assets and liabilities on borrowers' balance sheets can lead them to default on their loans, thereby converting a market risk for borrowers into a credit risk for the banks that have made foreign-currency-denominated loans. Garber and Lall (1996) have pointed out that even with a matched book on their balance sheets, banks may also be exposed to foreign exchange risk because of their use of derivatives, as occurred for Mexican banks during the tequila crisis.

crisis that forces many banks to close their doors, thereby directly limiting the ability of the banking sector to make loans, the effect on the economy is even more severe.

The bottom line from this asymmetric information analysis is that the East Asian financial crisis is the result of a collapse in both financial and nonfinancial firm balance sheets that makes asymmetric information problems worse. The result is that financial markets are no longer able to channel funds to those with productive investment opportunities, which then leads to a severe economic contraction.

Much of the story that I have outlined here is consistent with the discussion in the Radelet-Sachs paper. However, the authors put much more emphasis on multiple equilibria as a key factor in the East Asian financial crisis. I find that the multiple-equilibrium view can be highly dangerous when it is put in the wrong hands. Too much emphasis on the multiple-equilibrium story often gives credence to the view that the crisis is not due to policy mistakes, thereby encouraging politicians in these countries to put the blame for the crisis on everyone but themselves.

The view I have presented suggests that the crisis in East Asia was indeed due to serious policy mistakes. I agree with Radelet and Sachs that it is hard to find a smoking gun in the macroeconomic fundamentals of these countries and so the source of the crisis was unlikely poor macroeconomic policies. Indeed, the market's focus on *macroeconomic* fundamentals is one reason why the crisis in East Asia came as such a surprise. However, the story I have told sees the crisis as the result of *microeconomic* policy mistakes. Problems in the financial sectors of these countries, which resulted from poor regulatory and supervisory structures, were the key fundamental driving the crisis. Clearly, politicians in these countries were to blame for allowing the financial sector to get into the mess it was in before the crisis, and allowing them to escape accountability for the crisis, which the stress on multiple equilibria often does, may mean that they are less likely to put policies into place that will help to resolve the crisis.

To be clear, I do not want to give the impression that the multiple-equilibrium story is nonsense. I believe it is a valuable line of thinking that can help us to understand the dynamics of currency and financial crises. Indeed, the presence of multiple equilibria is consistent with the asymmetric information story I have outlined because an attack on a currency that leads to a devaluation does help trigger financial crisis. Thus, without the speculative attack, the bad equilibrium with a financial crisis does not have to occur. Furthermore, the exact date when an attack occurs may be quite random, just as the multiple-equilibrium view suggests. However, the likelihood of a successful speculative attack and a subsequent financial crisis is driven by fundamentals. Given the initial state of the financial sector in the crisis countries, the financial crisis was inevitable: the only

question was when it would occur and the multiple-equilibrium view provides us with the useful insight that the timing may have been unpredictable.

Policy Implications for Crisis Resolution

The asymmetric information view of the East Asian financial crisis provides some broad principles for steps to resolve this type of crisis. First, it suggests that the underlying reasons for these crises are microeconomic rather than macroeconomic. This suggests that a focus on microeconomic policies is likely to be the best way to resolve these crises. The asymmetric information view also suggests three principles that should guide resolution of these crises: (1) The financial system needs to be restarted so that it can resume its job of channeling funds to those with productive investment opportunities. (2) Balance sheets of financial and nonfinancial firms need to be restored so that asymmetric information problems lessen. (3) An adequate regulatory and supervisory system needs to be put in place in order to limit the moral hazard created by intervention to resolve the crisis, whether by the domestic government or by international organizations.

These principles are useful in thinking about the role of international organizations such as the IMF in helping to resolve crises like the ones we have experienced recently in Mexico and East Asia. In order to follow the first principle and quickly restart a financial system in a country, a lender of last resort is typically needed to restore liquidity to the financial sector. In industrialized countries, central banks can typically perform this lender-of-last-resort function well. However, there are reasons why the ability of a central bank in an emerging market country to take on this role is very limited. Central bank lending to the financial system in the wake of a financial crisis requires the expansion of domestic credit, which, because of weak credibility in an emerging market country, might arouse fears that inflation will spiral out of control. When inflation expectations rise, interest rates will rise and the exchange rate will depreciate. Thus, as we have seen above, cash flow and balance sheets can deteriorate further, potentially making the financial crisis even worse.

The above argument suggests that an outside entity—a large rich country such as the United States or an international agency such as the IMF—may be needed as a lender of last resort. The broad principles outlined above suggest what elements would be part of a successful international lender-of-last-resort operation to restart the financial system in a crisis country. The first principle implies an important element for success of a lender-of-last-resort operation is that it restore confidence in the financial system. Not only is the liquidity supplied by the lender of last resort necessary for this goal, but confidence that financial institutions will not go on taking excessive risk is also essential. This implies that steps to beef up the

regulatory and supervisory systems in crisis countries can play a useful role in restoring confidence and resolving crises. Insistence by the international lender of last resort on these steps as a condition for its lending can thus be an important part of making its operation successful.

The second principle indicates that resolution of a financial crisis requires a restoration of the balance sheets of both financial and nonfinancial firms. Restoration of balance sheets of nonfinancial firms requires a well-functioning bankruptcy law that enables the balance sheets of these firms to be cleaned up so they can regain access to credit markets. Restoration of balance sheets of financial firms may require the injection of public funds so that healthy institutions can buy the assets of insolvent institutions, but it also needs the creation of entities like the Resolution Trust Corporation in the United States, which can sell assets of failed institutions and get them off the books of the banking sector. International organizations can help in this process by sharing their expertise and by encouraging the governments in crisis countries to take steps to create a better legal structure and better resolution process for failed financial institutions.

The third principle indicates that it is necessary to limit the moral hazard created by intervention to resolve the crisis, whether by the domestic government or an international organization. This moral hazard can be limited by the usual elements of a well-functioning regulatory and supervisory system: punishment of the managers and stockholders of insolvent financial institutions, adequate disclosure requirements, adequate capital standards, prompt corrective action, careful monitoring of risk and institutions' risk management procedures, and monitoring of financial institutions to enforce compliance with the regulations. Because an international lender of last resort has so much leverage, it can use it to encourage adoption of these elements by emerging market countries, thereby limiting the moral hazard problem created by its intervention.

The bottom line of the discussion here is that an international lender of last resort may be needed to limit the damage from financial crises of the type that have recently been experienced in East Asia. However, in order for the international lender-of-last-resort role to be successful, it needs to focus on the microeconomics of financial markets in the crisis countries and impose strong conditionality on its lending in order to encourage governments in these countries to take the steps that will make a financial crisis less likely in the future. This leaves me in fundamental disagreement with the position outlined in Feldstein (1998): the asymmetric information framework for analyzing financial crises suggests that conditionality on microeconomic issues is a valid and necessary element of IMF intervention.

The analysis here also suggests that macroeconomic policies should not be emphasized as a solution to financial crises. The Radelet-Sachs paper

criticizes the IMF for its so-called austerity program for the East Asian countries. What are the right set of macroeconomic policies to pursue when a currency crisis develops is not absolutely clear, and this is currently a hot topic of debate. Regardless of what the right macro policies are, I think there are two reasons for deemphasizing them in coming up with a plan to limit financial crises in emerging market countries.

First is that the fundamentals driving the crises have been primarily micro, not macro. Thus macro policies are unlikely to resolve the crises. Second is that a focus on austerity programs is likely to be a political disaster. Politicians are prone to avoid dealing with the hard issues of appropriate reform of their financial systems, and this is particularly true in East Asia where many politicians' close friends, and even families, have much to lose if the financial system is reformed properly. Austerity programs allow these politicians to label the international lender of last resort, the IMF in the East Asian case, as antigrowth and even anti-Asian. This can help the politicians to mobilize the public against the international lender of last resort and avoid doing what they really need to do to reform the financial systems in their countries. With conditionality focused on microeconomic policies, there is a greater likelihood that the international lender of last resort will be seen as a helping hand that aids the emerging market country by assisting it in creating a more efficient financial system. An international lender of last resort is more likely to succeed if it is perceived as a proponent of tough love rather than abuse.

References

- Feldstein, M. 1998. Refocusing the IMF. *Foreign Affairs* 77 (March/April): 20–33.
- Folkerts-Landau, D., G. J. Schinasi, M. Cassard, V. K. Ng, C. M. Reinhart, and M. G. Spencer. 1995. Effect of capital flows on the domestic financial sectors in APEC developing countries. In *Capital flows in the APEC region*, ed. M. S. Khan and C. M. Reinhart, 31–57. Washington, D.C.: International Monetary Fund.
- Garber, P. M., and S. Lall. 1996. The role and operation of derivative markets in foreign exchange crises. February. Mimeograph.
- Mishkin, F. S. 1996. Understanding financial crises: A developing country perspective. In *Annual World Bank conference on development economics 1996*, ed. Michael Bruno and Boris Pleskovic, 29–62. Washington, D.C.: World Bank.
- . 1997. The causes and propagation of financial instability: Lessons for policymakers. In *Maintaining financial stability in a global economy*, ed. Craig Hakio, 55–96. Kansas City: Federal Reserve Bank of Kansas City.

This Page Intentionally Left Blank

Is Launching the Euro Unstable in the Endgame?

Robert P. Flood and Peter M. Garber

Recent analyses of the transition to European Economic and Monetary Union (EMU) have emphasized technical problems in the conversion ratios of currencies into the euro at the start of Stage III. Restrictions on bilateral conversion rates imply that they must be the same as market bilateral rates at the end of Stage II. From this fact has come a conclusion that exchange markets may generate volatility, speculative attacks, or even indeterminacy of exchange rates on the last day of Stage II. We show in this paper that concern over these technical issues per se, as an additional source of exchange market volatility, is a red herring: euro payment institutions that begin operating at the outset of Stage III make it easy for “in” central banks to establish any desired bilateral conversion ratios for their currencies. As long as Stage III itself is viable at the outset—a premise of the discussion—“in” central banks are formidably armed to impose desired conversion ratios within the restrictions. All discussion of the conversion problem presumes that Stage III will be viable. Otherwise, the notion that exchange rates are locked on 1 January 1999 is not valid. We also will presume that the irrevocable fixed rates will not be revoked on 1 January 1999 (or more accurately by the time the payments systems close on 4 January, the first business day of the year) and that the institutions will work as designed at the start of Stage III.

Moreover, the exchange rate models of monetary policy used to derive implications of increased volatility are quite narrow. Models that more accurately capture central bank operating policy in practice do not gener-

Robert P. Flood is senior economist at the International Monetary Fund. Peter M. Garber is professor of economics at Brown University and a research associate of the National Bureau of Economic Research.

ate problems with controlling exchange rate volatility in the transition to Stage III, as we show in section 5.3.

5.1 The Endgame Problem

The endgame of Stage II of the EMU is a period of great potential exchange rate instability. Uncertainty about final bilateral conversion factors of “in” country currencies and the market value of the euro and the ECU at the end of Stage II creates a pressure cooker for speculation after the “in” countries emerge. Various schemes for monetary cooperation and exchange rate policies have been proposed, ranging from tight bands, to progressively narrowing bands, to early operations of the European Central Bank (ECB) to enforce monetary cooperation.¹

Atop this general speculative environment, Obstfeld (1997a, 1997b), De Grauwe (1997), and De Grauwe and Spaventa (1997), among others, have emphasized a technical feature of the transition to Stage III that adds to the endgame instabilities. The Maastricht treaty requires that the conversion rates of individual “in” currencies into the euro announced on 1 January 1997 do not, of themselves, cause a jump in the ECU from its market value on 31 December 1998. The Madrid Council decision requires that on 1 January 1999, the conversion rates of the “in” currencies into the euro be such that one euro equals one ECU. Obstfeld (1997a, 1997b) shows that either of these requirements implies that the irrevocable bilateral conversion rates between “in” country currencies announced on 1 January 1999 must equal the market bilateral exchange rates at the close of business on 31 December 1998.

From this fact of arithmetic, Obstfeld (1997a) and De Grauwe (1997) infer additional problems for the transition. First, transient disturbances that are still contained in market exchange rates on 31 December 1998 will be locked forever in the bilateral conversion rates when the market rates are ratified by Stage III policy on 1 January 1999. Even a one-day transitory shock on 31 December 1998 will be permanently impounded in bilateral conversion rates, as stabilizing speculation will not soften the disturbance’s permanent impact. Indeed, any arbitrary exchange rates established by the markets will be made permanent, and this can generate tremendous volatility on the last day of Stage II.²

A facile answer to this endgame volatility is to manage the exchange

1. See Obstfeld (1997a) for a list of these proposals.

2. There is a difference of opinion between Obstfeld and De Grauwe over whether this volatility constitutes an indeterminacy problem among multiple equilibria. Obstfeld claims that there is an “especially severe risk on Dec 31 of an attack” since “speculators know that bilateral exchange rates must be maintained in Stage 3.” The “in” central banks may have to intervene in large amounts, but if their willpower fails there is a chance for a large speculative gain.

rate leading into 31 December 1997 with a hard peg at some mutually agreed set of bilateral rates by close of business. Indeed, to head off speculation about the bilateral conversion rates, the potential members of the European System of Central Banks (ESCB) have agreed that the intended bilateral rates will be announced simultaneously with the announcement of the "in" countries in May 1998. Such pegs, however, are subject to attack if speculators doubt that "in" central banks will conduct a near-in defense without limit. The attack may occur on or before 31 December 1997. Moreover, there is a moral hazard problem: a central bank may gain competitive advantage from a last-minute depreciation of its currency and reduce the real value of its debt. This may undermine the monetary cooperation needed to sustain preprogrammed bilateral exchange rates.

Taken together, the conversion constraints imposed by Maastricht and Madrid add to the potential volatility already inherent in exchange markets between the selection time of EMU members and the start of Stage III. Various proposals have aimed at controlling the problems imposed by these constraints. Obstfeld (1997a) states that it is rash to assume that monetary coordination will begin among independent central banks before the ECB is given control; he proposes a start-up in the ECB's powers of central monetary control prior to the start of Stage III.³

5.2 The Stage III Payments System Obviates the Conversion Problem

In the context of the 31 December 1998 exchange market, Obstfeld's (1997a) proposal to move the operations of the ESCB forward into Stage II already has implicitly been implemented in one vital aspect.⁴ The TARGET payments system will begin operation on 4 January 1999, the first business day of Stage III. Payments among "in" countries will be made through the operating procedures of TARGET. Such payments include those in settlement of foreign exchange transactions made two business days earlier and forward exchange transactions with a 4 January 1999 value date. Thus any exchange market intervention by an "in" country on 31 December 1998 or, indeed, on 30 December 1998 to establish agreed bilateral exchange rates will be settled through TARGET. We will show

3. This problem was at least partly addressed by the agreement to announce bilateral conversion rates in May 1998.

4. In an extensive update of his original paper, Obstfeld (1997b) incorporates the two basic points of an early draft of our current paper: (1) the details of TARGET system operations are a key element in making credible unlimited intervention in support of the selected bilateral exchange rates prior to 1 January 1999, and (2) forward intervention with maturity after 1 January 1999 by "in" central banks can be used in unlimited amounts to stabilize bilateral rates at desired levels by "in" central banks between May 1998 and 31 January 1999. By continuing to center his paper around the technical requirement of maintaining the bilateral exchange rate between 31 December 1998 and 1 January 1999, however, he ignores the implication of points 1 and 2: the endgame bilateral conversion restrictions are an irrelevant distraction.

that the unlimited inter-central-bank credit facilities of TARGET in fact realize the ability of a central bank to intervene without limit on 31 December and constitutes a de facto reach-back into Stage II of the operations of the ESCB. Thus the conversion restrictions add no operational problem to the start-up of Stage III because “in” central banks can unquestionably establish whatever exchange rates they agree upon on 31 December. Focusing on these technical start-up conditions throws an irrelevancy into the discussion.

EMU is intended to remove the costs that are perceived from currency transactions between members of the European Union and to create a currency area on a scale that can generate liquidity comparable to that in the U.S. dollar zone. Equally important, EMU, once completed, is expected to eliminate the possibility of a speculative attack of the sort that crippled the Exchange Rate Mechanism (ERM).

At the start of Stage III on 1 January 1999, the major currencies of those countries that join will have “irrevocably” locked exchange rates. National currencies will continue to exist until 2002, and commercial bank deposits can still be denominated in national currencies, although euro-denominated accounts will also be available. By 2002, the individual currencies—French francs, deutsche marks, and so forth—will disappear and be replaced by a circulating paper euro. In addition, two key institutions will become operational at the start of Stage III—the European System of Central Banks led by the European Central Bank and TARGET, the large-value cross-border euro electronic payments system.

5.2.1 The Structure of the European System of Central Banks

The ESCB will be a combination of the national central banks, such as the Banque de France and the Bundesbank, under the coordination of the ECB, but key central banking functions and operations will be performed by the still-existing national central banks.⁵ Monetary policy will be controlled by the ECB—that is, the setting of reserve requirements, discount rates, and foreign exchange policy; open market intervention; and so on. The ECB will have its own balance sheet and capital.

Nevertheless, the national central banks will retain their identities. In particular, each national central bank will operate its own national large-value payments system and have its own balance sheet and capital. The profits (and losses) on monetary operations of the ECSB will be distributed to the national central banks in proportion to their shareholdings in the ECB. In turn, national central banks can pass these profits through to their respective national governments as in current practice.

5. The discussion in this subsection and the next on TARGET is taken from Garber (1998).

5.2.2 Some Operational Details of TARGET

When it goes on line at the start of Stage III, the TARGET payments system will provide the interface between national payments systems and will not replace them.⁶ Euro payments originating in one country will be delivered one for one nearly instantly as euros in another country. The cross-border euro payment can then emerge as a commercial bank deposit denominated either in euros or, after fixed rate conversion, in the national currency. An understanding of some operational rules of TARGET is important: individual national central banks strictly adhering to them will freely provide unlimited credit to each other so that speculators will have no chance to profit by attacking and breaking the Stage III locked exchange rates.⁷

TARGET will effect large-value payments in the euro, the new common currency. TARGET is designed, according to the current risk control practice of most industrial country central banks, as a real-time gross settlement (RTGS) system. In such a system, final settlement of a payment is made almost simultaneously with the transmission of a payment message during the day. Therefore, the sender of the payment must have central bank money available at the time that the payment order is sent—otherwise, the payment is blocked.

Standard European RTGS systems allow a bank to overdraw its central bank account to make payments during the day provided that the overdrafts are collateralized by acceptable paper such as the securities of the national government.

The TARGET system will work as follows. As a first example, suppose that a payment is made in euros or French francs from one commercial bank to another in France. Both banks will have accounts at the Banque de France and will transmit payments across the national system. Payments will be settled by instantaneously transferring funds across bank deposit accounts at the Banque de France.

Second, suppose that a euro payment is made from a bank in France to a bank in Germany. The French bank will send a payment message over the French national system. The payment order will be channeled automatically through Banque de France software that will subtract the amount from the Banque de France account of the French bank and process the payment order onward through the TARGET system to the Bundesbank. In turn, on receiving confirmation that euro funds are available

6. TARGET stands for *Trans-European Automated Real-Time Gross Settlement Express Transfer*.

7. For the purposes of this paper we will make the standard assumption used by mainly European researchers on the EMU that Stage III is unassailable. Garber (1998) explores the issue of how the TARGET system might transmit and exacerbate a Stage III crisis.

in the Banque de France account of the sending bank, the Bundesbank will increment the account of the German bank one to one with euros.

Thus a euro payment will be settled almost instantaneously across borders. If in Stage III the cross-border payment from the French bank is denominated in deutsche marks, it will still be transmitted across the books of the central banks as euros but it will be credited as a deutsche mark deposit by the German bank on receipt. Such payments from the internal currency of one country to that of another now generally require the standard two-day wait in the exchange market through the use of two unconnected, parallel national payment systems.

Accounts can balance after this cross-border transaction because credit has been given by the Bundesbank to the Banque de France in settling the payment. The funds made available to the receiving bank in Germany are instantaneous and irrevocable; the funds that are deducted from the French bank are funds in an account at the Banque de France; so the Banque de France has incurred a "due to" to the Bundesbank. This will be accounted by incrementing the Bundesbank's bilateral correspondent (or interlinking) account at the Banque de France and reducing the Banque de France's correspondent account at the Bundesbank by the same amount.

In the example in table 5.1, Paribas makes a payment of 100 euros (or the equivalent amount of deutsche marks) to Deutschebank. This alters the Banque de France and Bundesbank balance sheets as shown between panels A and B. Commercial bank deposits fall by 100 euros at the Banque de France and rise by 100 euros at the Bundesbank. The overall monetary base in euros is unchanged, but part of it has migrated to Germany. This is accomplished instantly through an automatic credit from the Bundesbank to the Banque de France of 100 euros.⁸

In this regard, TARGET operation is not remarkable and differs little from, for example, the U.S. Federal Reserve's Fedwire system (based on Summers 1994). In the Federal Reserve system, daily imbalances between district Federal Reserve banks—that is, imbalances that arise when interbank payments cross district lines—are cleared by incrementing the claims of district Feds with net payment inflows against the Interdistrict Settlement Account. Claims against this account by district Feds with net payment outflows are reduced. This process is repeated on each succeeding business day. The cumulated claims against or obligations to the Interdistrict Settlement Account are settled once per year in April with the redistribution of gold certificates from district Feds with negative

8. The negative balance in the Banque de France's interlinking account at the Bundesbank is in accord with the European Monetary Institute's (1997) description of TARGET accounting. Peter Kenen has pointed out that this document is erroneous and that the item should appear as a "due from" Banque de France in the Bundesbank's asset column (see Kenen's comment on this chapter).

Table 5.1 Cross-Border Payment on TARGET

Banque de France			Bundesbank			
Assets		Liabilities	Assets		Liabilities	
<i>A. Initial Central Bank Balance Sheets (euros)</i>						
French government securities	400	0	Due to Bundesbank	Loans to German banks	400	0
		400	French bank deposits			400
						Due to Banque de France
						German bank deposits
<i>B. Central Bank Balance Sheets after Paribas Pays 100 Euros to Deutschebank</i>						
French government securities	400	100	Due to Bundesbank	Loans to German banks	400	-100
		300	French bank deposits			500
						Due to Banque de France
						German bank deposits

cumulated net payment positions to those with positive positions. Settlement in the Federal Reserve system does not require the use of accounts in a third-party bank. Specifically, the Board of Governors in Washington is not a bank in itself but a regulatory body of each of the district Federal Reserve banks. Nevertheless, the Interdistrict Settlement Account is a multilateral—not a bilateral—account; claims against it are claims against the system.

If the individual national central banks freely provide credit to other national central banks, TARGET will function as planned and serve as the heartbeat of the unified currency. In this scenario, speculators will have no chance to profit by attacking the locked exchange rates of the system in the face of unlimited inter-central-bank credit. This differs from the current ERM, in which unlimited inter-central-bank credit is not available.⁹

5.2.3 A Decembrist Attack

Let us imagine that the “in” central banks attempt to establish an agreed vector of bilateral exchange rates on 31 December but that speculators launch an attack anyway. This may be a self-fulfilling crisis or the result of a large, though transitory shock on 31 December. Let us suppose that the weak currency is the French franc, and the strong currency is the deutsche mark. Speculators want to short deposits in France denominated in French francs and acquire deposits in Germany denominated in marks. The agreed bilateral rates may be defended in several ways.

1. *The Banque de France in the Breach.* The Banque de France may intervene in the spot market, selling marks for francs to whatever extent the speculators want. It does not raise interest rates or take other action. In two business days—on 5 January 1999—the Banque de France sends a payment order through the TARGET system to the Bundesbank to deliver deutsche marks to the speculators’ mark-denominated bank accounts in Frankfurt. It incurs a euro-denominated liability to the Bundesbank, accounted for by adding to the Bundesbank’s interlinking correspondent account at the Banque de France. The Bundesbank will subtract a like amount from the Banque de France’s correspondent account at the Bundesbank. The Bundesbank will have given credit, if necessary, in unlimited amounts to the Banque de France. The speculators will have to deliver French francs to the Banque de France on the same day. Where will this huge amount of francs come from? The speculators have the marks just deposited by the Bundesbank in their Frankfurt commercial bank deutsche mark accounts, so they order franc payments to the Banque de

9. For a discussion of the accounting operations involved in a defense of ERM bands through the Very Short Term Financing Facility, see Garber (1998).

France in Paris. In turn, these payments will be processed over TARGET and exactly cancel the previous payments from the Banque de France. There is no net monetary impact from these transactions.

If we believe that the institutions of Stage III operate properly, as we must if we premise the problem on the viability of the conversion exchange rates at the start of Stage III, then the “in” central banks can effortlessly establish whatever bilateral exchange rates they want on 31 December or 30 December.

Extending the argument backward, intervention need not occur only in the spot markets. Prior to 30 December, “in” central banks can intervene in the franc-mark forward markets with a value date on 4 January 1999 to establish the bilateral exchange rates they may want. Again, the operation of TARGET implicitly feeds credit backward in time to whatever moment the central banks wish to begin their interventions to establish the desired conversion rates.

2. *Moral Hazard and a Stalwart Bundesbank.* Suppose that the Banque de France suffers from a bout of moral hazard and finds a reason not to intervene against the attack on 31 December. If it is still interested in the EMU, the Bundesbank can then pick up the burden through its own intervention. Again, the payment orders cancel on 5 January 1999, although they begin in the opposite direction.

3. *Does Any Central Bank Out There Want the EMU?* Suppose that, lukewarm about making the good faith effort to get to EMU, neither the Banque de France nor the Bundesbank intervenes when faced with the 31 December attack. The National Bank of Belgium, however, is enthusiastic about EMU, so it undertakes the massive intervention—selling deutsche marks for French francs in Stage II—required to maintain the desired bilateral rates. Where does it get the resources to do this? Again, through TARGET.

Unless an “in” central bank actively undercuts the agreed bilateral exchange rates, even the smallest “in” central bank is armed through TARGET with sufficient credit resources to hold the desired bilateral exchange rates together—in all the “in” currencies—in the face of a massive speculative attack.¹⁰ It is difficult to imagine such subversion among members of the elite club, however, while still believing that Stage III will proceed as planned, which is the premise of the various analyses of the Stage II conversion and volatility problem.

10. The undercutting might take the form of an opposite intervention. Also, an “in” country that drops out of the EMU before Stage III certainly breaks the supposed provision of unlimited credit, but this violates our working assumption of a successful Stage III.

5.3 Modeling the Endgame Problem

Although TARGET operations make unassailable the fixing of bilateral exchange rates on 31 December 1998, it is useful to examine the generality of the modeling framework used to infer the added volatility problems in the Stage II–Stage III conversion restrictions. Obstfeld (1997a) concludes that the future fixing of exchange rates in Stage III can—because of the requirement to carry over bilateral exchange rates from the end of Stage II into Stage III—destabilize the exchange rate in the present. Obstfeld's conclusions arise from a special model. While we agree with the theoretical results in the context of his model, we find some aspects of the model at odds with standard central bank operating procedures. In particular, in Obstfeld's model, monetary authorities at first apparently set a monetary aggregate without regard to short-term interest rates. Then, when the date for exchange rate fixing arrives, they abandon their monetary aggregates and set the exchange rate; and by implication, they also set short-term interest rates.

Contrary to this perspective, central banks in practice implement monetary policy in a very different manner. Monetary authorities implement policy by setting short-term interest rates, though as the date for Stage III approaches, they must set them with increasing attention to exchange rates. In the model that we will lay out, there is no increase in exchange rate volatility in the transition. Indeed, with interest rate targeting, exchange rate volatility converges to zero on the verge of the switch time between Stage II and Stage III. We argue further that this alternative model better matches important institutional aspects of the money supply process and foreign exchange market.

We will first lay out Obstfeld's model and derive his conclusions about volatility. Then we will twist the model in a direction appropriate for short-term analysis. Finally, we will discuss some technical aspects of the money supply process in European countries during the transition that point in the direction of our modeling strategy rather than that adopted by Obstfeld.

5.3.1 Obstfeld's Model and His Warning

Obstfeld (1997a) adopts a flexible price model of exchange rates. The equations determining the equilibrium exchange rate are

$$(1) \quad N_t - S_t = -\alpha(i_t - i_t^*), \quad \alpha > 0,$$

$$(2) \quad i_t - i_t^* = E_t S_{t+1} - S_t,$$

$$(3) \quad N_t = \bar{N} + \varepsilon_t,$$

where N is the log of market fundamentals, S is the log of the exchange rate quoted as the domestic currency price of foreign exchange, i is the short-term domestic currency interest rate, and i^* is the short-term foreign currency interest rate. Equation (1) is an asset market equilibrium condition that may be derived, for example, from the money market. In this view, N implicitly contains variables that are important in the short-term money market: the quantity of money and other price and money demand effects such as the real exchange rate, real income, or disturbances to money demand. Equation (2) is the statement of uncovered interest rate parity. It sets the interest differential equal to the rationally expected rate of exchange rate change. Equation (3) is a simple law of motion for exchange market fundamentals. \bar{N} is a constant and ϵ_t is a mean-zero, serially uncorrelated disturbance term. The law of motion of the exchange rate is a special case of the one that Obstfeld uses, chosen both to put his warning in its sharpest relief and to simplify the algebra.

According to this model, if the exchange rate were freely flexible it would follow

$$(4) \quad S_t = \bar{N} + \frac{\epsilon_t}{1 + \alpha}.$$

Setting the variance of ϵ at unity, exchange rate variance is

$$V(S) = \frac{1}{(1 + \alpha)^2} < 1.$$

Now turn to the days surrounding exchange rate fixing. Suppose that date t is the last day of floating and date $t + 1$ is the first day of the fixed rate era. This is a terminal condition on the foregoing model, and Obstfeld argues (correctly) that if the exchange rate is to be fixed precisely as proposed, at opening on Monday morning it will have to be pegged at the value inherited from closing the previous Friday. Hence, if day t is the day prior to fixing,

$$(5) \quad E_t S_{t+1} - S_t = 0.$$

Using this condition in equation (2) and then substituting into equation (1) we derive

$$(6) \quad S_t = N_t = \bar{N} + \epsilon_t.$$

The effect of promising to fix the exchange rate has removed completely the expected exchange rate change from the asset market on the day before fixing. Movements in N_t are reflected in identical movements of the exchange rate S_t . The coefficient on ϵ_t jumps from $1/(1 + \alpha)$ in equation (4), a number between zero and unity, to exactly unity. The exchange rate

variance must also jump from $(1/(1 + \alpha))^2 < 1$ to unity. In other words, the promise to fix the exchange rate at time $t + 1$ raises the short-run exchange rate variance at time t . As Obstfeld demonstrates, the promise to fix has similar, but slightly muted, effects on exchange rate variance on all the days prior to the Stage III fixing.¹¹

Obstfeld's logic, discussion, and derivation follow relentlessly once one has bought into the model embodied in equations (1), (2), and (3). From our perspective, however, it is plain that a different set of assumptions better describes one crucial aspect of the working of the foreign exchange market.

5.3.2 Modeling Monetary Policy

We agree that the empirical performance of all models of the foreign exchange market based on high-frequency data (observations of one year or less) has been an absolute disaster. These models usually include a market-clearing condition like equation (1), an uncovered interest parity condition, equation (2), and a data-appropriate forcing process for fundamentals like equation (3). While equations (1) and (2) do not hold up well in data, they allow Obstfeld to make his argument in a clean and simple way, and *that argument carries over to more complicated and possibly more realistic versions of equations (1) and (2)*. We therefore adopt Obstfeld's equations for private behavior, but we part company with his equation (3), the time-series model of market fundamentals, which incorporates short-run monetary policy.

Our preferred model is

$$(7) \quad M_t - S_t = -\alpha(i_t - i_t^*) - \varepsilon_t, \quad \alpha > 0,$$

$$(8) \quad i_t - i_t^* = \bar{\delta} + \lambda\varepsilon_t = E_t S_{t+1} - S_t,$$

$$(9) \quad M_t = \bar{M}_t + \psi\varepsilon_t.$$

In equation (7), we refine Obstfeld's N_t fundamentals into the sum of the money supply, M_t , and other fundamentals, ε_t . We continue to use Obstfeld's notation ε_t as the source of uncertainty, but we move it to the right-hand side of the money market equilibrium condition to distinguish it from M_t . Equation (8) continues to reflect uncovered interest rate parity, but in addition the government now sets the short-term interest rate differential at $i_t - i_t^* = \bar{\delta} + \lambda\varepsilon_t$. In this policy setting, $\bar{\delta}$ is the average interest rate differential and $\lambda\varepsilon_t$ depicts the sensitivity of interest rate policy to current market conditions. Equation (9) expresses the settings for monetary policy such that the government can realize its policy target for

11. See Obstfeld (1997a, app. A, eq. [3]) for details.

the interest rate differential. In this approach, *the time-series process for \bar{M}_t , the value of ψ , and the quantity of money M_t are all endogenous to the model.*

The policy authority may set $\bar{\delta}$ and λ as desired; but the money supply rule (9) must then be tailored to meet the interest rate target.¹² In the appendix we solve our model for a floating exchange rate along the lines suggested by Canzoneri, Henderson, and Rogoff (1983). That solution is

$$(10a) \quad S_t = \alpha \bar{\delta} + \bar{M}_t - \lambda \varepsilon_t,$$

$$(10b) \quad \bar{M}_t = \bar{\delta} + \bar{M}_{t-1},$$

$$(10c) \quad \psi = -[(1 + \alpha)\lambda + 1],$$

where M_{t-1} should be interpreted as a predetermined variable.

With this interest rate policy, the exchange rate variance is λ^2 . The deterministic portion of the money supply (differential) is explosive to the extent that $\bar{\delta}$ is different from zero.

With this model of operational monetary policy in mind, let us move to 31 December 1998, before the Stage III, immutable, exchange rate fixing. As Obstfeld argues, on 31 December interest rates must converge. In order to keep $E_t S_{t+i} = S_t$ for all future dates $t + i$, the government must set $\bar{\delta} = 0$ and $\lambda = 0$. This, of course, makes the 31 December exchange rate nonstochastic and equal to M_t , the deterministic portion of the money supply.

5.4 Conclusion

There are many reasons to worry about the approaching EMU. It may collapse in Stage III. It may generate an attack on the ERM in Stage II. It may succeed and exacerbate asynchronous cyclical pressures. That these instabilities may occur, however, has little to do with the minor technical issue of the equality of bilateral exchange rates across the interface days between Stage II and Stage III. The operational nature of the TARGET payments system and the use of forward market interventions or the equivalent interventions to fix interest rates are sufficient to bridge the bilateral rates across Stage II and Stage III, given the standard assumption of a successful Stage III. The issue of the equality of bilateral conversion rates across Stages II and III is of some technical interest, but by begging the question it can only distract attention away from the far more important issues of the survivability of Stage III and, working backward, the speculation over such survivability and over the ultimate "in" membership that will be ongoing both before and after May 1998.

12. The values of $\bar{\delta}$ and λ may be set to minimize a Kydland-Prescott-style loss function (Kydland and Prescott 1977) as in Obstfeld (1994).

Appendix

To solve models in which the money supply is set to accommodate private demand in order to implement an interest rate target, Canzoneri et al. (1983) recommend the following solution technique.

Step 1. Substitute from the interest rate rule, equation (8), and the required money accommodation, equation (9), into the equilibrium condition, equation (7), and rearrange to derive

$$(A1) \quad S_t = \alpha \bar{\delta} + \bar{M}_t + (\psi + \alpha\lambda + 1)\epsilon_t.$$

Step 2. Update equation (A1) by one period and take the expectation as of date t , yielding

$$(A2) \quad E_t S_{t+1} = \alpha \bar{\delta} + \bar{M}_{t+1}.$$

(Remember that \bar{M} is the nonstochastic part of the money supply.)

Step 3. Subtract equation (A1) from equation (A2) and equate the result to the interest rate target, resulting in

$$(A3) \quad \bar{M}_{t+1} - \bar{M}_t - (\psi + \alpha\lambda + 1)\epsilon_t = \bar{\delta} + \lambda\epsilon_t.$$

Equation (A3) is to be regarded as an identity, which determines the money supply so that the money market is in equilibrium. This requires

$$(A4) \quad \psi = -[(1 + \alpha)\lambda + 1],$$

$$(A5) \quad \bar{M}_{t+1} = \bar{\delta} + \bar{M}_t.$$

By direct calculation, substituting the restriction described in equation (A4) into equation (A1) results in equation (10a), the exchange rate expression reported in the main text.

Canzoneri et al. complete their solution as we do by imposing the initial condition that \bar{M}_0 is predetermined from the prehistory of the model. The Canzoneri et al. insight is to preserve the dynamic structure in a Cagan-style model of the price level by recognizing that pegging the interest rate is equivalent, in that model, to pegging the expected inflation rate. Pegging expected inflation, in turn, requires setting the prospective money growth rate, taking as predetermined an inherited money stock. Canzoneri et al., therefore, propose solving a single dynamic equation in two unknowns by imposing an initial condition on money. Sargent and Wallace (1973) in other, previous research had proposed solving an equivalent indeterminacy problem by imposing the famous “no bubbles” terminal condition.

References

- Canzoneri, Matthew, Dale Henderson, and Kenneth Rogoff. 1983. The information content of the interest rate and the optimal monetary policy. *Quarterly Journal of Economics* 98, no. 4 (November): 545–66.
- De Grauwe, Paul. 1997. The indeterminacy of the euro conversion rates: Why it matters and how it can be solved. Leuven: University of Leuven, May.
- De Grauwe, P., and L. Spaventa. 1997. Setting conversion rates for the third stage of EMU. CEPR Discussion Paper no. 1638. London: Centre for Economic Policy Research, April.
- European Monetary Institute. 1997. The single monetary policy in stage III. Frankfurt: European Monetary Institute, January.
- Garber, Peter. 1998. Notes on the role of TARGET in a stage III crisis. NBER Working Paper no. 6619. Cambridge, Mass.: National Bureau of Economic Research, June.
- Kydland, Finn, and Edward Prescott. 1977. Rules rather than discretion: The inconsistency of optimal plans. *Journal of Political Economy* 85:473–92.
- Obstfeld, Maurice. 1994. The logic of currency crises. *Cahiers Economiques et Monétaires* (Bank of France) 43:189–213.
- . 1997a. A strategy for launching the euro. Paper presented at the meeting of the Political Economy of European Integration Study Group, Center for German and European Studies, University of California, Berkeley, March.
- . 1997b. A strategy for launching the euro, revision. CEPR Discussion Paper no. 1732. London: Centre for Economic Policy Research, September.
- Sargent, Thomas J., and Neil N. Wallace. 1973. The stability of models of money and growth with perfect foresight. *Econometrica* 41, no. 6 (November): 1043–48.
- Summers, Bruce. 1994. Notes on Federal Reserve accounting structure. 10 June. Private notes.

Comment Peter B. Kenen

I have no quarrel with the main message of this paper. Central banks due to participate in EMU will have no trouble fixing the bilateral exchange rates between their currencies at the close of foreign exchange trading on the last day before EMU. They can therefore meet the restrictive conditions imposed by the Maastricht treaty. The real-time gross settlement system (TARGET) due to come into being when EMU begins will allow them to finance unlimited intervention on the day before EMU begins. Flood and Garber rightly draw an analogy with the short-term credit arrangements available under the ERM of the European Monetary System, and the analogy can be carried further. The exchange rate regime prevailing in the first years of EMU, before the national currencies are replaced completely by the euro, can be viewed as a new version of the ERM. There

Peter B. Kenen is the Walker Professor of Economics and International Finance and director of the International Finance Section at Princeton University.

will be no exchange rate band; there will be no need to repay reserve credit obtained from other central banks; and there will be no ceiling on the volume of credit obtainable from those central banks. (There is no formal limit under the ERM, but the Bundesbank reserved the right to impose one unilaterally in the so-called Emminger letter.)

The paper, however, raises two questions: (1) Why should there be any doubt about the central banks' ability to intervene on a scale sufficient to meet the requirements of the treaty? (2) Might TARGET itself break down because its credit facilities are too liberal? I will take up both questions shortly, after raising two technical objections to the Flood-Garber paper. It is too kind to the European Monetary Institute (EMI). It is unkind to Maurice Obstfeld.

In descriptions of TARGET published by the EMI (e.g., EMI 1997), TARGET is described as a network of bilateral correspondent (interlinking) accounts connecting the participating central banks, and Flood and Garber borrow that terminology. But they also borrow an example from the EMI that is inconsistent with it.

Flood and Garber describe a transfer from a French bank to a German bank. It starts when the Banque de France debits the account held by the French bank at the Banque de France and ends when the Bundesbank credits the account held by the German bank at the Bundesbank. In the process, the Banque de France incurs an obligation to the Bundesbank, and it will be recorded, Flood and Garber tell us, "by incrementing the Bundesbank's bilateral correspondent . . . account at the Banque de France and reducing the Banque de France's correspondent account at the Bundesbank by the same amount."

But that cannot be right. It involves double counting. When the Banque de France credits the Bundesbank's correspondent account, the Bundesbank acquires a claim on the Banque de France, which should appear automatically on the books of the Bundesbank. When the Bundesbank debits the correspondent account of the Banque de France, the Bundesbank discharges a debt to the Banque de France, which should appear automatically on the books of the Banque de France. If both pairs of entries are made, then, the Bundesbank's net position vis-à-vis the Banque de France will change by *twice* the amount of the transfer between the French and German banks.¹

The example provided by the EMI and borrowed by Flood and Garber would be quite right if TARGET were constructed differently—if each national central bank were to hold a single clearing account with the ECB. The transfer between the French and German banks would then be re-

1. In table 5.1 the entry "–100 Due to Banque de France" on the liability side of the Bundesbank's balance sheet should appear instead on the asset side as "100 Due from Banque de France."

corded by debiting the clearing account of the Banque de France and crediting the clearing account of the Bundesbank.² But the national central banks rejected this simple, sensible scheme because they sought to minimize the operational responsibilities of the ECB.

How are Flood and Garber unkind to Obstfeld? In the final section of their paper, they take issue with Obstfeld's finding that the variance of spot exchange rates will rise as the start of EMU approaches (Obstfeld 1997). They ascribe his result to his use of a model in which central banks target monetary aggregates rather than interest rates, and they go on to show that interest rate targeting can smooth the transition to EMU. They are quite right to say that the day-to-day conduct of monetary policy should be modeled as interest rate targeting, not money supply targeting, even for central banks that claim to adhere to a money supply target. But the difference in the modeling of monetary policy is not why exchange rates behave differently in the Obstfeld and Flood-Garber papers.

In Obstfeld's model, the variance of exchange rates rises because exchange rates float freely; central banks do not try to influence them by manipulating the nonstochastic component of the "fundamental" (i.e., the ratio of the monetary aggregates). In the Flood-Garber model, by contrast, there is a smooth transition to EMU because the central banks deliberately manipulate interest rates in order to regulate exchange rate behavior (i.e., they set $\delta = \lambda = 0$ on the eve of EMU).

Returning to the larger questions posed at the start of these comments, let us see why Flood and Garber feel the need to explain how the existence of TARGET will solve the so-called endgame problem. Is there, in fact, a problem?

It arises, they say, because some central banks might refuse to intervene just before the beginning of EMU. Suppose, for example, that holders of French francs started to sell them for deutsche marks on the eve of EMU. The franc would depreciate vis-à-vis the mark, jeopardizing adherence to the requirements of the Maastricht treaty. Under an ordinary pegged rate regime, the Banque de France might not be able to keep the franc from depreciating because its reserves are too small. Under ERM arrangements, the Banque de France could borrow marks from the Bundesbank, but it would have to repay them, and it might not want to incur that sort of debt to the Bundesbank. But the Bundesbank can buy francs freely to stabilize the franc-mark rate because it can print unlimited quantities of marks. And if it is willing to do that, there can be no endgame problem.

But what if the Bundesbank declines to intervene because it is "lukewarm" about EMU? That is where TARGET comes to the rescue. Spot

2. As Flood and Garber note, that is how imbalances are cleared within the Federal Reserve system (but they are cleared at the end of each day, in a single net settlement, not on a real-time gross settlement basis, which is the principle on which TARGET will operate).

transactions in the foreign exchange market are settled with a two-day lag. Transactions undertaken on the last day before EMU will be settled two days later, after EMU has started and TARGET is up and running. Hence, the Banque de France—or any other central bank—can intervene on the scale required to keep the franc from depreciating. It can sell marks to the speculators and use TARGET to pay for them two days later. It will credit the euro-denominated interlinking account held by the Bundesbank at the Banque de France and instruct the Bundesbank to complete the transaction by crediting the euro-denominated accounts that German banks hold at the Bundesbank. The German banks will then credit the mark-denominated accounts of the speculators who bought marks from the Banque de France. In effect, the Bundesbank will automatically extend euro-denominated credit to the Banque de France in the amount needed for the Banque de France to defend the franc-mark exchange rate, and the credit need not be repaid.³

But is it realistic to assume that Bundesbank would try to sabotage EMU by refusing to defend the franc on the eve of EMU? If the Bundesbank is lukewarm about EMU, it will make its doubts known openly and earlier. It will not try to subvert EMU at the last minute. In short, the endgame problem is a nonproblem, and it does not need to be solved—not by using TARGET, as proposed by Flood and Garber, nor by using forward transactions, as proposed by Obstfeld (1997).

Nevertheless, Flood and Garber raise an important problem that has received little attention. The long-run viability of EMU will depend crucially on the willingness of the national central banks to build up big claims on their partners—claims that need not be repaid. That is what happened in my example, where the Bundesbank built up large claims on the Banque de France. It will also happen after EMU starts if holders of one country's currency fear that the country will defect from EMU and allow its currency to depreciate. It could even happen after the euro replaces the national currencies; holders of euro-denominated deposits at one country's banks would shift them to other countries' banks if the first country was expected to defect.⁴ It could also happen if no country was

3. In the example given by Flood and Garber, the credit *is* repaid, because the speculative attack takes a different form—short sales of francs for marks. In that case, the speculators must acquire the francs they have already sold to the Banque de France, and they do that by converting their newly acquired marks back into francs. German banks then use TARGET to effect the conversion; they instruct the Bundesbank to credit the interlinking account of the Banque de France, which credits the euro-denominated accounts of French banks held with the Banque de France and instructs the French banks to credit the franc-denominated accounts of the speculators, giving them the francs they need to settle their foreign exchange transactions with the Banque de France. In the process, the Banque de France extends credit automatically to the Bundesbank and thus offsets its debt to the Bundesbank. I have used a different example, in which the speculators liquidate long positions in francs, to emphasize the open-ended nature of the credit lines available through TARGET.

4. Garber (1998) examines these possibilities.

expected to defect but one country ran a large, persistent current account deficit with a partner country and the deficit was not offset by private capital flows.

To the best of my knowledge, the EMI has not discussed this issue, not in its reports on TARGET nor in those on the conduct of monetary policy. Whenever I have raised the problem, moreover, I have encountered a certain ambivalence. Central bankers agree that the viability of EMU will depend on the willingness of the national central banks to build up unlimited claims on their partners. But some of them were clearly uncomfortable with that possibility. When I wrote my first monograph on EMU (Kenen 1992), I drew attention to the problem. Readers of the manuscript did not disagree with my warning that EMU could break down unless the national central banks were utterly indifferent to the size of their claims on their partners. But some of them wondered whether the Bundesbank would be indifferent to the size of its claims on the Banca d'Italia, and one of them distributed a paper recently arguing that EMU is more likely to break down if the ECB does not impose limits on the size of the claims that the national central banks as a group are obliged to accumulate on any single central bank or, more generally, on any euro-area country. He does not tell us, however, how "excess" claims should be paid down.

The treatment of imbalances within TARGET may be the most important piece of unfinished business for the ECB to tackle when, on 1 July 1998, it starts to adopt the formal rules under which it will operate.

References

- European Monetary Institute (EMI). 1997. *The single monetary policy in stage III: Specification of the operational framework*. Frankfurt: European Monetary Institute.
- Garber, P. M. 1998. Notes on the role of TARGET in a stage III crisis. NBER Working Paper no. 6619. Cambridge, Mass.: National Bureau of Economic Research, June.
- Kenen, P. B. 1992. *EMU after Maastricht*. New York: Group of Thirty.
- Obstfeld, M. 1997. A strategy for launching the euro. CEPR Discussion Paper no. 1732. London: Centre for Economic Policy Research.

This Page Intentionally Left Blank

The Mexican Peso in the Aftermath of the 1994 Currency Crisis

Sebastian Edwards and Miguel A. Savastano

6.1 Introduction

Years after Mexico's 1994 exchange rate crisis important questions remain regarding the country's economic future. Some observers wonder whether Mexico will be able to build the bases for solid and sustainable development. The historical elusiveness of macroeconomic stability in Mexico is at the core of this apprehension. More specifically, a number of observers, both in the private sector and in academic circles, have asked if Mexico will finally be able to escape the perverse cycle of failed stabilization attempts and exchange rate crises. Some have even argued that full dollarization is the only way for Mexico to avoid future crises (Dornbusch 1999).

Most empirical case studies of exchange rate crises—including those on the Mexican 1994 episode—have tended to emphasize the period leading to the currency collapse. Issues related to the pace of credit creation, asset demand, and current account sustainability, among others, have figured prominently in these studies. Almost no work has been done, however, on the behavior of the exchange rate—and other key macroeconomic vari-

Sebastian Edwards is the Henry Ford II Professor of International Economics at the Anderson Graduate School of Management, University of California, Los Angeles, and a research associate of the National Bureau of Economic Research. Miguel A. Savastano is deputy division chief of the Research Department of the International Monetary Fund.

The opinions expressed in this paper are exclusively those of the authors and do not reflect the views of the NBER or the IMF. The authors thank their discussant, Brad De Long, for helpful comments. They are grateful to Agustín Carstens and Abraham Vela from the Banco de México for their comments, for providing some of the data, and for helping clarify a number of issues. Julio Santaella also provided helpful comments. The authors thank Rajesh Chakrabarti and Stacy Maynes for their able assistance.

ables, for that matter—in the period following a crisis. More concretely, very few studies have focused on the strategies followed by the monetary authorities to stabilize the currency in the aftermath of a major exchange rate collapse. And yet, as the recent crises in East Asia, Russia, and Brazil have made abundantly clear, it is what follows the collapse of the exchange rate that determines the extent of “damage” done by the crisis itself.

This paper deals with the 1994 Mexican crisis and its aftermath. We concentrate on the events leading to the exchange rate collapse in December of that year, and we examine the behavior of some key macroeconomic variables in the three years following the crisis. We are particularly interested in addressing two main questions: First, what were the forces behind the apparent stability of the peso-dollar exchange rate during 1996–97? And second, what was the role of Bank of Mexico (BOM) monetary policy in the three years following the crisis? In particular, we are interested in investigating whether, as some analysts argued, the BOM’s monetary policy during 1996–97 was geared at maintaining a degree of nominal exchange rate stability that was at odds with the requirements of a floating rate regime. Because the analysis in the paper covers only developments until the end of 1997, it does not examine whether the appointment of a new central bank governor in early 1998 led to a change in the BOM’s conduct of monetary policy.

The rest of the paper is organized as follows: Section 6.2 deals with the period that preceded the 1994 crisis. We provide a brief overview of developments in 1990–94 and discuss two (implausible) explanations for the collapse of the peso that, interestingly, resurfaced in the context of the East Asian crises of 1997–98. We argue that throughout 1993–94 most available information suggested that things in Mexico were getting rapidly out of hand. Most analysts, however, badly missed the magnitude of the disequilibrium and thus underestimated the required adjustment in the nominal and real exchange rates following the abandonment of the exchange rate band. We argue that the use of inadequate models to evaluate real exchange rate behavior might have been at the core of the general inability to gauge the seriousness of the situation. Section 6.3 is devoted to analyzing exchange rate behavior in the three years following the crisis (1995–97). We inquire whether during this period the peso-dollar rate behaved in a manner compatible with a floating exchange rate regime. Our analysis, based on a cross-country comparison of exchange rate volatility measures, as well as on the calibration of a simple monetary model, suggests that throughout most of the 1995–97 period Mexico’s exchange rate behavior was largely consistent with that of (quasi-)floating rates. Our analysis, however, is also consistent with the notion that during this period the BOM took into account exchange rate developments in conducting monetary policy. Section 6.4 looks at this issue in greater detail and focuses on BOM operating procedures in 1995–97, trying to shed light on

the question, What did the Bank of Mexico really do? Concretely, we use daily data for 1996–97 to inquire whether there is evidence that when conducting monetary policy, the BOM relied on some type of feedback rule that took into account the behavior of the nominal exchange rate. We conclude that notwithstanding the perils of relying on “noisy” high-frequency data, some preliminary evidence supports that view.

6.2 The Road to Collapse: 1991–94

In 1985, three years after coming close to default on its external debt and having ignited the Latin American debt crisis, Mexico embarked on an ambitious market-oriented reform program. Although this process started slowly, by 1989 it had gathered considerable momentum. The overall program, vigorously pushed by the administration of President Salinas de Gortari, had four basic components:¹ (1) the opening of the economy to international competition; (2) a comprehensive process of privatization and deregulation; (3) a stabilization program centered on a predetermined nominal exchange rate and supported by restrictive fiscal and monetary policies; and (4) a broad social and economic agreement between the government, the private sector, and labor unions—known as the Pacto—aimed at guiding price, exchange rate, and wage increases over loosely specified horizons. By 1994, the last year of the Salinas administration, an impressive number of reforms had been implemented, including the approval of the much publicized North American Free Trade Agreement (NAFTA).

6.2.1 The Pacto, Capital Inflows, and the Exchange Rate

Mexico’s protracted adjustment to the external crisis of 1982 led to an upward ratcheting of the rate of inflation, which reached a historical high of 140 percent per annum in late 1987. At that point, the Mexican authorities decided to confront the inflation problem head on and designed an ambitious stabilization program centered on a temporary freeze of wages and administered prices agreed in the context of the Pacto. A few weeks after the launching of the program, in late February 1988, the nominal exchange rate was fixed and became the main anchor of the anti-inflationary effort.² Between 1988 and 1994 the authorities made several modifications to the exchange rate system, moving first in 1989 to a regime based on a preannounced rate of devaluation—where the rate of devaluation was set below the (actual and expected) rate of inflation—and in November 1991 to a (narrow) exchange rate band with a sliding ceiling. From

1. For a detailed account of Mexico’s reform program, see Aspe (1993) and Lustig (1992). See also Loser and Kalter (1992).

2. For comprehensive analyses of the Mexican stabilization program of 1988, see Vela (1993) and Santaella and Vela (1996). See also Aspe (1993).

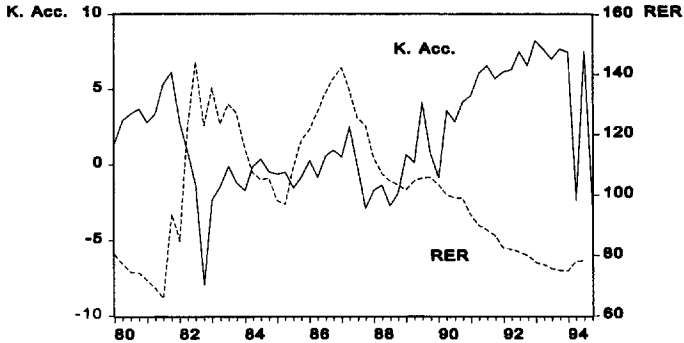


Fig. 6.1 Mexico: capital flows and real exchange rate, 1980–94

Sources: Banco de México and IMF.

Note: K. Acc. = capital flows in billions of U.S. dollars (*left-hand scale*). RER = real exchange rate index, 1990 = 100 (*right-hand scale*).

early 1992 to October 1993—when the NAFTA controversy heated up in the United States—the nominal peso-dollar rate was remarkably stable and invariably remained in the lower half of the band. Throughout most of this period, Mexico’s managed exchange rate regime was supported by prudent fiscal and monetary policies.

The rate of inflation fell drastically (to less than 20 percent) in the first eighteen months of the program, but from then on the pace of disinflation became painfully slow. As had happened a decade earlier in Chile, and in other stabilization episodes, the attempt to reduce inflation using the exchange rate as the main nominal anchor gave rise to a substantial and protracted real appreciation of the Mexican peso (see fig. 6.1).³ Already in 1989 a number of observers argued that this trend would become unsustainable because the country lacked sufficient foreign exchange reserves to finance the rapidly growing current account deficit (Edwards 1998a).

In early 1990, after arduous negotiations, the Brady debt reduction agreement was finally signed, the authorities accelerated the pace of their ambitious structural reform program, and foreign investors rediscovered Mexico. The ensuing surge in private capital inflows allowed Mexico to finance current account deficits on the order of 7 percent of GDP in 1992–94; all along the real exchange rate continued to appreciate, and output growth remained subdued.

In 1992 a public debate began to take place about the consequences of the real appreciation that the peso had experienced since the 1988 stabilization. In early 1992 Dornbusch claimed that “the current problem of

3. In fig. 6.1, and throughout the paper, a decline in the real exchange rate indicates a real appreciation. For a comparison of the Chilean and Mexican stabilization programs, see, e.g., Edwards (1998b).

the Mexican economy is the overvalued exchange rate" (reproduced in Dornbusch 1993, 369), and in November of that year he argued that the daily rate of devaluation of the peso had to be *tripled* in 1993 to 120¢ per day (*Excelsior*, 23 November 1992, 1). Also the World Bank, in its 1993 *Trend in Developing Economies*, noted that in Mexico "growth recovery has . . . been modest . . . [an outcome that] can be traced to a combination of slow productivity growth, a weak US economy, tight fiscal and monetary policies, and *real exchange rate appreciation*" (1993, 325–30; emphasis added). The Mexican authorities responded to these apprehensions with a rehashed version of the "Lawson doctrine" and argued that since the capital inflows were largely private and the fiscal accounts were in surplus, there was nothing to be concerned about. The authorities "substantiated" their view by arguing that rapid increases in productivity that would lead to a strong export expansion, and thus to a narrowing of the current account, were about to take place and stressing that the exchange rate bands and the freely determined interest rates gave enough flexibility to their monetary policy to deal with eventual disruptions in the flow of capital (see BOM 1993, 1994; Aspe 1993; Ortiz 1994). Confident that the approval of NAFTA in late 1993 and the entry to the OECD scheduled for 1994 were a tribute to the sound fundamentals of the Mexican economy, the authorities announced an economic program for 1994, a year of presidential elections, that envisaged single-digit inflation, a pick-up in output growth, and no fundamental change in the core macroeconomic policies.

The size and pace of the capital inflows that Mexico had been absorbing since 1991 gave rise to the notion that the accompanying strengthening of the peso represented an "equilibrium" movement of the real exchange rate that was fully justified by fundamentals. The view that an increase in capital flows will lead to an appreciation of the real exchange rate is of course correct from a simple theoretical perspective. Indeed, in order for the transfer of resources implied by a higher inflow of capital to become effective, a real appreciation is *required*. One problem with this interpretation, however, is that it overlooks that the rate at which capital was flowing into Mexico in 1992–94 (i.e., at 7 percent of GDP per annum) was clearly *not* sustainable in the long run. Considerations of external solvency and current account sustainability indicate unequivocally that flows of this magnitude at some point *have to* decline and that such a decline will encompass a reversal of the real exchange rate appreciation.⁴ Interestingly enough, even those analysts who recognized the unsustainable nature of the capital flows badly miscalculated the required real exchange rate adjustment. Indeed, in early 1994 the debate among Mexico skeptics was whether a 20 or a 30 percent devaluation would be required to reestablish

4. On the issue of current account sustainability, see Reisen (1995) and Milesi-Ferretti and Razin (1996).

equilibrium.⁵ Very few, if any, observers would have predicted that merely a year after abandoning the band, the peso would lose almost one-half of its value. This inability to grasp the seriousness of the Mexican situation (both before and after the collapse) clearly illustrates the shortcomings of the models commonly used by both private sector and academic analysts to assess the adequacy of real exchange rates. Indeed, most of these models are strictly based on flow considerations—and some of them are little more than glorified versions of purchasing power parity (PPP)—and ignore the interaction between flows and stocks.⁶ Models that, on the other hand, pay attention to stocks in general and to the foreign demand for securities issued by emerging markets in particular are, in principle, better equipped to gauge the magnitude of the disequilibrium in circumstances where credibility vanishes (Calvo 1994, 1995).

6.2.2 Mexico in 1994: Two Implausible Stories

Few episodes of currency crisis have received as much attention in the economic literature as that of Mexico in 1994.⁷ And yet, five full years after the fateful event, it can hardly be argued that there is consensus on what caused the December 1994 devaluation of the peso or, more precisely, on what was the (approximate) contribution of the various hypotheses put forward to explain the occurrence, timing, and size of the peso collapse. One reason for this state of affairs is that many of the earlier accounts of the Mexican crisis, in their quest to extract quick “lessons” and apportion blame, searched for simple explanations and sought a single culprit. As pointed out by Edwards et al. (1996) and others, however, this episode was highly complex and defies simple explanations. Indeed, as in the old high school exam, the answer to “What caused the Mexican crisis?” will often be “All of the above.”

It is beyond the scope of this paper to revisit developments in Mexico during 1994 or to assess, with the benefit of hindsight, the relative validity of the various hypotheses advanced to explain the December devaluation.⁸

5. See Edwards (1998a) for a detailed account of the evolution of different views on Mexico during 1994.

6. See Williamson (1995) for a discussion of some of these models.

7. Analyses of the Mexican crisis can be found in Calvo (1995), Calvo and Mendoza (1996), De Long, De Long, and Robinson (1996), Dornbusch, Goldfajn, and Valdés (1995), Edwards (1996, 1997), Edwards, Steiner, and Losada (1996), Gil-Díaz and Carstens (1996), International Monetary Fund (IMF 1995a, 1995b), Krugman (1995), Leiderman and Thorne (1995), Lustig (1995), Masson and Agenor (1996), Obstfeld and Rogoff (1995), Reynoso (1995), Sachs, Tornell, and Velasco (1996), Warner (1997), and Werner (1996). A more complete list would include most of the studies contained in the July 1996 special issue of the *International Journal of Finance and Economics*, in the July 1996 special issue of *Open Economies Review*, in the November 1996 special issue of the *Journal of International Economics*, and in Edwards and Naim (1997).

8. For a comprehensive discussion of developments leading to the crisis, see Edwards (1997). See also IMF (1995a, 1995b) and Sachs et al. (1996).

But we will take issue briefly with two rather extreme views that, interestingly, regained prominence during the unfolding of the 1997–98 East Asian currency crises. The first view ascribes a negligible role to policy mistakes in the unraveling of the Mexican crisis. This view, endorsed by the BOM since the very beginning,⁹ attributes the occurrence (and size) of the peso collapse to the combination of a sequence of adverse and unexpected shocks (domestic and foreign) and various sources of multiple equilibria that gave rise to a self-fulfilling run on the currency (Reynoso 1995; Gil-Díaz and Carstens 1996). The second view, more popular in financial circles, ascribes a central role to the incomplete information made available to foreign investors—in particular, to the paucity and unreliability of official data on key economic variables—in triggering the speculative attacks on the peso (see, e.g., Group of Thirty 1995).

A careful examination of the Mexican episode finds no strong support for either of these two “stories.” Let us start with the second one. In the aftermath of the crisis Wall Street analysts and operators argued that the lack of current information on Mexico’s international reserve position played an important role in magnifying the crisis. In fact, a post mortem of the crisis sponsored by the Council on Foreign Relations and undertaken by an independent task force chaired by John Whitehead concluded that “full financial information was not forthcoming to all investors” (Council on Foreign Relations 1996, 27). However, at least three pieces of evidence are at odds with the claim that markets did not know (or, more precisely, could not know) what was going on in Mexico in 1994.

First, markets were fully aware (and even supportive) of what turned out to be a crucial modification of Mexico’s monetary policy in 1994: the April decision to replace maturing peso-denominated Cetes with the infamous Tesobonos—short-term dollar-linked public debt instruments. This strategy was quite transparent and was even commented on, matter of factly, in financial circles. For example, J. P. Morgan’s *Emerging Markets Outlook* of 22 July 1994 noted that “half of the 28-day and 91-day Cetes offered were issued; the central bank would not accept the high yields required by the market to auction the full amount. . . . In the *Tesobonos* auction, yields . . . trended down modestly” (22). And on 23 July 1994 an article in the *Economist* pointed out that “the central bank has also had to issue plenty of *tesobonos*—dollar-linked bonds that are popular with investors that worried about currency risk.”¹⁰

Second, the public and academic debates on the sustainability of Mexico’s external position grew louder during the first half of 1994. For instance, in a much publicized piece prepared for the spring meetings of the

9. See, e.g., the op-ed article by former governor Miguel Mancera, “Don’t Blame Monetary Policy,” *Wall Street Journal*, 31 January 1995.

10. “Pounding the Peso,” *Economist*, 23 July 1994, 76.

Brookings Institution Economics Panel, Dornbusch and Werner (1994) argued that the Mexican peso was overvalued by at least 20 percent and urged the Mexican authorities to rapidly find a way to address the problem. These concerns were echoed, albeit on different grounds, by the two prominent discussants of the paper: Guillermo Calvo and Stanley Fischer (Calvo 1994; Fischer 1994). Financial analysts were also aware that the U.S. authorities' decision to extend a US\$6 billion swap facility to Mexico, announced on 24 March, one day after the Colosio assassination, reflected the serious concerns those authorities had about the loss of international reserves that the BOM had suffered in the tumultuous first quarter of 1994.¹¹

And third, documents released to the U.S. Senate Banking Committee during 1995 indicate quite clearly that the U.S. Treasury was able to keep track of the evolution of Mexico's international reserves throughout 1994 (see D'Amato 1995). For example, a mid-May 1994 memorandum from Assistant Secretary Shafer pointed out that the BOM had reportedly spent US\$10 billion since the Colosio assassination to defend the peso. Similar documentation shows that Treasury officials were well aware of the speed at which Mexico's reserves were being depleted in the last weeks of the year.¹² Even though the BOM had maintained during 1994 its long-standing practice of releasing to the public data on its international reserves only three times a year (in April, October, and November) there is no compelling reason why diligent analysts in the private sector could not have produced estimates of Mexico's international reserves as accurate as those of the U.S. Treasury on the basis of available information (on the stocks and flows of Cetes and Tesobonos, trade flows, and so on). Why so many of them did not, or if they did, why they did not react earlier to the deterioration of Mexico's external indicators remains an open question. But in light of the above evidence, it is hard not to conclude that until the very end, foreign investors simply underestimated the probability of a crisis.¹³

The flaws of the first view—the “bad luck” view—become apparent when one examines the policy response to the sequence of shocks that hit Mexico during 1994. As noted earlier, a crucial decision in the area of monetary and exchange rate policy prior to the December crash was taken in April 1994, when the Mexican authorities, in response to the increasing difficulties they were facing in rolling over the country's sizable stock of peso-denominated debt at the (high) yields prevailing at the time,¹⁴ decided to stave off further rises in domestic interest rates by substituting

11. See, e.g., the front page stories in the *Financial Times*, 26 and 28 March 1994.

12. See, e.g., the memoranda dated 18 November and 5 December in D'Amato (1995).

13. The results obtained by Masson and Agenor (1996) provide further support for this conclusion.

14. Interest rates on twenty-eight-day Cetes had almost doubled between February and mid-April 1994, when they reached a level of about 18 percent per annum in the secondary market.

dollar-linked Tesobonos for maturing Cetes while leaving intact the other two pillars of their monetary policy framework—that is, the exchange rate band and the target for nominal base money (and, hence, the sterilization of reserve flows). BOM officials have argued that they had followed a similar strategy in late 1993, when the peso came under pressure due to uncertainties about the ratification of NAFTA by the U.S. Congress, and thus that “it was natural to follow the same strategy after the Colosio assassination” (Gil-Díaz and Carstens 1996, 168). One problem with this line of reasoning, however, is that it ignores the fundamental difference between using debt swap operations to smooth transitory hikes in interest rates and using those operations to keep interest rates below their equilibrium level for a prolonged period of time. The tightening of monetary conditions in the United States in early 1994—which raised the floor for Mexican rates—and the rapid pace at which maturing Cetes were being replaced by Tesobonos several months after the policy had been adopted¹⁵ should have made it clear to BOM officials that their debt strategy was achieving the latter rather than the former. Moreover, the decision to maintain the course of policies unaltered after the August presidential election and after the internal debate that preceded the renewal of the Pacto in September leaves little doubt that the authorities deliberately opted for a policy stance that they hoped would enable them to continue lowering interest rates and preserve the exchange rate band.

One can only speculate about the reasons that led the authorities to miss these propitious opportunities to correct the stance of monetary and exchange rate policy. By the third quarter of 1994, Mexican authorities might well have been under the impression that they had weathered the worst of the speculative pressures and that it was a matter of time before capital inflows would resume at a pace similar to that of 1992–93. Concerns about the adverse effects that higher interest rates (or a depreciation of the peso) might have on the deteriorating situation of the banking system are also likely to have played a role;¹⁶ indeed, the decision to preserve the policy stance could have reflected an attempt to buy additional time to work out a plan to strengthen those financial institutions considered to be in particularly weak positions.¹⁷ Whatever the reasons, there is no question that the Mexican authorities seriously underestimated the risks em-

15. Between the end of March and the end of October 1994 the stock of Tesobonos outstanding increased by almost the same amount as the decline in the stock of Cetes (around US\$13 billion).

16. The preoccupation with the financial health of the recently privatized banks had begun in late 1992, when a significant increase in the past-due loan ratio became evident. In 1990, nonperforming loans—which prevailing regulations defined as unpaid installments of principal plus interest, rather than the total value of the loans—were estimated to be only 2 percent of total loans; that ratio increased to 4.7 percent in 1992, to 7.3 percent in 1993, and to 8.3 percent at the end of the first quarter of 1994.

17. In fact, by the end of June 1994 the government-owned banks had designed a debt relief program comprising a combination of write-offs of commercial bank past-due interest and government-issued loan guarantees.

bedded in their chosen course of action. It is quite a stretch to claim, as BOM officials have since the beginning, that this error in judgment (even if well intentioned) does not fall squarely in the category of policy mistakes.

Between June and November 1994 the stock of Tesobonos outstanding more than doubled to a total of US\$16 billion. By the end of November the BOM's international reserves, at US\$12.9 billion, were barely enough to cover 40 percent of total short-term public debt *or* 10 percent of total short-term liabilities of the banking system. The situation had long surpassed the current account and peso overvaluation sphere and had all the makings of a major financial crisis. It took little to cross the threshold. A few days after President Zedillo was sworn into office (on 1 December) news about renewed tensions in Chiapas led to a further attack on the peso, and on 20 December, when international reserves had fallen to about US\$10 billion, the authorities finally opted for a policy correction and lifted by 15 percent the ceiling of the exchange rate band. To everyone's surprise, the announcement of the new exchange rate ceiling was not accompanied by other supportive changes in macroeconomic policies or by a revision of the macroeconomic assumptions for 1995 that had been made public a few weeks earlier. In disbelief, investors—both foreign and domestic—fled, rendering the change in policy ineffective; in one day the BOM lost US\$4 billion in reserves. By then, the authorities realized that they had no alternative but to let the peso float. But the mayhem had just started.

6.3 The Mexican Peso during 1995–97: A Freely Floating Exchange Rate?

The behavior of the Mexican peso has been an object of interest to analysts and observers since the crash of December 1994. In the immediate aftermath of the December devaluation, most discussion centered on the possibility that a spiraling collapse of the peso would unleash an inflationary explosion that would wreak havoc with the real economy and the financial system. By late 1995 several observers became wary about what they considered the surprising—and some argued even unwarranted—stability of Mexico's nominal exchange rate. Many analysts were particularly surprised that even though the annual inflation rate was falling rather slowly from its 52 percent peak in December 1995 and had remained in double digits during 1996–97, the peso-dollar exchange rate by, say, mid-October 1997 (7.71 pesos per dollar on 21 October) was essentially at the same level it had been in early January 1996—see figure 6.2A. During this period there seemed to be a growing consensus that the relative stability of the nominal exchange rate in a context of double-digit inflation was more the result of measures undertaken by the BOM—allegedly to “smooth out” short-term fluctuations—than the outcome of market forces.

In its 3 October 1997 *Emerging Markets Data Watch*, J. P. Morgan

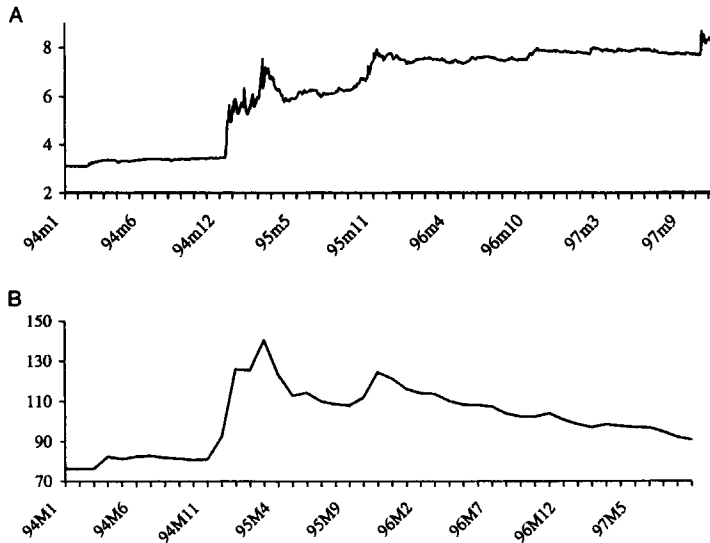


Fig. 6.2 Mexico: nominal and real exchange rates, January 1994–November 1997
 Note: A, Pesos per U.S. dollar. B, Real exchange rate vis-à-vis U.S. dollar, CPI based, 1990 = 100; increase means depreciation.

stated that “by staying at about NP7.8 throughout 1997 so far, the peso’s behavior has reopened the debate on whether it is appreciating too much in real terms. . . . Peso strength has gone further, and lasted longer than we had envisaged [in] our earlier forecasts” (3). This influential financial newsletter went on to say that the surprising strength of the peso was likely to be the result of a deliberate BOM policy stance. Other observers went a step further and saw in the stability of the nominal exchange rate, and the associated appreciation of the real exchange rate in 1996–97 (fig. 6.2B), signs of another cycle of policy-induced overvaluation of the peso that could lead to yet another episode of slow growth and overborrowing culminating in a major currency crisis similar to those that had affected the country during the past twenty-five years. For example, the *Economist* argued that the BOM policy stance toward the peso was unduly influenced by political considerations: “Distrustful investors have wondered aloud whether the central bank—which lost much credibility with the collapse—really enjoys independence. . . . The doubters have noted that the government’s policy on the peso, which is theoretically free to float, has actually been set by a committee.”¹⁸

Most analysts who expressed concerns about the behavior of the Mexican peso were not explicit, however, about the counterfactual—that is, about the type of behavior the peso should have exhibited if it really were

18. “The Lingering Tequila Effect,” *Economist*, 14–28 March 1998, 17.

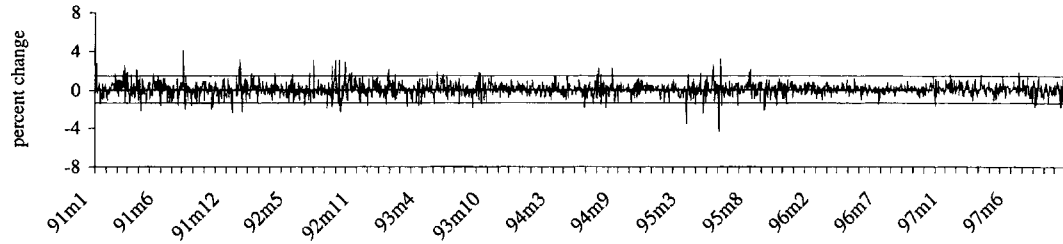
floating freely. Some could argue that the dismal performance of “traditional” exchange rate models to explain and predict short-term movements of floating exchange rates in the past two decades (Frankel and Rose 1995; Isard 1995) exempts observers from the need to provide some theoretical or empirical support for their concerns. We disagree. For one thing, many of the worries about the real overvaluation of the peso during 1995–97 seem to have been grounded on the notion that either some type of PPP adjustment or a simple flow-based real exchange rate equation—not too different from those used to evaluate the appropriateness of Mexico’s real exchange rate in 1993–94—provides a reasonable yardstick to assess the behavior of a floating exchange rate over relatively short periods. However, the notion that exchange rate analyses rooted in PPP are useful for this purpose has been flatly rejected by numerous empirical studies (Froot and Rogoff 1995; Isard 1995). Moreover, as we argued in the previous section, simple real exchange rate models that focus on flows and disregard the behavior of stock variables can produce highly misleading estimates of the degree of real exchange rate misalignment at a particular moment in time, especially under a floating regime.

Twenty-five years of experience with floating exchange rates have produced a substantial body of evidence on their short- and long-term empirical regularities (Baillie and McMahon 1989; de Vries 1994) that cannot be simply dismissed when passing judgment on the evolution of a particular float—even if this happens to be the Mexican peso. The analysis in this section attempts to place the debate about the behavior of the Mexican peso during the early postcrisis period on firmer ground. Specifically, we explore whether—and to what extent—the behavior exhibited by Mexico’s nominal exchange rate vis-à-vis the U.S. dollar in 1995–97 conforms to the behavior of other floating rates. To address this question we conduct two types of exercises, one based on a cross-country comparison of simple measures of nominal exchange rate volatility and the other focused on the evolution over time of various “fundamental determinants” of the peso-dollar exchange rate.

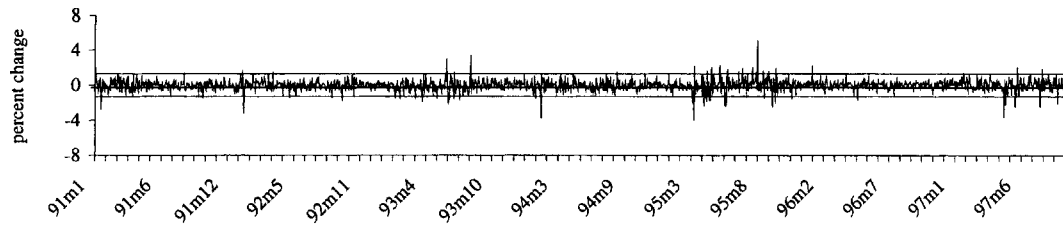
For the first exercise we used daily data on the nominal exchange rate vis-à-vis the U.S. dollar of the currencies of Germany, Japan, the United Kingdom, Canada, Australia, New Zealand, and Mexico and on the nominal exchange rate vis-à-vis the German mark of the French franc, for the period January 1991–November 1997 (about 1,800 observations per currency).¹⁹ We calculated the day-to-day percentage change of the eight nominal exchange rates over the whole sample (fig. 6.3) and then computed, for each calendar year, two measures of short-term volatility often

19. The exchange rates used for these calculations consist of the “representative rates” submitted daily by all countries’ central banks to the Treasurer’s Department of the IMF.

Deutsche marks per U.S. dollar



Japanese yen per U.S. dollar



British pounds per U.S. dollar

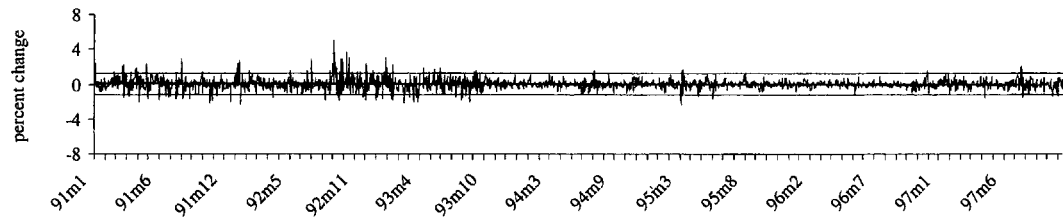
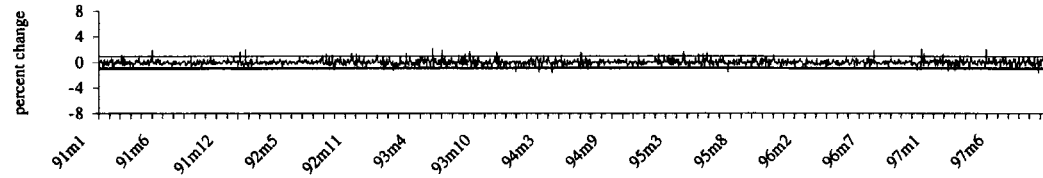


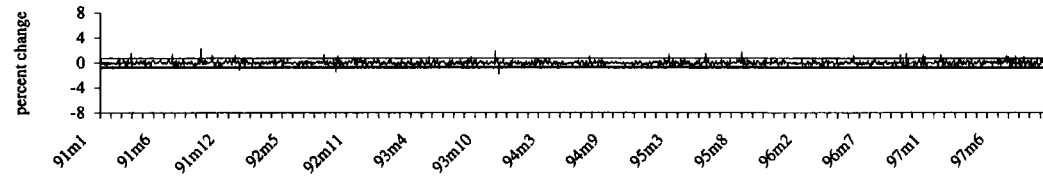
Fig. 6.3 Short-term variability of selected nominal exchange rates, January 1991–November 1997 (day-to-day percentage changes)

Note: Bands for each currency are set at 2 standard deviations of the daily percentage change over the sample period.

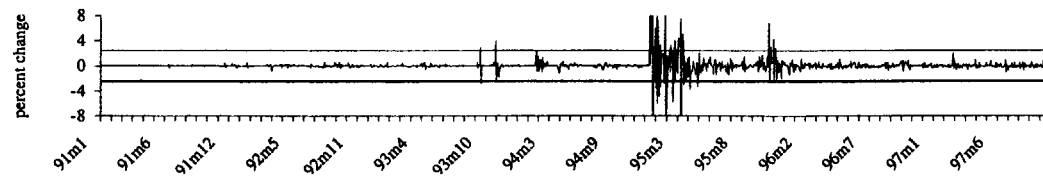
Australian dollars per U.S. dollar



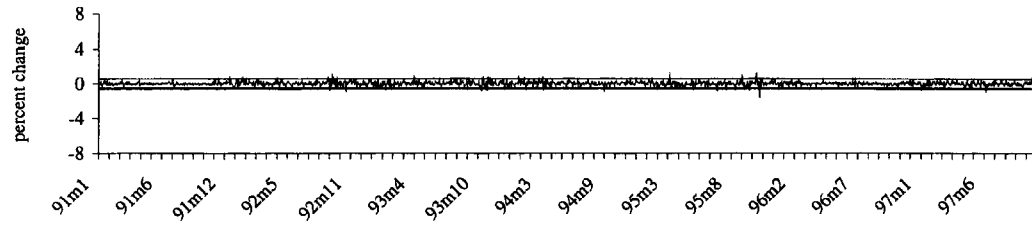
New Zealand dollars per U.S. dollar



Mexican pesos per U.S. dollar



Canadian dollars per U.S. dollar



French francs per deutsche mark

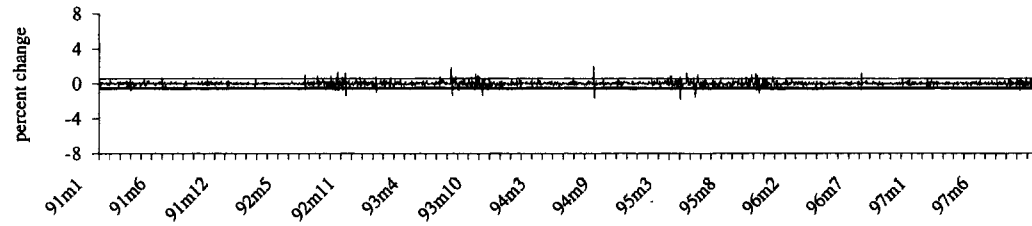


Fig. 6.3 (cont.)

used in empirical analyses of nominal exchange rates: (1) the *mean absolute value* of the day-to-day percentage change and (2) the *standard deviation* of the (actual) day-to-day percentage change (see Baillie and McMahon 1989). We also computed these two measures of volatility for the weekly (end of week) and monthly (end of month) percentage changes of the eight nominal exchange rates during the period.

The results of these computations are presented in tables 6.1, 6.2, and 6.3. These tables reveal three important features of the behavior of the Mexican peso during 1995–97: (1) The peso-dollar exchange rate was considerably less volatile than the other seven exchange rates in the period prior to the devaluation of December 1994 (January 1991–November 1994). (2) The Mexican peso exhibited the highest degree of short-term volatility among this group of currencies in 1995. (3) The short-term volatility of Mexico's nominal exchange rate was broadly in line with that of the other seven currencies in the last twenty-three months of the sample (January 1996–November 1997). The first two findings are hardly surprising: as noted earlier, Mexico's exchange rate system prior to the devaluation consisted of a gradually crawling band with relatively narrow margins in which the central bank intervened heavily to dampen (most) short-term fluctuations, whereas the financial mayhem that beset Mexico in the first quarter of 1995 was reflected primarily in wild daily gyrations in the value of the peso—which were greater than 6 percent (in both directions) on several occasions (fig. 6.3). The third feature, however, is quite interesting. According to the statistics in tables 6.1, 6.2, and 6.3, in 1996–97 the Mexican peso was consistently more volatile than the Canadian dollar and the French franc and, while it was more stable than the currencies of the G-3 and the United Kingdom (countries widely regarded as having the “cleanest” type of float), exhibited a degree of volatility comparable to that of the currencies of Australia and New Zealand (fig. 6.4).²⁰ This evidence, therefore, suggests that the relative stability of Mexico's nominal exchange rate in the aftermath of the 1994 crisis period was not “excessive” or unusual for a floating rate. At the same time, however, the fact that the peso-dollar rate exhibited a degree of volatility lower than that of the cleanest floaters in the group is not inconsistent with the view that during the period under consideration the BOM took into account, in some way, the behavior of the nominal exchange rate when conducting monetary policy.

Of course, it is possible that by comparing the mean absolute values and standard deviations of high-frequency exchange rate changes during

20. We decided to include the franc-mark exchange rate in the sample even though the French currency did not float freely during the period under study (but instead was linked, through the Exchange Rate Mechanism and monetary policy, to the evolution of the German mark) in order to have comparable data on a country with a managed float where exchange rate stability *has been* a primary objective of monetary policy.

Table 6.1 **Volatility of Daily Exchange Rates, 1991–97**

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
<i>1991</i>								
Number of obs.	258			257				
Mean absolute % change	0.6066	0.4317	0.5678	0.1276	0.2658	0.2510	0.1206	0.0495
Standard deviation of % change	0.8533	0.5787	0.7786	0.1802	0.3635	0.3704	0.1765	0.0821
Maximum absolute % change	4.1440	2.7656	2.8290	0.9158	1.9577	2.3219	0.8803	0.4904
Number of obs. with zero change*	12	24	9	15	12	23	13	18
<i>1992</i>								
Number of obs.	260							
Mean absolute % change	0.6505	0.4069	0.6701	0.2226	0.2937	0.2505	0.1800	0.1025
Standard deviation of % change	0.8922	0.5611	0.9520	0.2969	0.4188	0.3539	0.2867	0.1635
Maximum absolute % change	3.1903	3.2460	5.0254	1.1503	2.0030	1.5042	1.4214	0.8406
Number of obs. with zero change*	9	20	9	9	12	33	9	35
<i>1993</i>								
Number of obs.	260							
Mean absolute % change	0.5340	0.4818	0.5802	0.2346	0.4106	0.2634	0.2257	0.1573
Standard deviation of % change	0.6935	0.6734	0.7839	0.3076	0.5479	0.3756	0.3423	0.4423
<i>(continued)</i>								

Table 6.1 (continued)

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
Maximum absolute % change	2.1211	3.4568	3.0316	1.0413	2.2455	1.9604	1.8054	4.0609
Number of obs. with zero change ^a	9	24	9	9	13	31	13	36
<i>1994</i>								
Number of obs.	260							
Mean absolute % change Excl. 20–31 December	0.4501	0.4567	0.3071	0.1946	0.3059	0.2193	0.1434	0.4379 0.1813
Standard deviation of % change Excl. 20–31 December	0.6006	0.6179	0.4194	0.2630	0.4533	0.3011	0.2364	1.9721 0.2913
Maximum absolute % change	2.1824	3.7665	1.5282	0.9530	1.7561	1.1191	1.9889	22.5919
Number of obs. with zero change ^a	10	20	9	13	41	24	15	30
<i>1995</i>								
Number of obs.	259							
Mean absolute % change	0.5474	0.6307	0.3435	0.2311	0.3569	0.2660	0.2553	1.3144
Standard deviation of % change	0.8032	0.9214	0.4874	0.3281	0.4818	0.3653	0.3707	2.3005
Maximum absolute % change	4.4128	5.0721	2.4375	1.6231	1.7140	1.7509	1.8348	15.8940
Number of obs. with zero change ^a	9	14	10	16	13	21	17	13

<i>1996</i>								
Number of obs.	260							
Mean absolute % change	0.3202	0.3435	0.2569	0.1396	0.2838	0.2477	0.1285	0.2592
Standard deviation of % change	0.4290	0.4557	0.3556	0.1922	0.4042	0.3504	0.1866	0.3461
Maximum absolute % change	1.7236	2.2562	1.6238	0.6616	2.1690	1.5314	1.1580	1.1565
Number of obs. with zero change ^a	12	22	8	12	15	16	13	15
<i>1997 (January–November)</i>								
Number of obs.	237							
Mean absolute % change	0.4739	0.5167	0.4045	0.1981	0.4209	0.3356	0.1459	0.3363
Standard deviation of % change	0.6086	0.7174	0.5352	0.2585	0.5726	0.4471	0.2039	0.8485
Maximum absolute % change	1.8414	3.6526	2.0122	0.9679	2.7822	2.0083	0.8352	9.7792
Number of obs. with zero change ^a	8	21	5	8	9	19	12	10
<i>1991–97^b</i>								
Number of obs.	1,794			1,793				
Mean absolute % change	0.5122	0.4661	0.4476	0.1926	0.3329	0.2610	0.1717	0.3800
Standard deviation of % change	0.7142	0.6597	0.6507	0.2663	0.4677	0.3686	0.2676	1.2148
Maximum absolute % change	4.4128	5.0721	5.0254	1.6231	2.7822	2.3219	1.9889	22.5919
Number of obs. with zero change ^a	69	145	59	82	115	167	92	157

^aIncludes national holidays and other nontrading days; excludes weekends.

^bUp to the end of November 1997.

Table 6.2 Volatility of Weekly Exchange Rates, 1991–97 (end-of-week exchange rate)

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
<i>1991</i>								
Number of obs.	51							
Mean absolute % change	1.5918	0.8843	1.4403	0.3086	0.6700	0.7288	0.1491	0.1361
Standard deviation of % change	1.9114	1.1877	1.7526	0.4005	0.9178	0.9317	0.1980	0.1485
Maximum absolute % change	4.4849	3.4043	3.5161	1.1208	3.0275	3.0319	0.6806	0.3829
Number of weeks with zero change	0	2	0	1	0	0	0	0
<i>1992</i>								
Number of obs.	53							
Mean absolute % change	1.4656	0.9306	1.5399	0.5685	0.6065	0.5132	0.2960	0.2104
Standard deviation of % change	1.8843	1.1691	2.2629	0.7004	0.8621	0.6931	0.4735	0.3199
Maximum absolute % change	4.6834	3.0313	11.3738	1.8815	3.3650	2.2762	1.5829	1.1316
Number of weeks with zero change	0	0	0	0	0	2	0	4
<i>1993</i>								
Number of obs.	52							
Mean absolute % change	1.1605	0.9995	1.2965	0.5460	0.9277	0.6493	0.4166	0.2989
Standard deviation of % change	1.4529	1.2546	1.6097	0.7682	1.1398	0.8593	0.5906	0.7026
Maximum absolute % change	4.0163	3.5285	3.9243	2.1415	2.5771	2.9412	1.7629	4.0000

Table 6.2 (continued)

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
Maximum absolute % change	2.1930	2.1091	2.7248	1.2527	2.3468	2.0616	0.7090	2.2754
Number of weeks with zero change	0	0	0	0	1	1	0	0
<i>1997 (January–November)</i>								
Number of obs.	48							
Mean absolute % change	1.0502	1.1412	0.9589	0.5381	0.8936	0.6955	0.1998	0.6305
Standard deviation of % change	1.2782	1.5171	1.2660	0.6719	1.1224	0.9288	0.2458	1.1699
Maximum absolute % change	3.2729	5.2760	4.3556	1.8926	4.0958	3.7168	0.6484	6.3722
Number of weeks with zero change	0	0	0	0	0	2	0	2
<i>1991–97^a</i>								
Number of obs.	360							
Mean absolute % change	1.1867	0.9956	1.1317	0.4895	0.7498	0.6004	0.3112	0.7085
Standard deviation of % change	1.5453	1.3090	1.5966	0.6407	0.9889	0.8017	0.4740	2.5351
Maximum absolute % change	5.3676	5.3162	11.3738	2.1415	4.0958	3.7168	2.3369	44.3001
Number of weeks with zero change	1	4	0	3	1	6	0	11

^aUp to the end of November 1997.

Table 6.3 Volatility of Monthly Exchange Rates, 1991–97 (end-of-month exchange rate)

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
<i>1991</i>								
Number of obs.	12							
Mean absolute % change	3.3509	1.7903	3.0408	0.8385	1.4008	1.2110	0.2784	0.3922
Standard deviation of % change	5.1158	2.6926	4.4050	0.9610	1.7454	1.4713	0.3518	0.2372
Maximum absolute % change	12.9457	6.8182	10.5445	1.8509	3.2903	3.9749	0.5978	0.5984
Minimum absolute % change	0.2544	0.0000	0.0877	0.2794	0.0255	0.0500	0.0236	0.1878
<i>1992</i>								
Number of obs.	12							
Mean absolute % change	3.2771	2.0783	4.1578	1.3930	1.4079	0.9990	0.4475	0.5079
Standard deviation of % change	4.3586	2.5664	5.6491	1.7522	1.6783	1.2895	0.5343	0.6549
Maximum absolute % change	9.0612	3.9326	13.6201	4.4177	4.3174	2.3689	0.8763	1.1572
Minimum absolute % change	0.0284	0.0401	0.4762	0.5042	0.0527	0.0183	0.0984	0.0163
<i>1993</i>								
Number of obs.	12							
Mean absolute % change	2.6266	2.0684	2.1527	0.9646	2.2055	1.1803	0.7765	0.3294
Standard deviation of % change	3.0404	2.6082	2.9448	1.2106	2.6574	1.2989	1.0415	0.4111
Maximum absolute % change	5.9097	5.5377	5.3288	2.8580	5.1263	2.5948	1.7822	0.8176
<i>(continued)</i>								

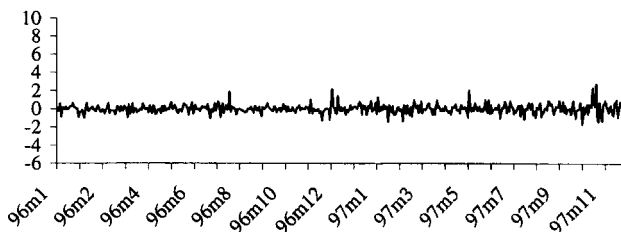
Table 6.3 (continued)

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
Minimum absolute % change <i>1994</i>	0.8733	0.1202	0.0135	0.0787	0.6992	0.1846	0.0807	0.0515
Number of obs.	12							
Mean absolute % change Excl. December	1.6826	1.7654	1.3936	1.0605	1.7563	1.5685	0.2917	5.3873 1.4999
Standard deviation of % change Excl. December	1.8524	2.3000	1.8476	1.3314	1.9837	1.4846	0.3270	13.7661 2.0748
Maximum absolute % change	3.8889	5.2320	3.8080	2.3447	4.7947	2.7501	0.6299	48.1481
Minimum absolute % change <i>1995</i>	0.0251	0.2005	0.0000	0.0651	0.3907	0.0831	0.0734	0.0322
Number of obs.	12							
Mean absolute % change	2.0075	3.4603	1.2954	0.8516	1.4847	1.2757	0.8324	6.2493
Standard deviation of % change	2.9102	5.1158	1.6821	1.1934	1.9293	1.7951	1.0007	7.2188
Maximum absolute % change	6.2296	12.0660	3.2206	2.8163	4.1007	3.6220	1.5444	13.5294
Minimum absolute % change	0.1807	0.1475	0.0310	0.0596	0.2115	0.0468	0.0859	0.9677

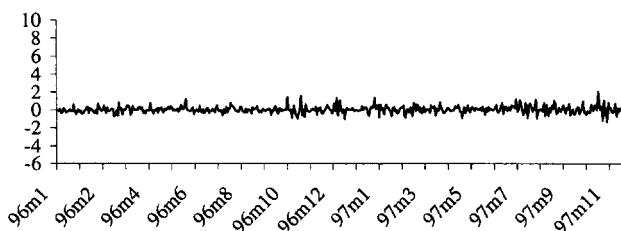
<i>1996</i>								
Number of obs.	12							
Mean absolute % change	1.8336	1.8893	1.5026	0.6650	1.3969	0.8328	0.5663	1.6822
Standard deviation of % change	2.2174	2.0307	1.8739	0.8315	1.6273	0.7738	0.6902	2.5443
Maximum absolute % change	4.0670	4.2984	4.0536	1.5710	2.4623	2.3023	1.1425	5.9058
Minimum absolute % change	0.3073	0.0264	0.0514	0.1320	0.0403	0.2545	0.0172	0.0000
<i>1997 (January–November)</i>								
Number of obs.	11							
Mean absolute % change	2.7319	3.0889	1.5150	0.9524	2.0314	1.4074	0.1756	1.4737
Standard deviation of % change	2.9178	3.9472	2.4033	1.1225	1.9259	1.4046	0.2109	2.8232
Maximum absolute % change	5.0685	8.1987	5.9925	1.9682	4.5276	4.2769	0.3881	8.3966
Minimum absolute % change	0.7923	0.8678	0.0061	0.0145	0.0403	0.1448	0.0245	0.0639
<i>1991–97*</i>								
Number of obs.	83							
Mean absolute % change	2.4987	2.2964	2.1588	0.9609	1.6647	1.2083	0.4849	2.2987
Standard deviation of % change	3.3278	3.1635	3.2697	1.2305	2.0446	1.5612	0.6511	6.1610
Maximum absolute % change	12.9457	12.0660	13.6201	4.4177	5.1263	4.2769	1.7822	48.1481
Minimum absolute % change	0.0251	0.0000	0.0000	0.0145	0.0255	0.0183	0.0172	0.0000

*Up to November 1997.

Australian dollars per U.S. dollar



New Zealand dollars per U.S. dollar



Mexican pesos per U.S. dollar

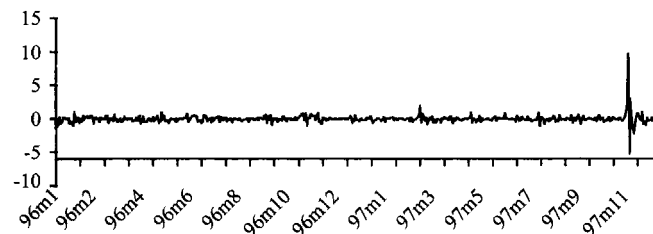


Fig. 6.4 Short-term variability of nominal exchange rates, January 1996–November 1997 (day-to-day percentage changes)

specific calendar years we are imposing arbitrary restrictions on the distribution of nominal exchange rates that prevent us from detecting important peculiarities of the behavior of the Mexican peso. In particular, it may be the case that the volatility measures of the Mexican peso for the years 1996–97 (and even 1995) are unduly influenced by large “volatility clusters” (de Vries 1994) and that, except for a few days (or weeks) with very large exchange rate fluctuations, the nominal peso-dollar rate is “excessively” stable for the most part of the year. To explore whether this is in fact the case, we broke the sample for the years 1995–97 into “turbu-

lent” and “calm” periods for each exchange rate. Specifically, we used the day-to-day percentage changes to construct monthly measures of volatility for each currency and ranked them in descending order. We then used the observations from the three months of each year when volatility was highest for each exchange rate to compute the volatility measures for the turbulent period and the observations from the other nine months to obtain the corresponding measures for the calm period of the year. The outcomes of these calculations are reported in table 6.4. Overall, the results are quite similar to those we obtained using all the observations for each calendar year: the Mexican peso still stands out as the most volatile currency in this group in 1995 (in both the turbulent and calm periods), and perhaps more important, the volatility of the peso-dollar exchange rate continues to be higher than that of the Canadian dollar and the French franc—and similar in magnitude to that of the New Zealand dollar—in the calm periods of 1996–97. Hence, these findings support our earlier conclusion: the relative stability exhibited by the Mexican peso over many intervals during 1996–97 is not at odds with the behavior of exchange rates in other countries generally regarded as having (some variant of) a floating exchange rate arrangement.²¹

One aspect of the behavior of the Mexican peso captured by the indicators in table 6.4, however, seems rather peculiar, namely, the marked shift in the (relative) degree of volatility between turbulent and calm subperiods. In fact, unlike the other currencies, which more or less preserve their pecking order in the scale of volatility in both subperiods, the peso-dollar exchange rate jumps ahead in the scale of volatility in turbulent periods. Indeed, table 6.4 shows that the degree of volatility of the peso-dollar rate during these subperiods was comparable to that of the three most volatile exchange rates in the sample (i.e., the mark-dollar, yen-dollar, and pound-dollar rates). These large shifts in the (relative) degree of volatility across subperiods²² might reflect a different (“atypical”) underlying distribution of nominal exchange rate changes for the Mexican peso or differences in the relation between the nominal exchange rate and other financial variables (e.g., interest rates) in the case of Mexico. We will come back to this issue later in the paper.

For the second exercise we followed the methodology developed by Rose (1994) and Flood and Rose (1995) to analyze the relation between exchange rate volatility and macroeconomic volatility across exchange regimes. The methodology helps to ascertain whether the increase in

21. Werner (1997) reaches a similar conclusion.

22. These shifts are also clear when one compares the ratio between the measures of volatility in turbulent and in calm periods. With the exception of Mexico, these ratios are quite similar across countries and over time (on the order of 1.5 to 1.6—and none, except for two, greater than 2). In the case of Mexico, however, these ratios are much larger than 2 in 1995 and 1997, and on the order of 1.8 in 1996.

Table 6.4 Volatility of Daily Exchange Rates: “Turbulent” and “Calm” Periods, 1995–97

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
<i>1995</i>								
Number of obs.	259							
Mean absolute % change	0.5474	0.6307	0.3435	0.2311	0.3569	0.2660	0.2553	1.3144
Standard deviation of % change	0.8032	0.9214	0.4874	0.3281	0.4818	0.3653	0.3707	2.3005
Three most volatile months ^a								
Number of obs.	68	64	66	66	65	66	68	65
Mean absolute % change	0.7354	0.9967	0.4929	0.3112	0.4533	0.3456	0.4015	3.2422
Standard deviation of % change	1.1134	1.2431	0.6464	0.4277	0.5673	0.4599	0.5531	4.2080
Other 9 months								
Number of obs.	191	195	193	193	194	193	191	194
Mean absolute % change	0.4805	0.5106	0.2924	0.2037	0.3246	0.2388	0.2032	0.6685
Standard deviation of % change	0.6617	0.7743	0.4006	0.2712	0.4498	0.3269	0.2803	1.0719

1996

Number of obs.	260							
Mean absolute % change	0.3202	0.3435	0.2569	0.1396	0.2838	0.2477	0.1285	0.2592
Standard deviation of % change	0.4290	0.4557	0.3556	0.1922	0.4042	0.3504	0.1866	0.3461
Three most volatile months ^b								
Number of obs.	64	65	65	66	65	65	66	65
Mean absolute % change	0.4180	0.4076	0.3577	0.1993	0.3843	0.3433	0.1713	0.3917
Standard deviation of % change	0.5468	0.5862	0.4911	0.2620	0.5825	0.5125	0.2660	0.4789
Other 9 months								
Number of obs.	196	195	195	194	195	195	194	195
Mean absolute % change	0.2883	0.3221	0.2234	0.1193	0.2504	0.2158	0.1139	0.2151
Standard deviation of % change	0.3842	0.4039	0.2960	0.1623	0.3242	0.2780	0.1504	0.2894

1997^c

Number of obs.	237							
Mean absolute % change	0.4739	0.5167	0.4045	0.1981	0.4209	0.3356	0.1459	0.3363
Standard deviation of % change	0.6086	0.7174	0.5352	0.2585	0.5726	0.4471	0.2039	0.8485
Three most volatile months ^d								
Number of obs.	63	64	61	65	64	67	66	63

(continued)

Table 6.4 (continued)

Year and Measure	Germany (DM/US\$)	Japan (yen/US\$)	United Kingdom (pound/US\$)	Canada (Can\$/US\$)	Australia (Au\$/US\$)	New Zealand (NZ\$/US\$)	France (FFr/DM)	Mexico (peso/US\$)
Mean absolute % change	0.6211	0.7051	0.5370	0.2647	0.5827	0.4369	0.2402	0.6449
Standard deviation of % change	0.7420	0.9781	0.6967	0.3361	0.7768	0.5674	0.3032	1.5691
Other 8 months Number of obs.	174	173	176	172	173	170	171	174
Mean absolute % change	0.4205	0.4469	0.3585	0.1729	0.3611	0.2956	0.1095	0.2246
Standard deviation of % change	0.5545	0.5818	0.4686	0.2209	0.4784	0.3895	0.1502	0.3077

^a*Germany*: March, May, and June. *Japan*: March, April, and September. *United Kingdom*: February, March, and May. *Canada*: March, September, and October. *Australia*: February, May, and October. *New Zealand*: February, March, and April. *France*: March, May, and October. *Mexico*: January, February, and March.

^b*Germany*: January, February, and December. *Japan*: January, February, and April. *United Kingdom*: May, November, and December. *Canada*: January, February, and July. *Australia*: July, November, and December. *New Zealand*: March, October, and December. *France*: January, July, and November. *Mexico*: January, June, and October.

^cJanuary to November.

^d*Germany*: January, August, and November. *Japan*: May, June, and August. *United Kingdom*: February, August, and November. *Canada*: January, May, and June. *Australia*: March, October, and November. *New Zealand*: July, August, and October. *France*: August, September, and October. *Mexico*: February, October, and November.

exchange rate volatility brought about by a switch from a fixed (managed) to a floating exchange rate regime is associated with a corresponding increase in macroeconomic volatility. To the extent that this is the case, “standard” macroeconomic fundamentals can be said to account for the high exchange rate volatility that characterizes floating rates (as with the Mexican peso in 1995–97). Conversely, if macroeconomic fundamentals do not change systematically across exchange regimes, one would have to conclude that the sources of the increased exchange rate volatility in a float are not macroeconomic in nature (this is, in fact, the main conclusion of Flood and Rose’s analysis of the behavior of the nominal exchange rates of eight OECD economies before and after the breakdown of Bretton Woods). The methodology is useful for identifying potential fundamental determinants of exchange rates and is grounded on sound economic intuition. Simply put, it combines the fact that theoretical models typically assume that there exists a regime-invariant (linear) link between (nominal) exchange rates and “fundamentals” with the empirical observation that the conditional volatility of exchange rates rises sharply whenever a previously fixed or managed exchange rate is allowed to float. The testable corollary of these two premises is that any variable considered a potentially valid fundamental determinant of exchange rates also has to exhibit a significant increase in its conditional volatility with the switch from a fixed to a floating exchange regime.

The mechanics of the exercise are fairly straightforward. In the case of the simple flexible price monetary model of the exchange rate, the exercise starts from the three standard equations: (a) a structural money market equilibrium condition for the domestic country,

$$(1) \quad m_t - p_t = \beta y_t - \alpha i_t + \varepsilon_t,$$

where m_t is the (natural logarithm of the) money supply in period t , p_t is the (log of the) price level, y_t is (the log of) real income, i_t is the nominal interest rate, ε_t is a money demand shock, and α and β are structural parameters; (b) a comparable equilibrium condition for the foreign country,

$$(1') \quad m_t^* - p_t^* = \beta y_t^* - \alpha i_t^* + \varepsilon_t^*,$$

that assumes elasticities for real income and the interest rate equal to those of the home country; and (c) the assumption that PPP holds, at least up to a disturbance,

$$(2) \quad p_t - p_t^* = e_t + v_t,$$

where e_t is the (log of the) nominal exchange rate (units of domestic currency per unit of foreign currency) and v_t is a stationary disturbance. It

then combines (a) through (c) to obtain the familiar exchange rate equation:

$$(3) \quad e_t = (m - m^*)_t - \beta(y - y^*)_t + \alpha(i - i^*)_t - (\varepsilon - \varepsilon^*)_t - v_t,$$

which can also be expressed as

$$(3') \quad e_t - \alpha(i - i^*)_t = (m - m^*)_t - \beta(y - y^*)_t - (\varepsilon - \varepsilon^*)_t - v_t.$$

In the case of other structural exchange rate models (e.g., sticky price models, portfolio balance models, and currency substitution models) the procedure would be similar, namely, obtain the reduced-form relation for the nominal exchange rate implied by the model, and then exploit the fact that the left-hand side and right-hand side of that relation represent, in theory, alternative ways of measuring the same latent variable: the “fundamental determinants” of the exchange rate. For example, Flood and Rose (1995) explicitly consider the alternative case of a sticky price model à la Frankel (1979) that relaxes the PPP assumption. Another alternative that would seem relevant for small developing economies—such as Mexico—would be a model that relaxes the assumption that monetary services are provided only by the domestic currency and, hence, allows a role for currency substitution in the determination of the exchange rate. One problem with these alternatives is that their corresponding reduced-form equations have multiple empirical specifications and therefore it is far more difficult to rely on the empirical literature to make reasonable assumptions about the values of the structural parameters necessary to implement the procedure. Thus, to simplify matters, and as a first approximation, we decided to stick to the familiar flexible price monetary model.

Flood and Rose (1995) call the left-hand side of equation (3') the virtual fundamentals (VF):

$$(4) \quad VF \equiv e_t - \alpha(i - i^*)_t,$$

and the first two terms of the right-hand side the “traditional fundamentals” (TF):

$$(5) \quad TF \equiv (m - m^*)_t - \beta(y - y^*)_t;$$

they also consider a variant of equation (5) that includes the term for money disturbances and call it “augmented traditional fundamentals” (ATF):

$$(6) \quad ATF \equiv (m - m^*)_t - \beta(y - y^*)_t - (\varepsilon - \varepsilon^*)_t,$$

which, using equation (3), can be shown to be equal to

$$(6') \quad ATF \equiv (p - p^*)_t - \hat{\alpha}(i - i^*)_t.$$

The thrust of this approach consists of comparing the time-series characteristics of VF, TF, and ATF (the only difference between the latter two being the money disturbance term $(\varepsilon - \varepsilon^*)_t$). As noted above, the underlying hypothesis is that if the model is a useful approximation of reality, virtual and traditional fundamentals should exhibit similar time-series properties. If they do not, then either the model is faulty, measurement errors are pervasive, or both. To deal with the possible nonstationarity of the data, Flood and Rose (1995) propose using the conditional volatility (i.e., the standard deviations of the first differences of VF, TF, and ATF) as the metric for the comparison. They also stress that the methodology does not require strong assumptions about the processes of the forcing variables (including, in particular, assumptions about exogeneity); all it requires, aside from the raw economic data, is “reasonable”—that is, empirically sound—assumptions about the values of the structural parameters α and β .

To apply this methodology to the peso-dollar exchange rate we used monthly data for Mexico and the United States for the period January 1991–October 1997.²³ We assumed that Mexico was the domestic country and used consumer price indexes (CPIs) to measure prices, narrow money (M1) data to measure the money supply, industrial production indexes as a proxy for real income, and the return on one-month treasury bills as interest rates.²⁴ All the series were transformed by natural logarithms, except for the interest rates—which were measured as nominal rates divided by 100. Following Flood and Rose (1995), we chose $\alpha = 0.5$ and $\beta = 1.0$ as the benchmark values in the computation of VF, TF, and ATF and checked the sensitivity of the results to two alternative values for α (0.1, 1.0) and β (0.5, 1.5).

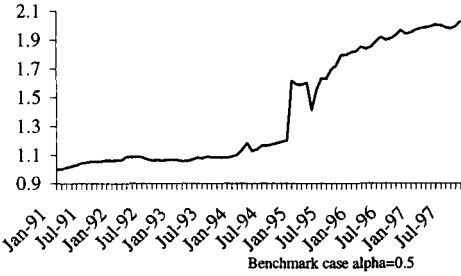
Figure 6.5 shows the plots of the levels (*left*) and first differences (*right*) of the three measures of the fundamentals of the peso-dollar exchange rate using the benchmark values $\alpha = 0.5$ and $\beta = 1.0$ for the period January 1991–June/October 1997. Since we are interested in the conditional innovations of the fundamentals—more precisely, in comparing those innovations before and after the devaluation of December 1994—the plots of the first differences are the objects of greatest interest.²⁵ Visual inspection of the plots suggests, first, that the volatility of the virtual fundamentals of the Mexican peso increased markedly following the December 1994 deval-

23. All the data for this exercise were extracted from the IMF's *International Financial Statistics*. For a few series—e.g., industrial production indexes—the latest observations at the time of writing were for June 1997.

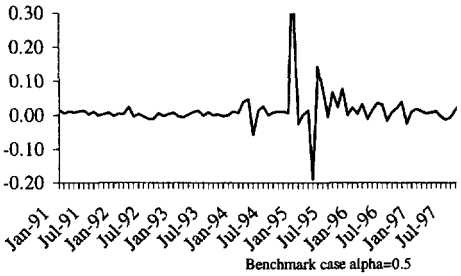
24. We also used the monetary base to conduct this analysis. The results were essentially the same.

25. If the fundamentals follow a random walk—as conventional unit-root tests applied to high-frequency data on the underlying variables typically suggest—then the first difference is also the innovation (see Edwards and Savastano 1998).

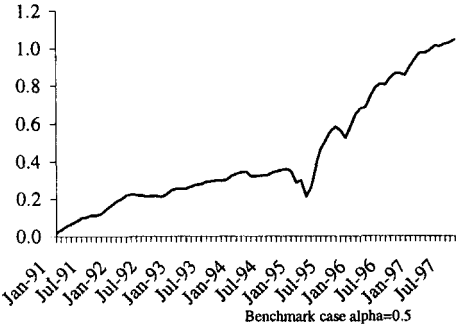
Virtual Fundamentals
(levels)



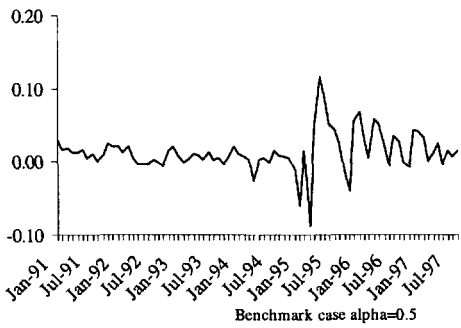
Virtual Fundamentals
(first differences)



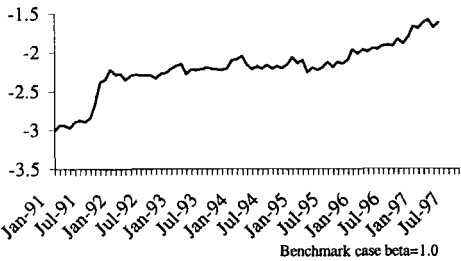
Augmented Traditional Fundamentals
(levels)



Augmented Traditional Fundamentals
(first differences)



Traditional Fundamentals
(levels)



Traditional Fundamentals
(first differences)

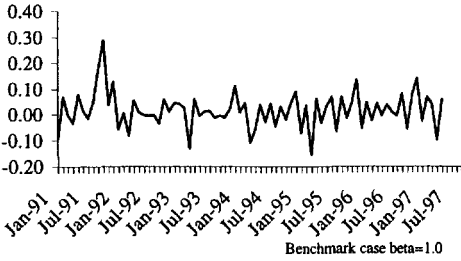


Fig. 6.5 Mexican peso: “virtual” and “traditional” fundamentals, January 1991–October 1997

Table 6.5 Fundamental Volatility of the Mexican Peso, 1991–97 (monthly data)

	Standard Deviation of First Differences			Volatility Ratio ^a
	Full period (1991:1–1997:10)	Predevaluation (1991:1–1994:11)	Postdevaluation (1995:1–1997:10)	
<i>Log exchange rate</i>	0.058	0.011	0.087	8.20
<i>Benchmark case</i>				
$\alpha = 0.5, \beta = 1.0$				
VF	0.056	0.014	0.083	5.84
ATF	0.027	0.009	0.039	3.96
TF	0.069	0.071	0.068	0.96*
<i>Sensitivity</i>				
$\alpha = 0.1$				
VF	0.056	0.011	0.084	7.68
ATF	0.012	0.006	0.014	2.52
$\alpha = 1.0$				
VF	0.066	0.020	0.098	4.85
ATF	0.052	0.017	0.078	4.70
$\beta = 0.5$				
TF	0.061	0.066	0.054	0.83*
$\beta = 1.5$				
TF	0.082	0.080	0.086	1.07*

^aRatio of sample standard deviations for the two subperiods (postdevaluation/predevaluation).

*The null hypothesis of equal volatility in the two subperiods cannot be rejected at the 0.05 confidence level (0.05 critical value for $F(30,50)$ is 1.7).

uation; second, that the volatility of the augmented traditional fundamentals was also higher in the period following the devaluation; and, third, that the volatility of the traditional fundamentals did not change systematically after the adoption of a floating exchange rate. The first and last features are broadly in line with the findings of Flood and Rose (1995) for their sample of eight OECD economies (and the first is also consistent with our earlier analysis of the volatility of the peso-dollar rate). However, the second feature—the fact that the volatility of ATF increased after the devaluation—seems at odds with the results obtained by Rose (1994) and Flood and Rose (1995).

The information contained in these plots can be analyzed more rigorously with the help of table 6.5. The table presents estimates of the standard deviations of the first differences of VF, ATF, and TF for the whole period, as well as for the periods before and after the December 1994 devaluation, for different values of the parameters α and β . In addition, the last column contains estimates of the *ratio* of the standard deviations of the first differences of fundamentals in the period following the devaluation (the floating period) to the standard deviation of the corresponding

variables in the period prior to the devaluation.²⁶ The estimates in the table support our interpretation of the plots in figure 6.4. The sample standard deviations show a marked increase in the level of volatility in the series of VF and ATF since the devaluation of December 1994 for all values of α and similar levels of volatility across periods for all the series of TF. In fact, the estimates of the “volatility ratio” in the last column of table 6.5 indicate that the null hypothesis of no increase in conditional volatility during the float is rejected for all the VF series *and* all the ATF series at any reasonable level of statistical confidence, while such a hypothesis cannot be rejected for any of the TF series. This basic result did not change when we computed the standard deviations (and the volatility ratio) excluding December 1994 and some or all of the observations for 1995 from the second subsample—although in these cases the increases in the level of volatility of the VF and ATF series were considerably smaller.²⁷

These results suggest that in contrast with the OECD experiences examined by Flood and Rose (1995), the increase in the level of volatility of the virtual fundamentals of the peso-dollar rate during the first three years of the float *was* accompanied by an increase in the level of volatility of (some) macroeconomic fundamentals. Put differently, in the case of Mexico the evidence from 1995–97 does not rule out completely the possibility that the determinants of nominal exchange rate volatility were macroeconomic in nature. That said, the evidence also indicates that the likely sources of the increase in macroeconomic volatility in that period were shocks to (relative) money demand—which, as we noted earlier, is the only difference between TF and ATF. We find this quite interesting. More unstable (less stable) money demand would normally call for some change in the operating procedures of monetary policy, especially when the shocks are “permanent” (regime-specific) in nature and when those procedures entail some type of targeting of monetary aggregates. According to the evidence above, however, Mexico’s monetary policy—crudely proxied by the behavior of TF—did not seem to change significantly after the country adopted a floating exchange rate regime in 1995. In principle, this would tend to undermine the effectiveness of monetary policy, in particular its ability to achieve the desired combination of inflation and output outcomes, and may be a factor behind the anomalies in the behavior of the peso-dollar rate discussed earlier in this section. The finding could also be taken as

26. Following Flood and Rose (1995) we report the ratio of standard deviations rather than the corresponding F -statistics to highlight those cases where fundamental volatility was actually lower during the float than in the previous period. The relevant F -statistic can be obtained by squaring the ratio presented in the table (provided that the ratio is greater than one). Of course, the ratio of regime-specific sample variances that will be obtained by this procedure, suitably adjusted by degrees of freedom, will be distributed as F only if the first differences of the fundamentals are normally distributed (which may not be the case).

27. To conserve space, these results are not reported in table 6.5. They are available on request.

evidence that the BOM continued to take into account the behavior of the exchange rate in conducting monetary policy in the months that followed the December 1994 devaluation. We explore this issue in greater detail in section 6.4.

6.4 The Bank of Mexico and the Peso-Dollar Rate in 1995–97

The peso devaluation of December 1994 imparted a severe blow to the credibility of the BOM. The damage became acutely apparent in the first quarter of 1995, when uncertainties about Mexico's capacity to redeem in full its large stock of short-term debt and about its authorities' resolve to confront the crisis led to an enormous depreciation of the peso that rendered obsolete the monetary program announced by the BOM in mid-January. A critical turning point was reached in March and April, following the securing of the US\$52 billion international support package arranged by the IMF and the U.S. Treasury and the authorities' announcement of a revised (and more realistic) set of macroeconomic policies and targets for 1995. The draconian tightening of monetary policy that accompanied these developments—with Cetes interest rates remaining above 70 percent for several weeks—put an end to the freefall of the peso and gradually restored calm to financial markets.

From then on, the BOM confronted the arduous task of restoring its tarnished credibility. To this effect, its authorities reiterated publicly and repeatedly that the primary objective of its monetary policy was to arrest the inflationary effects of the peso depreciation and to rapidly bring inflation down to moderate levels, that the exchange rate and interest rates would be freely determined by market forces, and that they would refrain from imposing any type of control or restriction on capital movements. The BOM also made it clear that other (secondary) objectives of its monetary policy were to prevent "excessive" fluctuations in the value of the peso, to rebuild its stock of international reserves, and to provide limited (and mainly technical) assistance in the restructuring of the badly damaged banking system. To underscore its resolve to increase the transparency of its actions and policies, the BOM made available to market analysts and the public at large timely information on its balance sheet and other monetary and financial indicators and stepped up its efforts to disseminate and explain the (various) initiatives being adopted to deal with the unfolding crisis in the banking system.

Financial analysts and other observers of the Mexican economy gave a lukewarm reception to these bold initiatives and, throughout 1995, raised repeated objections to the BOM's monetary policy. Some criticized the (revised) annual inflation target of 42 percent—on the grounds of its being either unambitious or unattainable. Others questioned the overall policy framework, in particular, the BOM's decision to adopt—and its intention

to abide by the rules of—a floating exchange rate. The arguments offered in support of these criticisms were quite unwieldy. The most sophisticated observers based their assessment of the stance (and likely consequences) of the BOM's monetary policy on mechanical applications of the quantity theory of money, variants of interest rate parity conditions, or simple PPP-based calculations. Others, a vast majority, based their objections on anecdotal evidence, personal intuition, and noneconomic considerations.

Sometime in 1996 the tenor of the concerns about Mexico's monetary policy started to change. The numerous worst-case scenarios advanced in 1995 were shelved one after another in light of a series of favorable developments including a steady fall in the rate of inflation,²⁸ signs of an early rebound in output growth, the turnaround of the external current account balance, the repayment in full of the stock of Tesobonos, and Mexico's successful reentry into international capital markets.²⁹ At this point, a more constructive debate about the actual priorities and operating procedures of the BOM's monetary policy took center stage. In particular, as noted in section 6.3, a number of analysts started to argue that the BOM was gearing its monetary policy, through changes in short-term interest rates, to maintaining an artificially strong peso. Underlying this view was the observation that since mid-1995, periods of relative nominal exchange rate stability and falling interest rates had been interrupted by episodes of exchange rate depreciation and interest rate rises that were reversed quickly and, hence, did not serve to arrest the real appreciation of the peso (see fig. 6.6).³⁰

Throughout 1996–97 the BOM systematically dismissed these arguments, considering them misguided and unfounded. Specifically, the BOM maintained the position that its monetary policy was not geared toward attaining or maintaining any particular *level* of the exchange rate *or* of interest rates, that these variables were freely determined by market forces, and that its monetary policy actions were guided solely by the dual objectives of securing its annual inflation target and ensuring orderly functioning of the money and foreign exchange markets (Gil-Díaz 1997). But the

28. The monthly rate of CPI inflation peaked at 8 percent in April 1995, averaged 2.5 percent from June 1995 to April 1996, and stayed below 2 percent from May to November 1996. The twelve-month rate of inflation peaked at 52 percent in December 1995 and fell steadily thereafter.

29. On Mexico's external debt strategy following the 1994 crisis, see Andrews and Ishii (1995) and IMF (1996). For an overview of the main macroeconomic developments in Mexico in 1995 and early 1996, see OECD (1996).

30. Fig. 6.6 shows that from late 1995 to September 1997 it is possible to identify visually at least six episodes, or cycles, of "spikes" in the nominal exchange rate and interest rates followed by relatively long periods of exchange rate stability and falling interest rates; the approximate starting date of these episodes were October–November 1995, February–March 1996, June–July 1996, October 1996, March 1997, and June 1997. The figure also shows that over time, the spikes became smaller in size and there was some upward ratcheting in the nominal exchange rate as well as a clear downward trend in nominal interest rates.

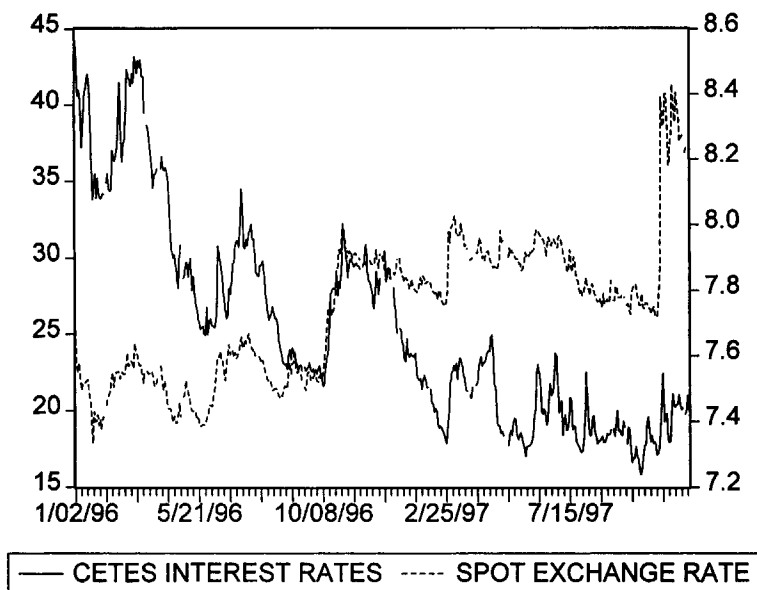


Fig. 6.6 Daily peso-dollar rate and daily Cetes rate (secondary market)

debate on what the BOM really did continued. On 3 October 1997, J. P. Morgan's *Emerging Markets Data Watch* noted: "It has often been argued in the past year or two that Banxico has been exacerbating upward pressure on the peso by tightening monetary policy" (6), and David Malpass, chief economist of Bear Stearns, stated in the *Wall Street Journal* that "Mexico stopped its economic and financial deterioration almost overnight [in the aftermath of the 1994 devaluation] by announcing a feedback mechanism between the exchange rate . . . and . . . monetary liquidity."³¹

Central banks often act in ways that do not exactly correspond to their pronouncements. Notwithstanding the emphasis that the recent literature on central banking places on the *transparency* of monetary policy,³² there is nothing intrinsically wrong or unusual about that type of behavior. In fact, a number of analysts have used statistical methods to shed light on the systematic component of central banks' actions that is not reflected in their public pronouncements in order to obtain a better understanding of what it is that central banks really do. Taylor's (1993) analysis of the Fed's behavior since the 1960s is perhaps the best known example of this approach. More recently, Clarida and Gertler (1997) tried to infer from the

31. "Free Float to Disaster," *Wall Street Journal*, 20 October 1997, A23.

32. See, e.g., the discussion in Federal Reserve Bank of Kansas City (1996) and Romer and Romer (1997).

data the way in which the German Bundesbank conducts monetary policy and found that in practice, the actual conduct of this policy differed significantly from the official line.³³ In Edwards and Savastano (1998) we used high-frequency (weekly) data to analyze Mexico's monetary policy during the first three years of the float. In the rest of this section we use daily data to investigate the behavior of some key macroeconomic variables—including the behavior of the monetary base—in an attempt to shed some light on the operations of the BOM.

We acknowledge at the outset that given Mexico's very limited experience with a floating exchange rate regime, the task of identifying what the BOM really did in the first three years after the 1994 crash is extremely difficult. In fact, those who have undertaken this type of challenge for advanced countries with at least twenty-five years of data have found it to be a very "complex issue, one that . . . [their] analysis cannot fully resolve" (Clarida and Gertler 1997, 364). But we consider it a worthy endeavor. The rest of the section is divided in two parts: subsection 6.4.1 presents a description and brief discussion of the conduct of monetary policy by the BOM; subsection 6.4.2 undertakes a preliminary examination of the behavior of key macroeconomic variables in the days following large depreciations of the peso.

6.4.1 The Bank of Mexico's Monetary Policy: The Official View

At a very general level, the BOM's approach to monetary policy seems quite standard and straightforward. Abiding by its constitutional mandate to maintain price stability, at the end of every year the BOM—in conjunction with the rest of the economic team—chooses and announces an end-point inflation target for the following calendar year and specifies a time path for the demand for money consistent with that inflation target and with the expected evolution of output, interest rates, and other macroeconomic variables.³⁴ Based on a number of considerations, including its relative stability over long periods of time, the monetary aggregate preferred by the BOM is the monetary base.³⁵ The BOM's conduct of monetary policy throughout the year is therefore geared primarily at keeping the intermediate target (the monetary base) on (close to) its prespecified path, taking due account of new (unexpected) developments in the economy.

33. Bernanke and Mihov (1997) reached a similar conclusion using (slightly) different vector autoregression techniques. The Bundesbank's official view on monetary policy, however, has remained the same (see Issing 1997).

34. The announcement usually takes place in the context of the presentation to Congress of the economic program for the following year, which is spelled out in a document called "Criterios Generales de Política Económica."

35. Since the adoption of a system of zero reserve requirements on deposits in the early 1990s, Mexico's monetary base is approximately equal to the amount of currency in circulation.

Seen in this way, the BOM's approach to monetary policy resembles a conventional two-stage intermediate target procedure, which, given the BOM's revealed preference for the monetary base, can be thought of as a framework of "base money targeting."

At a more detailed level, however, the BOM's conduct of monetary policy looks somewhat less conventional. This is so for two main reasons. First, the BOM combines its annual estimates of the demand for monetary base and (historical) information on seasonal fluctuations in that monetary aggregate to produce quarterly, monthly, and *daily* estimates of the demand for base money. And second, unlike the majority of central banks, the BOM does not use short-term interest rates as an operating target to guide its daily operations or modify the stance of monetary policy. Instead, since 1995 the BOM has used a system of cumulative balances with commercial banks (also known as *reserve averaging around zero*) to guide its daily supply of liquidity to the economy. It is through changes in the BOM's objective for the system's cumulative balance that the monetary authority conveys signals (to banks) about its desired stance of monetary policy (see O'Dogherty 1997).

Strict adherence to this short-term operating procedure implies that in "normal" times (days), the BOM's monetary policy consists mainly of accommodating or satisfying all the liquidity (currency) demanded by the banks provided that they are in compliance with the existing objective for the system's cumulative balance.³⁶ In those times, BOM actions arguably do not exert a major influence on (nor are they influenced by) the exchange rate or interest rates; all movements in these variables are, in principle, market-determined outcomes (Gil-Díaz 1997). According to the official view, the role of the daily estimates of the demand for monetary base in normal times is rather limited. Those estimates provide a benchmark against which BOM officials can compare the amount of liquidity demanded by the banks on a given day or week, but not much else. The daily assessment of monetary conditions by the BOM board, the argument goes, takes precedence over the (inherently inaccurate) estimates of daily money demand when deciding the amount of liquidity the BOM will inject into the system. A key premise behind this course of action is, clearly, that the banks' daily demand for liquidity reflects (or provides a better estimate of) the "true" demand for monetary base that the BOM has to satisfy to ensure orderly functioning of the money market.

As noted above, however, that operating procedure leaves scope for the

36. The actual measurement of compliance is a rather complicated process that depends crucially on the period over which the cumulative balances are computed (the maintenance period) and the net position of individual banks vis-à-vis the BOM. See Aguilar and Juan-Ramón (1997) and O'Dogherty (1997).

BOM to conduct more “active” monetary policy if it so wishes. Concretely, if for whatever reason the BOM decides at a given point in time that market conditions require or justify a change in the stance of its monetary policy, the BOM will signal that decision to the market (more precisely, to the banks) by changing its objective for the system’s cumulative balance. Specifically, BOM officials argue that they can and will announce, and thereafter enforce, a lower objective for the system’s cumulative balance if they want to tighten the stance of monetary policy and a higher objective if they wanted to ease monetary conditions. According to their view, these signals—and the ensuing enforcement of the new objectives for the cumulative balance—will alter the short-run behavior of banks and, through their actions, market interest rates in the desired direction: that is, interest rates will rise when the BOM tightens its stance and will fall in the opposite case. These policy-induced changes in market interest rates will, in due course, affect the demand for monetary base also in the desired direction, thus contributing to eliminate the (perceived) disequilibrium in the money market (Gil-Díaz 1997).

We will refrain from assessing the analytical consistency of the BOM’s view of monetary policy as described, for example, in the articles cited above. We leave that daunting task for another occasion. We will say, however, that we find it peculiar that the BOM seems more comfortable casting the discussion of its monetary policy over (extremely) short horizons than over the longer term (say, six months or a year). All central banks conduct day-to-day operations in a number of markets using a variety of (direct and indirect) instruments. Few of them feel compelled to describe the nitty-gritty of their daily operating procedures when asked to characterize their framework for monetary policy. There are many good reasons for this, but, in our view, none more important than the long and variable lags that are normally thought to undermine the short-run effectiveness of monetary policy. The BOM’s view of monetary policy as equivalent to daily liquidity management turns this old argument on its head. We are also puzzled by the small number of episodes, during 1996–97, in which the BOM acknowledges having modified the stance of its monetary policy, and therefore having influenced the short-run behavior of interest rates and the exchange rate, in response to market developments. By its own reckoning, the BOM changed the stance of its monetary policy fifteen times between 25 September and 25 December 1995 and eight times between December 1995 and November 1996 and kept the stance unchanged (at a “neutral” level—i.e., a cumulative balance of zero) during the first three quarters of 1997 (Gil-Díaz 1997; Aguilar and Juan-Ramón 1997). It follows from this that, according to the BOM, all movements of interest rates and the exchange rate in, say, the first semester of 1997 (or in any other long period between changes in the BOM’s objective for the system’s cumulative balance) did not justify or elicit a response from monetary

policy. Such an implication merits, at least, a closer look at the data. We took on the challenge.

6.4.2 What Did the Bank of Mexico Really Do in 1996–97? An Exploratory Investigation

In this subsection we use daily data in an effort to gain some understanding of the way in which the BOM conducted monetary policy in the immediate postcrisis period. Our analysis relies on high-frequency data for two reasons: first, the short period of time elapsed since the adoption of the floating system leaves us with no alternative but to use every data point available; second, and as noted before, the BOM stated explicitly that its monetary policy during 1996–97 was aimed at satisfying the demand for monetary base on a daily basis. The subsection is organized as follows: We start by analyzing briefly the evolution of the daily target for the monetary base and comparing its behavior to that of the actual monetary base. This analysis shows that especially during 1997, there were important deviations between target and actual base money. We then examine the behavior of a number of key variables in the periods surrounding thirty large daily peso depreciations.

Figure 6.7 presents daily data on the evolution of target and actual monetary base (in billions of pesos) during 1996–97. The figure shows that between January 1996 (the first date for which we have BOM forecasts of the daily demand for monetary base) and the end of January 1997, the deviations between these two variables were rather small. Starting in February 1997, however, the actual monetary base persistently exceeded the estimated (target) base—the median daily deviation for this period was significantly higher than for the January 1996–January 1997 period. The BOM explained these discrepancies by arguing that during most of 1997 the rate of remonetization was stronger than anticipated and that in estimating the demand for money it had missed important seasonal variations, including the surge in the demand for cash during Mother’s Day weekend, and the faster than expected rate of growth of GDP during that year.³⁷ Figure 6.8 presents the proportional deviations between actual and target base—a variable we have called “excess liquidity.” Panel *A* displays the actual deviations between actual and target base, while panel *B* presents a *detrended* excess liquidity index. Both panels, however, tell a similar story: the excess liquidity indexes exhibited considerable variability during 1996–97. An important question is whether these deviations from the daily targets for monetary base (released to the public in late 1996 in an effort to increase the transparency of the BOM’s monetary policy) were the

37. On reactions to the overshooting of the base money target in early 1997, see, e.g., “Mexico Central Bank Primes Economy; Critics See Attempt to Sway Elections,” *Wall Street Journal*, 27 May 1997. See also a related story in the *New York Times*, 29 May 1997.

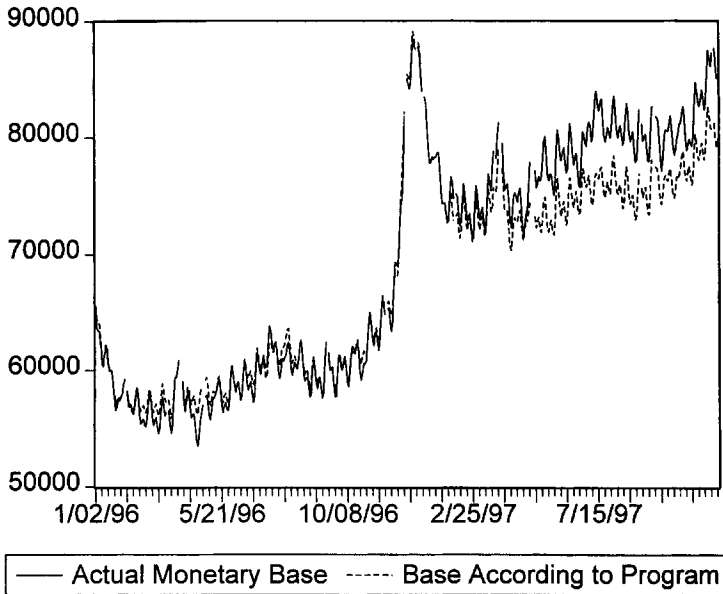


Fig. 6.7 Actual and target monetary base: daily data, 1996–97

result of deliberate policy responses to developments deemed undesirable by the BOM—including exchange rate changes—or whether they represented a combination of noise and the BOM’s stated policy of simply accommodating banks’ actual demand for liquidity on a daily basis. The analysis below addresses precisely this question.

In table 6.6 we present data on the behavior of a number of key variables in the days surrounding thirty large daily depreciations of the peso-dollar rate during the period January 1995–November 1997. The first ten episodes correspond to the ten largest peso depreciations of 1995, while the other twenty consist of the largest depreciations observed during 1996–97.³⁸ Column A is the episode’s date; column B is the one-day depreciation of the peso; column C contains data on the change (in basis points) in the twenty-eight-day Cetes interest rate in the secondary market one day after the depreciation episode relative to one day prior to the depreciation; column D contains the change in the Cetes primary interest rate in the period spanning from the Cetes auction prior to the depreciation to the first auction after the depreciation; column E presents the change in the monetary base that had been programmed (estimated) to take place in the period spreading from the day prior to the depreciation to five days

38. This allowed us to have episodes from all three years. Since the exchange rate was significantly more volatile in 1995 (see section 6.3), had we chosen the thirty largest depreciations for the three-year period as a whole we would have ended up mostly with 1995 episodes.

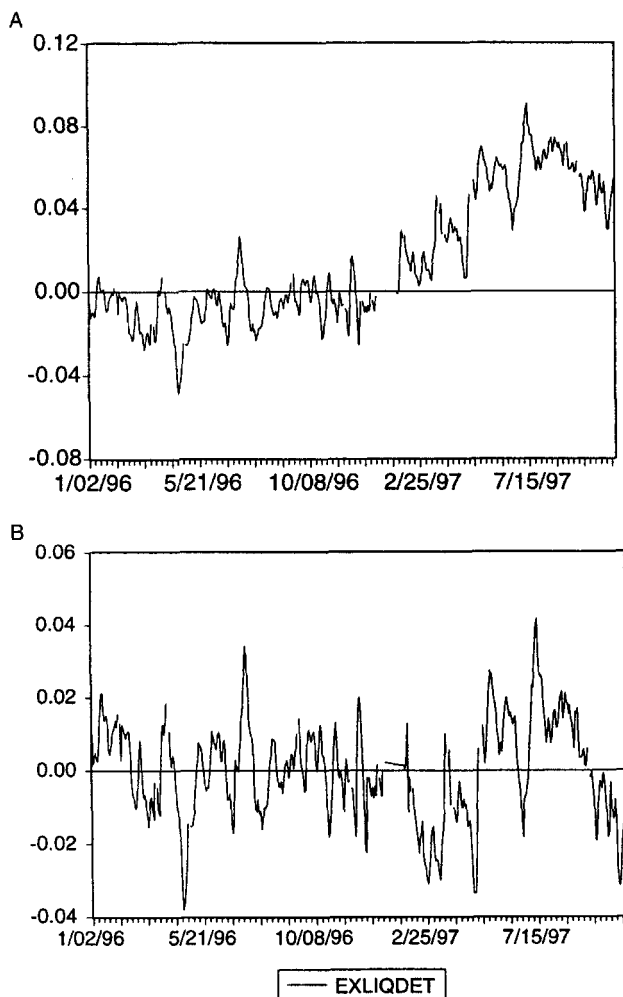


Fig. 6.8 Excess liquidity index: (A) daily data and (B) detrended, daily data, 1996–97

after the depreciation; column F is the actual change in the monetary base during the same period; and column G presents the change in the detrended liquidity index in the five days following the depreciation.³⁹

The information contained in table 6.6 is a first step in the effort to elucidate the behavior of the BOM in the first three years of the float. We

39. The data on the 1995 episodes are restricted to exchange rate and Cetes interest rate movements because data on the BOM's daily estimates of the monetary base for 1995 (if they exist) were not made available to us.

Table 6.6 Ten Largest Peso Depreciations of 1995 and Twenty Largest Peso Depreciations from January 1996 to November 1997

Date A	Depreciation (%) B	Change in Cetes Rate from Previous Day (basis points) C	Auction-to-auction Change in Cetes Rate (basis points) D	Programmed Change in Monetary Base over 5 Days E	Actual Change in Monetary Base over 5 Days F	Detrended Cumulative Excess Liquidity over 5 Days G
3 Jan 1995	6.60	700	200	-	-	-
4 Jan 1995	4.76	300	700	-	-	-
6 Jan 1995	6.60	900	700	-	-	-
10 Jan 1995	6.67	200	700	-	-	-
30 Jan 1995	9.64	-233	-444	-	-	-
3 Mar 1995	4.67	0	829	-	-	-
9 Mar 1995	5.45	300	2,439	-	-	-
15 Mar 1995	4.38	500	27	-	-	-
26 Oct 1995	6.63	350	302	-	-	-
8 Nov 1995	4.35	680	575	-	-	-
23 Jan 1996	1.32	170	-80	-1,072.8	-1,104.9	-0.00086
8 Mar 1996	1.02	135	76	2,027	1,957.43	-0.00082

2 May 1996	0.81	330	101	575.2	565.9	0.00843
11 Oct 1996	0.72	105	316	2,607.46	2,498.99	-0.00194
14 Oct 1996	0.84	190	316	538.36	-208.54	-0.01242
16 Oct 1996	0.8	260	180	-1,000.5	-2,650.6	-0.02746
23 Oct 1996	0.77	-55	164	1,400.36	2,433.37	0.01666
30 Oct 1996	0.82	220	11	1,232.57	1,329.14	0.00142
27 Feb 1997	2.23	290	257	1,403.63	1,744.18	0.00361
28 Apr 1997	1.09	-35	-134	-3,077.0	-3,555.5	0.046
15 Jul 1997	0.84	125	-53	-1,777.5	-3,830.3	-0.02609
29 Aug 1997	0.81	35	-206	187.74	86.2	-0.00245
23 Sep 1997	0.89	-55	-26	556.02	750.93	0.00121
23 Oct 1997	1.00	155	368	2,670.19	4,004.68	0.01479
24 Oct 1997	1.01	335	368	3,100.09	5,309.37	0.02542
27 Oct 1997	6.24	375	368	1,885.79	4,110.53	0.02632
30 Oct 1997	1.08	55	-199	2,376.86	3,102.17	0.00682
6 Nov 1997	0.79	310	222	3,138.21	2,909.63	-0.00603
7 Nov 1997	1.67	30	222	3,554.94	4,230.98	0.00489
12 Nov 1997	1.08	20	-82	2,608.33	4,970.69	0.02654

are particularly interested in understanding the behavior of interest rates and of the monetary base in the days following a large depreciation. If the BOM was concerned about the value of the peso, we would expect the monetary base to fall in the days following a sharp exchange rate jump; likewise, we would expect an increase in nominal interest rates during those periods.⁴⁰ In analyzing this table it is useful to consider three subperiods. The first covers 1995, a year of great turbulence in Mexico's foreign exchange market. The second period runs from January 1996 through mid-1997 and corresponds to the period when, according to many private analysts, the BOM geared its policy toward maintaining a stable peso. The final period covers the latter part of 1997, when the BOM became less reluctant to let the peso depreciate (Edwards and Savastano 1998).

Several interesting facts emerge from this table. First, in twenty-two of the thirty episodes there is an increase in the auction-to-auction primary Cetes interest rates. Second, and highly related, in twenty-six of the thirty episodes the secondary market Cetes interest rate rises in the day following the depreciation. A possible explanation for these results—and one we explore in greater detail in Edwards and Savastano (1998)—is that the BOM reacted to (relatively) large losses in the value of the peso by tightening liquidity relative to its daily target, thus putting upward pressure on interest rates. The BOM has acknowledged that it indeed tightened liquidity in the periods following some, but not all, of these depreciation episodes. For example, on 9 November 1995 the BOM lowered significantly its objective for the system's cumulative balance—a measure that at least according to the official view, would signal a willingness to *relax* (rather than tighten) the monetary stance. A similar measure was taken in 23 and 25 January 1996 (Aguilar and Juan-Ramón 1997). Interestingly, however, the BOM denied that it *systematically* tightened liquidity in response to large peso depreciations during this period and also that it defended or targeted any particular *level* of the peso-dollar rate. Moreover, as noted before, according to official pronouncements, there was no change in the stance of monetary policy (exchange rate motivated or not) between October 1996 and November 1997. The BOM's (semi)official explanation for the apparently systematic relation between peso depreciations and interest rate rises captured in table 6.6 is that the increases in (Cetes) interest rates are market-determined outcomes; concretely, they are simply a reflection of a higher expectation of depreciation in the context of interest arbitrage conditions. One problem with this explanation is that it requires the public's expectations of peso depreciation to exhibit some degree of persistence; econometric analysis of the time-series properties of (actual) daily depreciations, however, suggests strongly that they were "white noise" during 1996–97.

40. Naturally an increase in interest rates could also reflect an increase in the expectations of devaluation. For reasons we explain below, this does not seem to be the case, however.

Columns E, F, and G in table 6.6 help to shed some light on monetary policy in the periods surrounding large peso depreciations. We are particularly interested in comparing the actual monetary stance taken by the BOM in the days following these depreciations with the policy implied by the original forecasts. We compared the cumulative targeted and cumulative actual increases in the monetary base five, ten, and fifteen days following each depreciation episode. Interestingly enough, these figures suggest an important change in behavior in late September 1997, when the BOM signaled that it would be willing to adopt a more relaxed monetary stance. As may be seen, between January 1996 and August 1997—a period that has been characterized as more “conservative”—monetary policy was tighter than programmed in eight of the twelve depreciation episodes. We can also see that after September 1997, following the BOM announcement of a more relaxed monetary stance, the pattern of base money tightening following a large depreciation all but disappeared. Although this analysis is very preliminary and does not control for the potential role of other variables, it does suggest that from January 1996 to September 1997 the BOM did take into account the behavior of the peso when deciding how much liquidity to provide, every day, to the banking system. In Edwards and Savastano (1998) we explore this issue further and conclude, based on results from various econometric tests, that during 1996–97 the BOM indeed had a feedback rule linking the rate of expansion of base money to the rate of depreciation of the peso.

6.5 Concluding Remarks

The Mexican peso crisis of December 1994 shocked politicians, analysts, and pundits. Many asked how a country wildly hailed as an example of economic strength could collapse so rapidly. Shock was followed by panic, as domestic and international investors fled the country and tried to undo their positions. As 1995 unfolded it seemed increasingly clear that default on the rapidly maturing Tesobonos was more than a distant possibility. It took a massive bailout package put together by the IMF and the U.S. Treasury to generate some tranquility in the markets in mid- to late 1995.

From early on the Mexican authorities stated that stabilizing the value of the peso, within the context of a freely floating exchange rate regime, was one of their most important policy objectives. During most of 1995 this objective seemed highly elusive. Starting in 1996, however, the peso began to exhibit an impressive degree of stability. So much so that a number of analysts in the media and in academic and financial circles began to wonder whether this stability was consistent with a freely floating regime. Some even argued that it was “*déjà-vu* all over again” and that the BOM was manipulating monetary policy in order to maintain artificially a strong peso. At the core of this concern was the notion that by following

this policy the BOM was setting the stage for another round of currency overvaluation that would end in a crash.

In this paper we have tried to explain the relative stability exhibited by the peso-dollar nominal exchange rate since late 1995. Specifically, we approached this issue from two main angles: First, we asked whether the behavior of the peso-dollar rate since 1995 is broadly comparable to or consistent with the behavior of a “typical” floating exchange rate. Our answer to this question was a qualified yes. Second, we focused on thirty large one-day depreciations to ascertain whether the BOM reacted in a systematic manner to those events. Our answer to this question was another qualified yes, but perhaps more strongly qualified than the first one.

We address the first question in section 6.3, where we used standard measures of exchange rate volatility (the mean absolute value of percentage changes and the standard deviation of percentage changes) to compare the behavior of the peso-dollar rate from 1991 to 1997 with that of seven other floating exchange rates—all of them from industrial countries. We conducted the comparison at daily, weekly, and monthly frequencies for every year and checked whether the “calendar-year window” imposed arbitrary restrictions on the distribution of exchange rates that may prevent us from detecting important peculiarities in the behavior of the Mexican peso. The two most interesting findings from this exercise were, first, that the degree of volatility of the Mexican peso in 1995 was an order of magnitude higher than that of the typical floating exchange rate and, second, that in 1996–97 the degree of volatility exhibited by the Mexican peso was broadly in line with that of the seven other currencies in the sample.

The first finding simply reflects that the financial mayhem that beset Mexico in 1995 turned the peso into a complete outlier in terms of volatility. This suggests to us that in periods when the fundamental issue is lack of confidence in the government’s response to an external liquidity crisis—that is, in periods of widespread panic—there are simply no good yardsticks for assessing the behavior of floating exchange rates. The fundamental priority in those periods is to arrest the freefall of the currency through a credible tightening of monetary policy. The second finding, on the other hand, suggests that the relative stability of the Mexican peso in 1996–97 was not “excessive” or grossly at odds with the behavior of other floating rates. True, the peso was less volatile than the currencies of countries widely regarded as having the “cleanest” floats (the G-3 and the United Kingdom), but it was as or more volatile than other floating exchange rates.

In the second part of section 6.3 we applied the methodology developed by Flood and Rose (1995) to examine the relation between nominal exchange rate volatility and macroeconomic volatility in several OECD countries to the case of Mexico. Our results suggest that unlike the OECD experiences, the increase in volatility of the peso-dollar rate under the current float was accompanied by an increase in the volatility of some macroeconomic fundamentals. We took this as an indication that the evidence

did not rule out the possibility that the determinants of nominal exchange rate volatility in Mexico between 1995 and 1997 were indeed macroeconomic in nature. It also left open the possibility that the observed behavior of the peso-dollar rate was indeed related to the conduct of monetary policy.

In section 6.4 we looked in some detail at the relation between exchange rate changes and monetary policy. There are three reasons why we thought this question was interesting: First, throughout 1996–97 the BOM denied emphatically that it relied on any type of feedback rule or mechanism linking the exchange rate to monetary policy. Interestingly, it did so in response to both criticism and praise from outside observers of the alleged use of such a feedback rule since the adoption of the float. Second, many observers were mystified by the BOM's pronouncements regarding the way in which it conducts monetary policy. In particular, it is peculiar that the BOM (in its official and semiofficial pronouncements) treats its day-to-day liquidity management operations as equivalent to its framework for monetary policy—rather than as an important but secondary part of it, as most central banks do. And third, and related to the other two, the BOM not only frames its discussion of monetary policy over extremely short horizons, but it allegedly relies on daily estimates of the demand for monetary base produced at the beginning of each year to guide its monetary policy.

To address the question, What did the BOM really do in 1995–97? we looked at the behavior of interest rates and base money in the period surrounding thirty large daily depreciations of the peso during those years (daily depreciations that range from 0.7 to 9 percent). In our view, the results from this analysis provide some preliminary support for the conjecture that during the period under consideration, the BOM took into account the short-run behavior of the nominal exchange rate for conducting monetary policy. This conjecture is also consistent with results obtained from time-series analysis with high-frequency data that are reported in Edwards and Savastano (1998). Although it is too early for a final verdict, the evidence examined suggests that in spite of its shortcomings, Mexico's monetary policy between 1995 and 1997 contributed to the achievement of two key policy objectives: it helped to arrest the freefall in the value of the peso while allowing a considerable degree of exchange rate flexibility, and it helped to reduce inflation at a pace that very few observers deemed achievable by mid-1995.

References

- Aguilar, A., and V. H. Juan-Ramón. 1997. Determinantes de la tasa de interés de corto plazo en México: Efecto de las señales del banco central. *Gaceta de Economía* (Instituto Tecnológico Autónomo de México—ITAM) 3, no. 5 (fall): 209–20.

- Andrews, D., and S. Ishii. 1995. The Mexican financial crisis: A test of the resilience of the markets for developing country securities. IMF Working Paper no. 95/132. Washington, D.C.: International Monetary Fund, November.
- Aspe, P. 1993. *Economic transformation the Mexican way*. Cambridge, Mass.: MIT Press.
- Baillie, R., and P. McMahon. 1989. *The foreign exchange market: Theory and econometric evidence*. Cambridge: Cambridge University Press.
- Banco de México (BOM). Various issues. *The Mexican economy*. Mexico City: Banco de México.
- Bernanke, B., and I. Mihov. 1997. What does the Bundesbank target? *European Economic Review* 41:1025–53.
- Calvo, G. 1994. Comments and discussion. Comments on Mexico: Stabilization, reform, and no growth, by R. Dornbusch and A. Werner. *Brookings Papers on Economic Activity*, no. 1:298–303.
- . 1995. Varieties of capital market crises. Center for International Economics Working Paper no. 15. College Park: University of Maryland, November.
- Calvo, G., and E. Mendoza. 1996. Mexico's balance-of-payments crisis: A chronicle of a death foretold. *Journal of International Economics* 41, nos. 3/4 (November): 235–64.
- Clarida, R., and M. Gertler. 1997. How the Bundesbank conducts monetary policy. In *Reducing inflation*, ed. C. Romer and D. Romer. Chicago: University of Chicago Press.
- Council on Foreign Relations. 1996. *The Mexican crisis of December 1994*. New York: Council on Foreign Relations.
- D'Amato, A. 1995. *Report on the Mexican economic crisis*. 103d Cong., 2d sess., 29 June 1995, S. Rept.
- De Long, B., C. De Long, and S. Robinson. 1996. In defense of Mexico's rescue. *Foreign Affairs* 75 (May/June): 8–14.
- de Vries, C. 1994. Stylized facts of nominal exchange rate returns. In *The handbook of international macroeconomics*, ed. F. van der Ploeg. Cambridge, Mass.: Blackwell.
- Dornbusch, R. 1993. Mexico: How to recover stability and growth. In *Stabilization, debt, and reform*, by R. Dornbusch. Englewood Cliffs, N.J.: Prentice-Hall.
- . 1999. *Business Week* column, several issues.
- Dornbusch, R., I. Goldfajn, and R. Valdés. 1995. Currency crises and collapses. *Brookings Papers on Economic Activity*, no. 2:219–93.
- Dornbusch, R., and A. Werner. 1994. Mexico: Stabilization, reform, and no growth. *Brookings Papers on Economic Activity*, no. 1:253–97.
- Edwards, S. 1996. Exchange rate anchors, credibility and inertia: A tale of two crises, Chile and Mexico. *American Economic Review Papers and Proceedings* 86, no. 2 (May): 176–80.
- . 1997. The Mexican peso crisis: Bad luck or bad policies? Los Angeles: University of California. Mimeograph.
- . 1998a. The Mexican peso crisis: How much did we know? When did we know it? *World Economy* 21 (January): 1–30.
- . 1998b. Two crises: Inflationary inertia and credibility. *Economic Journal* 108 (May): 680–702.
- Edwards, S., and M. Naim, eds. 1997. *Mexico 1994: Anatomy of an emerging market crash*. Washington, D.C.: Carnegie Endowment for International Peace.
- Edwards, S., and M. Savastano. 1998. The morning after: The Mexican peso in the aftermath of the 1994 currency crisis. NBER Working Paper no. 6516. Cambridge, Mass.: National Bureau of Economic Research, April.
- Edwards, S., R. Steiner, and F. Losada. 1996. Capital flows, the real exchange rate and the Mexican crisis. Washington, D.C.: World Bank. Mimeograph.

- Federal Reserve Bank of Kansas City. 1996. *Achieving price stability*. Proceedings from symposium held at Jackson Hole, Wyo., August.
- Fischer, S. 1994. Comments and discussion. Comments on Mexico: Stabilization, reform, and no growth, by R. Dornbusch and A. Werner. *Brookings Papers on Economic Activity*, no. 1:303–9.
- Flood, R., and A. Rose. 1995. Fixing exchange rates: A virtual quest for fundamentals. *Journal of Monetary Economics* 36:3–37.
- Frankel, J. 1979. On the mark: A theory of floating exchange rates based on real interest rate differentials. *American Economic Review* 69:610–22.
- Frankel, J., and A. Rose. 1995. A survey of empirical research on nominal exchange rates. In *Handbook of international economics*, vol. 3, ed. G. Grossman and K. Rogoff. Amsterdam: North-Holland.
- Froot, K., and K. Rogoff. 1995. Perspectives on PPP and long-run real exchange rates. In *Handbook of international economics*, vol. 3, ed. G. Grossman and K. Rogoff. Amsterdam: North-Holland.
- Gil-Díaz, F. 1997. La política monetaria y sus canales de transmisión en México. *Gaceta de Economía (ITAM)* 3, no. 5 (fall): 79–102.
- Gil-Díaz, F., and A. Carstens. 1996. One year of solitude: Some pilgrim tales about Mexico's 1994–95 crisis. *American Economic Review Papers and Proceedings* 86, no. 2 (May): 164–69.
- Group of Thirty. 1995. *Mexico: Why didn't Wall Street sound the alarm?* New York: Group of Thirty.
- International Monetary Fund (IMF). 1995a. Factors behind the financial crisis in Mexico. In *World economic outlook*, annex 1. Washington, D.C.: International Monetary Fund, May.
- . 1995b. *International capital markets: Developments, prospects and policy issues*. Washington, D.C.: International Monetary Fund.
- . 1996. *International capital markets: Developments, prospects, and policy issues*. Washington, D.C.: International Monetary Fund.
- Isard, P. 1995. *Exchange rate economics*. Cambridge: Cambridge University Press.
- Issing, O. 1997. Monetary targeting in Germany: The stability of monetary policy and of the monetary system. *Journal of Monetary Economics* 39:67–74.
- Krugman, P. 1995. Dutch tulips and emerging markets. *Foreign Affairs* 74, no. 4 (July/August): 28–44.
- Leiderman, L., and A. Thorne. 1995. Mexico's 1994 crisis and its aftermath: Is the worst over? Tel Aviv: Tel Aviv University, August. Mimeograph.
- Loser, C., and E. Kalter, eds. 1992. *Mexico: The strategy to achieve sustained economic growth*. IMF Occasional Paper no. 99. Washington, D.C.: International Monetary Fund, September.
- Lustig, N. 1992. *Mexico: The remaking of an economy*. Washington, D.C.: Brookings Institution.
- . 1995. The Mexican peso crisis: The foreseeable and the surprise. *Brookings Discussion Papers in International Economics* no. 114. Washington, D.C.: Brookings Institution, June.
- Masson, P., and P. R. Agenor. 1996. The Mexican peso crisis: Overview and analysis of credibility factors. IMF Working Paper no. 96/6. Washington, D.C.: International Monetary Fund, January.
- Milesi-Ferretti, G. M., and A. Razin. 1996. Current-account sustainability. *Princeton Studies in International Finance*, no. 81. Princeton, N.J.: Princeton University, October.
- Obstfeld, M., and K. Rogoff. 1995. The mirage of fixed exchange rates. *Journal of Economic Perspectives* 9, no. 4 (fall): 73–96.
- O'Dogherty, P. 1997. La instrumentación de la política monetaria en México. *Gaceta de Economía (ITAM)* 3, no. 5 (fall): 80–136.

- OECD (Organization for Economic Cooperation and Development). 1996. *OECD economic surveys, 1996–1997: Mexico*. Paris: Organization for Economic Cooperation and Development, December.
- Ortiz, G. 1994. Comment on R. Dornbusch: “Stabilization and reform in Latin America.” In *A framework for monetary stability*, ed. J. O. de Beaufort Wijnholds et al. Boston: Kluwer.
- Reisen, H. 1995. Managing temporary capital inflows: Lessons from Asia and Latin America. Paris: OECD Development Centre. Mimeograph.
- Reynoso, A. 1995. Sostenibilidad de la política cambiaria en economías pequeñas. Documento de Investigación no. 68. Mexico City: Banco de Mexico, July.
- Romer, C., and D. Romer, eds. 1997. *Reducing inflation*. Chicago: University of Chicago Press.
- Rose, A. 1994. Are exchange rates macroeconomic phenomena? *Federal Reserve Bank of San Francisco Economic Review*, no. 1:19–30.
- Sachs, J., A. Tornell, and A. Velasco. 1996. The collapse of the Mexican peso: What have we learned? *Economic Policy: A European Forum*, no. 22 (April): 15–66.
- Santaella, J., and A. Vela. 1996. The 1987 Mexican disinflation program: An exchange rate-based stabilization? IMF Working Paper no. 96/24. Washington, D.C.: International Monetary Fund, March.
- Taylor, J. 1993. Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy* 39:195–214.
- Vela, A. 1993. Three essays on inflation and stabilization: Lessons from the Mexican solidarity pact. Unpublished Ph.D. diss., University of California, Los Angeles.
- Warner, A. 1997. Mexico’s 1994 exchange rate crisis interpreted in light of the non-traded model. NBER Working Paper no. 6165. Cambridge, Mass.: National Bureau of Economic Research.
- Werner, A. 1996. Mexico’s currency risk premia in 1992–94: A closer look at the interest rate differentials. IMF Working Paper no. 96/41. Washington, D.C.: International Monetary Fund, April.
- . 1997. Un estudio estadístico sobre el comportamiento de la cotización del peso mexicano frente al dólar y de su volatilidad. *Gaceta de Economía (ITAM)* 3, no. 5 (fall): 221–52.
- Williamson, J., ed. 1995. *Estimating equilibrium exchange rates*. Washington, D.C.: Institute for International Economics.

Comment J. Bradford De Long

Sebastian Edwards and Miguel Savastano make four major points:

Throughout 1993–94 most available information suggested that things in Mexico were getting badly out of hand. Most analysts, however, completely missed the magnitude of the disequilibrium—and thus the magnitude of the crisis.

J. Bradford De Long is professor of economics at the University of California, Berkeley, and a research associate of the National Bureau of Economic Research.

The nominal stability of the peso during 1996–97 has been a source of alarm: will “it” happen again?

Has the Bank of Mexico’s monetary policy been geared toward maintaining a degree of nominal exchange rate stability at odds with the requirements of the floating rate regime? No. The Bank of Mexico appears to have been using a feedback rule that takes account of the behavior of the nominal exchange rate. But Mexico’s exchange rate behavior has been largely consistent with a (dirty, but not badly soiled) float.

As I read this paper, I became more and more impressed by the work that Edwards and Savastano put into it, and less and less impressed at our collective understanding of Mexico 1994–95—why it happened, what it was, and what the chances are that it will happen again. They have done a very good job, yet I find myself feeling like—there is a “Far Side” cartoon, of dogs in lab coats, captioned, “Dog scientists trying to discover the doorknob principle,” an image that will resonate strongly with anyone who has had a dog and watched it try to open a door.

They begin their paper by trying to debunk pieces—opposed pieces—of “conventional wisdom” that have become common rhetorical moves made either in looking back at Mexico 1994–95 or in looking across the Pacific at East Asia today. The first piece of conventional wisdom is that the peso crisis occurred because the Mexican government (assisted, of course, by its lackeys in the U.S. Treasury) lied about—concealed—hid—information about the state of its economy and that when investors discovered all was not pure, they recoiled in horror. Edwards and Savastano have very little patience with this view, for which I thank them.

They also have little patience with the other—opposed—piece of conventional wisdom: that Mexican policymakers were simply doing their jobs, and doing reasonably well at their jobs, when by bad luck the roof suddenly fell in. They write: “The Mexican authorities seriously underestimated the risks embedded in their chosen course of action. It is quite a stretch to claim . . . that this error in judgment . . . does not fall squarely in the category of policy mistakes.” In other words, because Mexican economic policy led to catastrophe—did not keep the roof from falling in—Mexican economic policy was catastrophically awry.

From one perspective this position is clearly correct. Catastrophe happened. Policies to avoid it were not adopted. This was a policy catastrophe. From another perspective it is unsatisfactory. The most interesting thing about the recent Mexican crisis was that the Mexican government’s sins against the gods of monetarism seemed at the time—seem now—to have been relatively small. The magnitude of fundamental disequilibrium seemed at the time relatively small. Yet the punishment was swift, sure, deadly, and catastrophic: I do not know how deep Mexico’s 1995–96 de-

pression would have been in the absence of IMF and (rather hastily paid back) U.S. Treasury support. I fear it would have been deep and long.

Now we do have models in which relatively small “fundamental disequilibria” can be followed by large currency collapses. But these are models of fiscal crisis (in which the government budget balance moves into massive deficit in such a way as to make everyone believe that large-scale monetization is likely) or models of policy fragility (in which a sudden fall in the currency induces a substantial shift in government policy toward accommodation and monetization). The Mexican case was neither of these: the government budget was not in substantial deficit; the fall of the peso did not lead to a substantial loosening but rather to a tightening of policy—interest rates up to 80 percent.

Before the fact very, very few saw a crisis of the magnitude that actually occurred as even possible. As Edwards and Savastano write: “Very few, if any, observers would have predicted that merely a year after abandoning the [currency] band, the peso would lose almost one-half of its value. This inability to grasp the seriousness of the Mexican situation . . . clearly illustrates the shortcomings of the models commonly used by both private sector and academic analysts to assess the adequacy of real exchange rates.”

They go on to criticize our collective model building, writing: “Indeed, most of these models are strictly based on flow considerations. . . . Models that, on the other hand, pay attention to stocks in general and to the foreign demand for securities issued by emerging markets in particular are, in principle, better equipped to gauge the magnitude of the disequilibrium in circumstances where credibility vanishes.”

But is this correct? What is the fundamental foreign demand for securities issued by emerging markets? It depends on risk, covariance with industrial market returns, and expected return—and expected return is largely linked to the expected future growth rates of emerging market economies.

I do not know anyone who has a clear vision of the distribution of growth possibilities for emerging market economies. I do not know how news about today—about politics and economics today—should affect my estimate of the future growth of emerging market economies, and thus my fundamental demand for emerging market securities. Nor do I know why a—relatively minor, 125 basis point—increase in medium-term real interest rates in the United States in 1994 should have had a large effect on industrial economy demand for emerging market securities.

I do know that the amount of capital crossing borders today is smaller, relative to the size of the world economy, than before 1914. We have vastly more information now than they did then. And our markets and political systems are more open and more honest—back in the old days E. H. Harriman refused to let J. P. Morgan vote by proxy the shares of his British

clients at the Illinois Central annual meeting, on the ground that even though the bylaws of the corporation admitted proxies the laws of the state of Illinois did not. That makes me think that “fundamental” demand for emerging market securities is considerably higher than the current value of such securities: that capital markets have been liberalized and we are on a trajectory toward a steady state in which cross-border investment holdings are much larger than they are today.

I also know that when you do not know much, and when news does not teach you much, your beliefs do not vary much—that conditional expected values are and remain close to the unconditional means of probability distributions. Under such circumstances large swings in the stock demand for emerging market securities seem a deep puzzle: if we know next to nothing about long-run returns, how can our demand based on expectations of long-run returns suddenly and significantly change?

And this brings me to the second part of the paper. Edwards and Savastano ask, in essence: Will “it” happen again? Is the Mexican government informally pegging its nominal exchange rate in a way that is leading to sustained real appreciation and real overvaluation, thus setting Mexico up for a repeat crisis? Some prominent and influential international macroeconomists who write columns for *Business Week* and have the initials “R. D.” have worried that it is. Edwards and Savastano analyze this question by comparing the actual behavior of the Mexican peso over the past couple of years to what would have been expected had the currency been undergoing a relatively “clean” float.

Their first problem is that it is not at all clear how a currency undergoing a clean float behaves. We have good models of how it *should* behave. When we test these models, the data rejects them. We have very good *normative* models of exchange rates—but not good *positive* models of exchange rates.

So Edwards and Savastano begin by comparing the short-term variability of Mexico’s exchange rate in 1996–97 to the variability of other exchange rates and find that Mexico is not out of line. They go on to worry about the sudden shifts in volatility regime apparently experienced by Mexico—using the “virtual fundamentals” methodology of Flood and Rose (although it is not clear to me whether “virtual” is used in the sense of “virtual particle,” “virtual reality,” or “virtual presence”). They find—in sharp contrast to Flood and Rose, who found that changes in exchange rate volatility for OECD countries appeared unconnected with changes in macroeconomic volatility—that the macroeconomics have changed: that Mexico’s money demand has become more unstable in the period since the crisis.

This is very interesting: Flood and Rose, as I understand them, set up their model—and the contrast between traditional and virtual fundamentals—to make it as hard as possible for changes in the exchange rate regime to be paralleled by changes in traditional fundamentals. The point

was to demonstrate the inadequacy of monetary models of exchange rates. Yet Edwards and Savastano, using Flood and Rose's methodology, actually find standard monetary models . . . somewhat useful. They also provide interesting evidence that the Bank of Mexico has not focused on domestic conditions entirely but has kept one eye on the exchange rate in 1996–97—tightening monetary policy in response to large depreciations of the peso.

How does all this bear on their major question: is “it” likely to happen again? Unfortunately, the answer is not clear. The Bank of Mexico appears to be following a policy like that of many other countries—float the exchange rate, but pay some (but not exclusive or even primary) attention to the exchange rate in setting monetary policy. There is no reason why such a feedback rule should lead to a period of pronounced real overvaluation followed by a currency crash. But then a year before the 1994–95 collapse of the peso there seemed to be no fundamental reason for the peso to undergo a catastrophic collapse either.

The Aftermath of the 1992 ERM Breakup Was There a Macroeconomic Free Lunch?

Robert J. Gordon

The secret of empirical work is to define your hypothesis so that failure to find significant results can be interpreted as support.

—Attributed to Jeffrey Frankel by Paul Krugman (1996, 406)

7.1 Introduction

7.1.1 From 1992 to 1999: What Happened in Between?

Viewed from afar, the literature on European currency issues in the 1990s has a peculiar character. There is an abundance of papers on the context of the 1992 Exchange Rate Mechanism (ERM) breakdown—was it caused largely, partly, or not at all by the fundamentals, was it predictable, and if so why did market participants fail to predict it?¹ There is now an outpouring of attention to the imminent establishment of a single European currency—with much concern both about the broader issues of its sustainability and the narrower issues of the day-to-day transition to 1 January 1999.²

But what happened between 1992 and 1999? There has been remarkably

Robert J. Gordon is the Stanley G. Harris Professor in the Social Sciences at Northwestern University, a research associate of the National Bureau of Economic Research, and a research fellow of the Centre for Economic Policy Research, London.

This research is supported by the National Bureau of Economic Research and is part of the NBER research program in Economic Fluctuations and Growth and International Finance and Macroeconomics. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research. The author is grateful to Barry Eichengreen for useful suggestions and help with the references, to Paul Krugman and Andrew Rose for their helpful comments, and to Tomonori Ishikawa for compiling the data and producing the figures.

1. Among the many interpretations of the 1992 ERM breakdown are Dornbusch, Goldfajn, and Valdés (1995), Eichengreen and Hsieh (1995), Eichengreen and Wyplosz (1993), Eichengreen, Rose, and Wyplosz (1995), Krugman (1996), Obstfeld (1995), Rose and Svensson (1994), and Svensson (1993).

2. References include Kenen (1995), McKinnon (1997), Obstfeld (1997, 1998), Taylor (1995), von Hagen and Eichengreen (1996), and Wyplosz (1997).

little systematic analysis of the macroeconomic aftermath of 1992. How has the macroeconomic performance of those nations that dropped out of the ERM (hereafter the “leavers”) differed from those that stayed in (hereafter the “stayers”)? One common impression is that an economic miracle occurred in which the leavers grew faster than the stayers, and in the starkest contrast, the United Kingdom achieved an unemployment rate little more than half that of France in 1997 despite having in 1992 an unemployment rate that was almost exactly the same.³ While faster growth might have been expected, so would faster inflation. Yet “surprisingly, the European experience failed to reveal almost any inflationary response to devaluation” (Dornbusch et al. 1995, 254). Similarly, “according to the evidence presented, depreciating countries also did better in decelerating inflation” (Pelagidis 1997). Henceforth, based on these quotes, we will take the “free lunch” interpretation to represent the “conventional wisdom.”

Did the leavers receive the macroeconomic equivalent of a free lunch, achieving faster growth and lower unemployment without extra inflation, and if so, how was this achieved? Finding that a free lunch occurred would have profound implications for two of the most debated issues in European macroeconomics. First, if the demand stimulus provided by devaluation boosted real growth without extra inflation, this would imply that high unemployment in Europe is not caused entirely by structural impediments but is at least in part a result of insufficient aggregate demand.⁴ This finding would change the perception of the trade-off faced by nations considering the abandonment of a fixed exchange rate. While normally a nation contemplating devaluation must weigh the benefit of faster growth against the cost of faster inflation, the discovery that there is no such cost would tilt the benefit-cost calculus toward devaluation.⁵ Second, the ability of individual nations to achieve unambiguous improvements in economic performance by breaking away from the Bundesbank’s tight policy regime raises doubts about the sanity of those countries that seem so eager

3. In September–November 1997, the U.K. unemployment rate by the standardized ILO definition was 6.6 percent while that of France was 12.4 percent (*Economist*, 24 January 1998, 104). In 1992 the standardized unemployment rates were 10.1 and 10.3 percent, respectively (OECD 1997, annex table 22).

4. In contrast, with the single exception of Finland, Nickell treats the actual average rate of unemployment as an accurate estimate of the equilibrium rate (or NAIRU) and dismisses the contribution of inadequate aggregate demand: “Business cycle effects and autonomous demand shocks of various kinds should wash out if we take a long enough period—and our focus has been on 1983–1996, a 14-year stretch. . . . Over the longer period, there is only one country where truly exceptional problems have distorted the long period average dramatically, namely Finland. . . . Without these exceptional events, there is no question that average unemployment would have been substantially lower over the relevant period and this lower number would more accurately reflect the equilibrium rate in Finland” (1997, 72).

5. The output-inflation trade-off cited in the text is the normal view, which “welcomes nominal exchange rate depreciations or devaluations because they improve competitiveness, but . . . also . . . [fears them] because they may bring about inflation so dampening the initial competitive gains” (Alberola, Ayuso, and López-Salido 1997, 1).

to join the European Economic and Monetary Union (EMU) and reinforces the view that the motivation for EMU must be entirely political, since it makes little economic sense.⁶ The apparent benefits of exchange rate flexibility would appear to free policymakers from “the dire consequences of the policy responses required to defend the exchange [that] can bring a government’s entire macroeconomic strategy tumbling down” (Eichengreen et al. 1995, 251).

Beyond its implications for these great policy debates, the ERM aftermath raises perplexing problems for the more academic concerns of macroeconomists. Much of the literature on exchange rate pegging stresses its role as a signal of inflation credibility (e.g., Rebelo 1997). It follows that devaluations in the 1992 mode must reveal inflation noncredibility. If the presence or absence of credibility plays an independent role in the determination of the inflation rate, as many have surmised from the role of the European Monetary System in achieving inflation convergence during the 1981–90 period, then this creates two a priori reasons to predict an inflationary outcome after 1992, namely, the noncredibility effect and the normal exchange rate pass-through effect to the prices of exports, imports, import-competing goods, and ultimately labor costs.

7.1.2 Goals and Plan of the Paper

This paper attempts to provide a comprehensive treatment of the macroeconomic aftermath of 1992.⁷ Enough time has now elapsed to determine whether the nominal depreciations of 1992–93 achieved real depreciations that were permanent or were ephemeral, being gradually but steadily eroded—as many theories would suggest—by differentially faster inflation. And the elapsed time allows conclusions to be drawn on whether faster output growth was achieved, whether faster output growth was achieved primarily in the external sector or partially by more rapid growth in domestic demand, whether there was a surprising absence of extra inflation and, if so, to what extent this surprise originates in an atypically low pass-through of the exchange rate import prices as contrasted with a low pass-through of import prices to labor costs.

The paper differs from most of the literature by treating the origins of

6. Feldstein (1997) provides a skeptical view of both the economic and political implications of EMU.

7. Many citations of data on the 1992 aftermath are scattered in the articles cited in n. 1, but the primary focus of those articles is on the circumstances of the 1992 breakdown rather than the details of the aftermath. The most systematic analysis is that of Eichengreen et al. (1995, esp. 269–85), who provide charts showing the average behavior of a large number of variables before and after specified types of exchange rate depreciations, devaluations, and crises. However, the 1992 aftermath provides only a small number of observations in their large set of episodes extending from 1959 to 1993. A graphical view of several aspects of post-1992 performance is contained in Bergin and Moersch (1997). Post-1992 is one of the episodes studied in Borenzstein and De Gregorio (1998).

the 1992 breakdown as a side issue rather than a central focus, and we bypass entirely the debates on the role of fundamentals versus pure speculation and on single versus multiple equilibria.⁸ The only important aspect of the run-up to 1992 that concerns us is the fundamentals themselves, both because the response of inflation to devaluation depends in part on the degree of macroeconomic slack in the year or two directly preceding the devaluations and because the differing experiences among the leaver nations may depend not only on differing policies pursued after 1992 but also on differing shocks and policy responses prior to 1992.

Our analysis compares macroeconomic outcomes in six leaver countries (Finland, Italy, Portugal, Spain, Sweden, and the United Kingdom) with those of five stayer countries (Austria, Belgium, France, Netherlands, and Switzerland).⁹ In order to avoid being swamped with individual country statistics on a number of macroeconomic variables, primary attention is given to GDP-weighted leaver and stayer aggregates. However, these aggregates disguise diversity; just as Nickell's (1997) analysis of structural unemployment in Europe remarks on the diversity of experience within Europe, so our analysis uncovers a wide range of experience among the leavers, and to a lesser extent among the stayers.¹⁰ For instance, we will find that the frequent comparison of the United Kingdom with France is misleading because the United Kingdom is the only country in our group of twelve that had a lower unemployment rate in 1996 than in 1991.

The paper begins with a theoretical section, based in part on the IS-LM framework, that centers on the role of German reunification as the essential precondition for the 1992 crisis. A shift in the Germany monetary-fiscal mix (in the same direction as that in the United States in 1981) raised interest rates and should have caused a deutsche mark appreciation. By adhering to a fixed deutsche mark parity in 1990–92, both leavers and stayers condemned themselves to depressed domestic and foreign demand. Leavers then devalued and boosted external demand, in effect shifting the IS curve rightward, raising the level of real demand consistent with the German-determined interest rate. As long as the aggregate supply curve (or Phillips curve) is positively sloped, however, the boost in demand should have increased the leavers' inflation rates (or caused a smaller de-

8. The clearest presentation of the traditional theory based on fundamentals, as contrasted with "the new theory" emphasizing the independent role of speculators, and of the subtle variations between the two theories is contained in Obstfeld (1996).

9. Exchange rate aficionados may quibble with the choice of countries and the terminology. Norway was as much a leaver as Sweden and Finland and should have been included. Spain, Portugal, Ireland, and Denmark devalued in 1992–93 but maintained bands with the deutsche mark. The GDP weights that would be attributed to the omitted countries (Norway, Denmark, and Ireland) are so small that none of the conclusions is affected by the omissions.

10. "Labor markets in Europe exhibit enormous diversity; in fact, differences within Europe are much greater than are the difference between the European average and North America" (Nickell 1997, 55).

celeration of inflation) than occurred among the stayers. This analysis suggests that any tendency for the leavers to experience the same inflation as the stayers (as suggested by the above-cited conventional wisdom) would indeed be surprising.

The empirical analysis consists of three main sections. First, in section 7.3 we study macroeconomic outcomes, using a mix of quarterly and annual data presented either in graphical or tabular form. Indexes of real growth indicate that while the leavers had the expected boost to external demand, this did not spill over to more rapid growth in either domestic demand or real GDP as a whole. Almost all of the extra nominal GDP growth enjoyed by the leavers was chewed up by extra inflation, not just in import prices but in both the CPI and GDP deflator. Nominal unit labor costs increased at the same rate in the leavers and stayers, explaining why the much more rapid growth of import prices for the leavers translated into faster overall inflation. Up to this point the results contradict the conventional wisdom that the leavers obtained a macroeconomic free lunch.

In section 7.4, the second part of the empirical analysis develops econometric estimates of pass-through equations for the individual countries and the leaver and stayer aggregates, comparing the estimated short-run and long-run coefficients with the pass-through literature to determine whether there was anything unusual about the pass-through process after 1992. Then section 7.5 develops econometric estimates of equations explaining the rate of price and wage inflation. Using both dummy variables and postsample simulations for the post-1992 period, we ask whether there was anything unusual about the behavior of post-1992 inflation in the individual countries and in the two subaggregates.

7.2 Theoretical Issues

In some theoretical frameworks, this paper could not be written, because the real exchange rate is not a policy instrument in any but the shortest run. Over the medium and long terms, domestic inflation rises by exactly the same proportion as the exchange rate depreciation, thus causing an evaporation of the initial response of the real exchange rate to the depreciation in the nominal exchange rate. We begin with a brief review of the theoretical case supporting a policy role for the real exchange rate and then proceed to the responses of real variables and the inflation rate that might have been expected following the 1992 devaluations.

7.2.1 Is the Real Exchange Rate a Policy Variable?

A traditional view holds that a domestic policymaker cannot control the real exchange rate because a nominal exchange rate depreciation is quickly offset by domestic inflation, causing any ephemeral real exchange

rate depreciation to vanish. Dornbusch et al. (1995, 247–50) describes two views, “monetarist” and “classical,” both of which deny any policy role for the real exchange rate. In the better articulated classical view, the real exchange rate is a market price, and any increase in the real exchange rate is a market response to a positive economic performance. “It is the reward for reform, stabilization, and doing good and right.”

The view that a nominal exchange rate depreciation does not create a permanent real exchange rate depreciation is based, of course, on the assumption that any nominal depreciation must, sooner or later, create a unit-elastic response in the domestic price level that leaves the real exchange rate unaffected. This is equivalent to the assumption that purchasing power parity (PPP) must hold in the long run. In an influential review of exchange rate theory, Obstfeld (1995, 121–39) supports the view that inflation rates explain most of the cross-country variation in dollar exchange rates, except for the continuing long-term appreciation of the Japanese yen, for which he invokes the Balassa-Samuelson theory that would attribute the yen appreciation to a continuing differential in the rates of productivity growth in traded versus nontraded goods. Obstfeld links the short-run correlation between nominal and real exchange rates to delays in adjustment that (citing Frankel and Rose 1995) have a half-life of around four years.

It is standard practice to build models in which PPP holds in the long run. One of the earliest papers on the ERM breakdown by Eichengreen and Wyplosz centers its analysis on a model in which the relationship between the nominal exchange rate and the domestic price level is described by a 45° line, and in which the exchange rate and the price level both continue to adjust until they eliminate any gap between movements away from equilibrium among the domestic money supply, domestic price level, and nominal exchange rate (1993, 83–84). If macroeconomic adjustment in Europe were described by this model, by now in 1998 the effects of the 1992 devaluations on the real exchange rate should have nearly vanished, referring again to the Frankel and Rose (1995) result that the half-life of the adjustment process is four years.

Robert Mundell (1998) has provided an even stronger statement that the effect of devaluations on the real exchange rate vanish within a short period of time:

To be sure, after a long period of price stability, devaluation, like a sudden burst of money acceleration, can have real effects due to rigidities and money illusion. . . . Provided wage rates are not indexed to prices, a *surprise* devaluation can be a temporary spur to the economy for the duration of existing wage contracts. . . . There is no free lunch, however. . . . The crucial elements of money illusion and surprise are no longer present. Since the breakdown of the Bretton Woods arrangements, trade union leaders and investors have become fully aware of the

link between currency depreciation and inflation, and have learned how to protect themselves against it. Wages now quickly adapt to inflation forecasts, leaving as a residue higher prices without any employment gains.

Mundell's confidence that wages are adjusted subsequent to the "duration of wage contracts" predicts that the real effects of a devaluation would vanish after one to three years.

The long-run validity of PPP requires both full pass-through of the exchange devaluation to import prices and then to wages. There is an entire separate literature on import price "pass-through" which appears (to this outsider) to be less than perfectly integrated with the conventional distinction between the short-run and long-run validity of PPP. The important survey by Menon (1995) establishes at least five reasons why a unit-elastic pass-through from the exchange rate to import prices may not occur. First, inelastic supply or demand may make pass-through incomplete. Second, a large literature suggests that imperfect substitutability between goods produced by different countries but sold in one market can be an independent cause of violation of the law of one price. Third, the pervasiveness of intraindustry trade lends further support to the view that domestic and foreign manufactured goods are imperfect substitutes.¹¹ Fourth, changes in exchange rates of such large economies as the United States can alter world prices, thus ensuring the coexistence of less than full pass-through with the preservation of the law of one price. Fifth, nontariff barriers (NTBs) serve as a buffer to the response of import prices to the exchange rate: "The increase in the coverage of the NTBs as the dollar depreciated would hold up import prices. Then as the dollar depreciated from 1985, the premium on NTB-restricted imports would fall instead of import prices rising. Pass-through would imply a reduction of the premium on imports rather than rising prices" (Branson 1989, 331).

The second step required for the validity of long-run PPP is the full adjustment of labor costs to the increase in the domestic price level contributed by the import price pass-through.¹² Full adjustment of labor costs is not guaranteed except in the extreme case of fully indexed labor contracts, which have gradually disappeared since the era when the *scala mobile* dominated Italian industrial relations and less extreme versions rigidified wage adjustment in other countries. Numerous models of labor market adjustment can accommodate the result that nominal labor costs increase less than one to one with an increase in consumer prices, that is, that the real consumption wage is flexible. The absence of complete wage indexation and the existence of a labor supply curve that is less than infi-

11. Citations of the previous literature are provided in Menon (1995, 200–201).

12. The adjustment of markups on import prices is taken into account in this two-step account while the adjustment of domestic markups is ignored.

nately elastic with respect to changes in the real wage suffice to establish the possibility of a pass-through from import prices to domestic labor costs that is less than unit elastic.

7.2.2 German Reunification and Its Aftermath

While the previous literature is ambiguous and inconsistent about the inevitability of a unit-elastic response of the domestic price level to an exchange rate devaluation, it has established a firm consensus that the fundamental event that eventually caused the 1992 ERM breakup was the German reunification of 1989–90. In the well-chosen words of Branson, “The [fundamental] shocks started coming from the center!” (1993, 129). It is helpful to use a simple textbook IS-LM model to establish the macroeconomic environment of 1992 and the direction in which we should have expected the main variables to move after the devaluation by the leavers.

Figure 7.1 arrays horizontally three IS-LM diagrams applying to, respectively, Germany, the stayers, and the leavers.¹³ Germany in the left-hand panel begins at point A, with initial output Y_0 and an initial interest rate r_0 . Reunification shifts rightward the IS curve to position IS_1 as a result of the ensuing fiscal expansion and increase in investment opportunities. To repress the inflationary implications of the subsequent output boom, which would otherwise move the economy to point B, the Bundesbank tightens monetary policy, shifting the LM curve leftward to position LM_1 , thus boosting the interest rate to r_1 . As a result of the shift in the fiscal-monetary mix, the economy moves from point A to point C.

In the middle panel of figure 7.1, the stayers find themselves faced with a demand contraction as higher interest rates push their economies northwest from point A to point D. Lacking the “IS-stimulus” that Germany experienced, the other stayers experience the normal negative response of aggregate expenditure to high interest rates. In the right-hand panel the leavers initially duplicate the stayer experience, moving from point A to point D, and they move into recession just as do the stayers. However, the ensuing devaluation as the leavers depart from the ERM reduces the real exchange rate, boosts net exports, shifts the IS curve rightward from IS_0 to IS_2 , and allows a monetary easing (shown by the rightward LM shift from LM_1 to LM_2) while still maintaining the same interest rate chosen by the Bundesbank, r_1 . As a result the leaver economies achieve a rightward movement from point D to point E. Whether or not the higher leaver output at Y_2 exceeds the initial output level Y_0 depends on the values of the parameters and the size of the devaluation.

As drawn figure 7.1 appears to predict that the leaver countries will enjoy a higher level of real GDP than the stayers, and yet we will find

13. The use of the IS-LM model is suggested by Krugman (1996, 373). The first two situations in the two left-hand panels of fig. 7.1 are identical to his diagram on p. 373, but the analysis in the right-hand panel and the subsequent discussion of inflation adjustment and convergence extend his analysis.

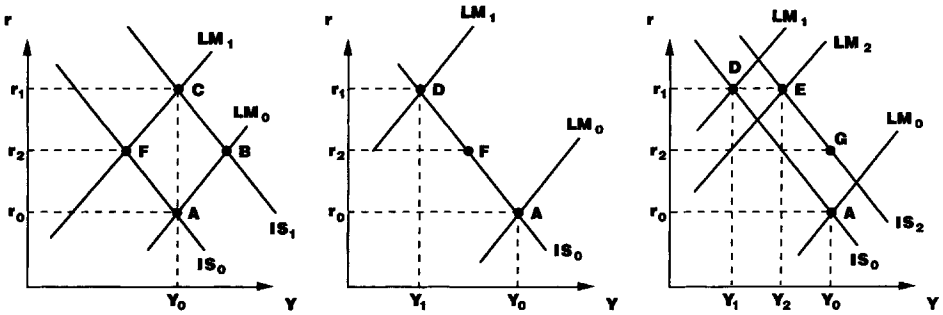


Fig. 7.1 IS-LM analysis of Germany (left), the stayers (middle), and the leavers (right)

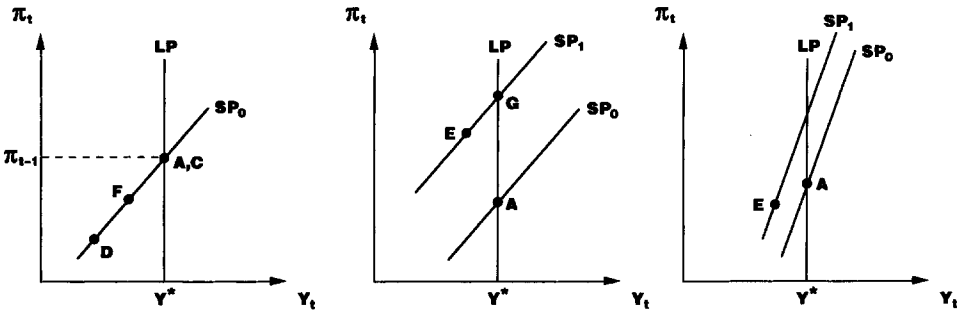


Fig. 7.2 Short-run and long-run Phillips curve analysis of Germany (left), the stayers (middle), and the leavers (right)

below that this did not occur. The reason is extraneous to the analysis of devaluations but nevertheless empirically important, and this is the pressure of the Maastricht criteria in creating a fiscal tightening in the leaver countries that put downward pressure on domestic demand and real GDP. As shown in tables 7.2 and 7.3 below, the structural budget deficit was reduced between 1992 and 1996 much more in the leaver countries than in the stayer group.

How does the inflation rate respond to the three output scenarios depicted in figure 7.1? All three panels of figure 7.2 incorporate the natural rate hypothesis and plot a textbook Phillips curve relating the inflation rate (π_t) to the detrended level of output (Y_t). The vertical Phillips curve (LP) is a locus of points at which the inflation rate is constant ($\pi_t = \pi_{t-1}$), and the short-run Phillips curve (SP) displays a positive relation between the current inflation rate and the output level, holding constant last periods inflation rate (π_{t-1}). That is, the SP curve plots a positive relation between the acceleration of inflation and the detrended output level. Inflation accelerates when output exceeds the natural level of output at Y^* and decelerates when output falls short of the natural level.

The situation of Germany and the stayers is depicted in the left-hand panel of figure 7.2. The economy's initial position is at point A, with steady inflation. The German shift in the fiscal-monetary mix maintains a constant output level at point C in figure 7.1, which is also consistent with steady inflation at point C in figure 7.2. The lower level of output reached by the stayers yields a prediction that inflation decelerates, as at point D. An immediate problem posed by this analysis is that the stayers could not maintain a fixed exchange rate with Germany if their inflation rates continually decelerated relative to Germany, as suggested by the lower inflation at point D in the left-hand panel of figure 7.2 as contrasted with point C. Some force must have operated to cause the inflation rate in the stayer countries to converge to that of Germany, and if the natural rate approach in figure 7.2 is valid, this means that the output gaps in Germany and the stayers must have converged as well.

One scenario consistent with output and inflation convergence in Germany and the stayers is suggested in the two left-hand panels of figure 7.1. Since the reunification boom was temporary, eventually the IS curve for Germany in the left-hand panel must have shifted back to the left, which we shall assume for simplicity is to the original position IS_0 . Without any change in the real money supply, the Germany economy would have remained on LM_1 . The economy would have moved to point F, with a lower interest rate and lower output than at point C. The stayer countries would have enjoyed some relief from high interest rates, and their position would have shifted from point D to point F (the intermediate LM curve crossing the IS curve at point F is omitted for clarity). At this point Germany and the stayers have achieved output and inflation convergence. Point F in the left-hand panel of figure 7.2 suggests that the inflation rate in both Germany and the stayer countries should have continued to decelerate.

The reversal of the IS stimulus in Germany and subsequent reduction in interest rates gives a secondary boost to output in the leaver countries, as shown by the movement from point E to point G in the right-hand panel of figure 7.1 (again, the final LM position intersecting IS_2 is omitted for clarity). There is no particular reason for point G to represent a higher or lower output level than the initial point A, so point G is drawn in the right-hand panel of figure 7.1 as having the same level of output as point A. As shown in the middle panel of figure 7.2, there are two reasons for the leaver countries to have a higher inflation rate than Germany or the stayer countries. First, the increase in the relative price of imports caused by the exchange rate depreciation has, at least temporarily, shifted the SP curve above its initial position.¹⁴ Second, the higher output level (E higher

14. The vertical position of the SP curve depends not just on lagged inflation (π_{t-1}) but also on any operative supply shocks. An increase in the real price of imports or of oil shifts the SP curve upward for a temporary period, and a decrease shifts the SP curve downward. For a more detailed analysis, see Gordon (1998, 248–58).

than D and G higher than F) implies that the leaver countries are further northeast along any given SP curve than the stayer countries.

However, while the leaver countries necessarily should experience more inflation than the stayer countries, there is no necessary reason why their inflation rates had to exceed their initial situation at point A, since a sufficiently steep SP curve combined with a sufficiently deep recession could place point E vertically below point A, as in the right-hand panel of figure 7.2. Whether point G lies above or below point A depends on whether the temporary upward shift in the SP curve caused by an increase in the relative price of imports has reversed itself by the time the economy moves rightward from point E to point G.

Ceteris paribus, this analysis makes clear predictions about the post-1992 macroeconomic performance of the leaver countries compared to the stayers: output should be higher but so too should be the inflation rate. But at the same time, there is no presumption that the leavers should have higher output or inflation than the same countries experienced before the ERM breakup, say, in 1991–92. This analysis also provides a framework for examining the data in subsequent sections. It would be truly surprising if the leaver countries did not experience higher output than the stayer countries and even more surprising if they did not exhibit more rapid inflation than the stayers (the extra surprise residing in the extra boost of higher import prices to domestic inflation, over and above the contribution of higher output). If the data do indeed yield surprises relative to this analysis, two possible explanations might be that the analysis is wrong or that *ceteris* was not *paribus*, that is, that the leavers (either individually or together) experienced different shocks than the stayers.

7.3 Leavers versus Stayers before and after 1992

The empirical conclusions of this paper rely primarily on a quarterly data file covering the nominal and real exchange rates, nominal and real import price deflators, nominal and real GDP, the GDP deflator, nominal and real unit labor costs, the CPI, and the unemployment rate. Leaver and stayer aggregates are formed, using GDP weights as described in the data appendix. The quarterly data series are supplemented by selected annual series on other variables. The behavior of ten of the quarterly data series, expressed as index numbers with 1991 equal to 100, is plotted in figures 7.3 through 7.12 for the period 1987–96. We focus on the period after 1987 because that year is generally acknowledged to represent the beginning of the five-year period of exchange rate stability within the EMS and is subsequent to the 1981–87 period during which inflation rates converged and numerous realignments occurred. Our discussion is divided into two parts, referring first to differences between leavers and stayers in the run-up to the 1992 crisis and then to differences in the evolution of economic

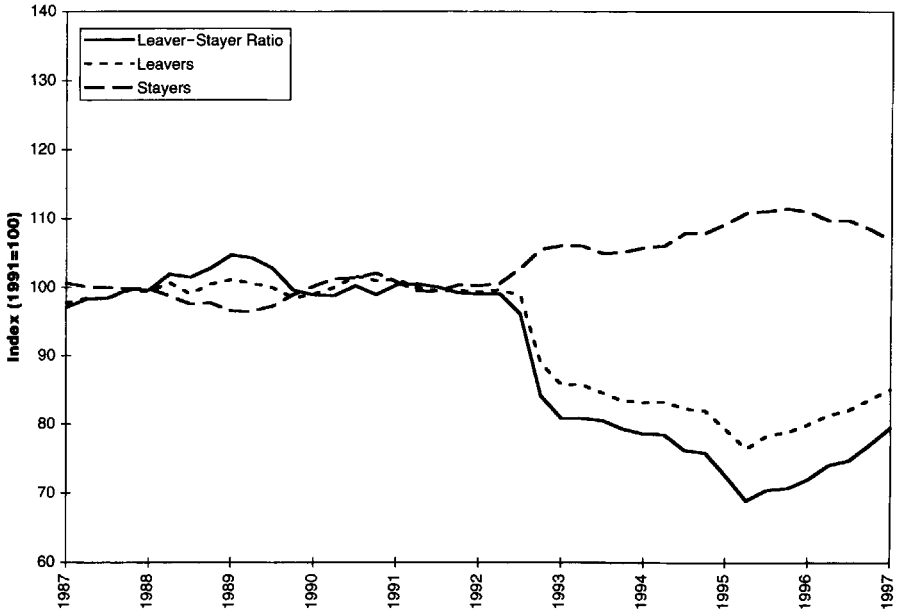


Fig. 7.3 Nominal effective exchange rate, 1987-96 (1991=100)

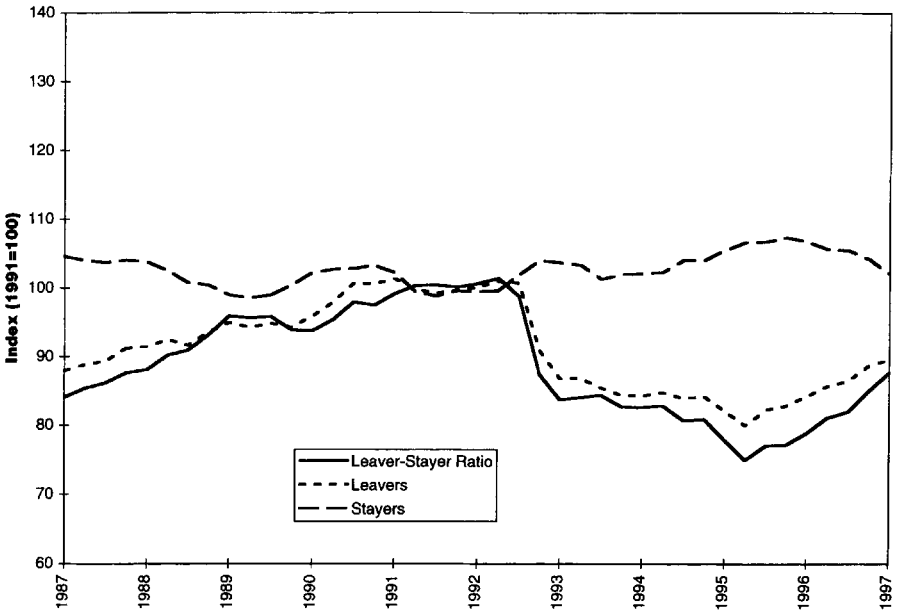


Fig. 7.4 Real effective exchange rate, 1987-96 (1991=100)

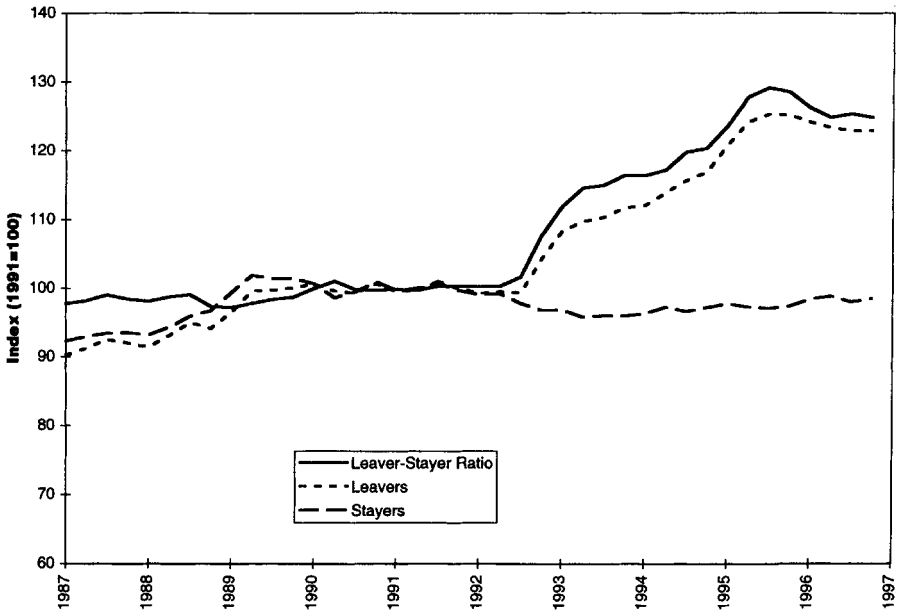


Fig. 7.5 Nominal import price deflator, 1987-96 (1991=100)

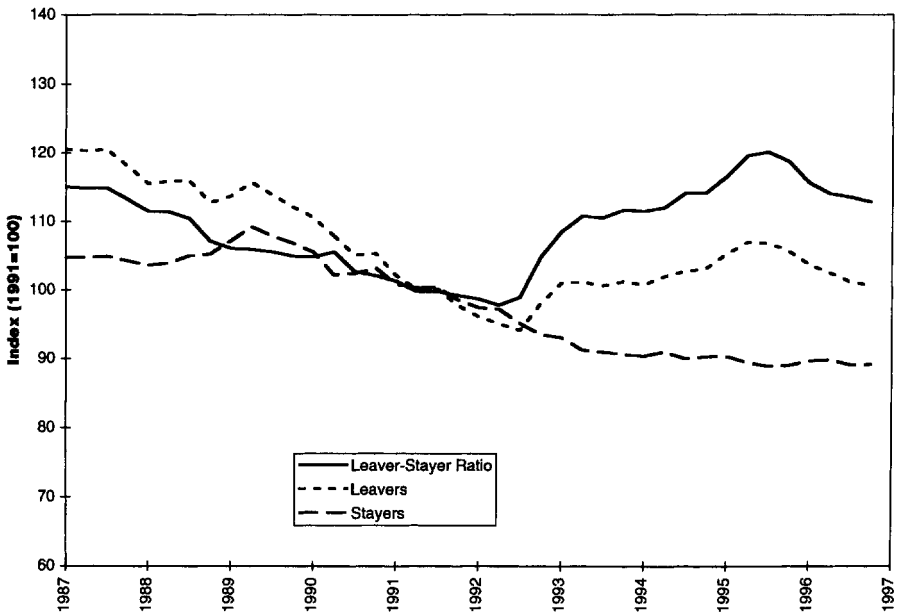


Fig. 7.6 Real import price deflator, 1987-96 (1991=100)

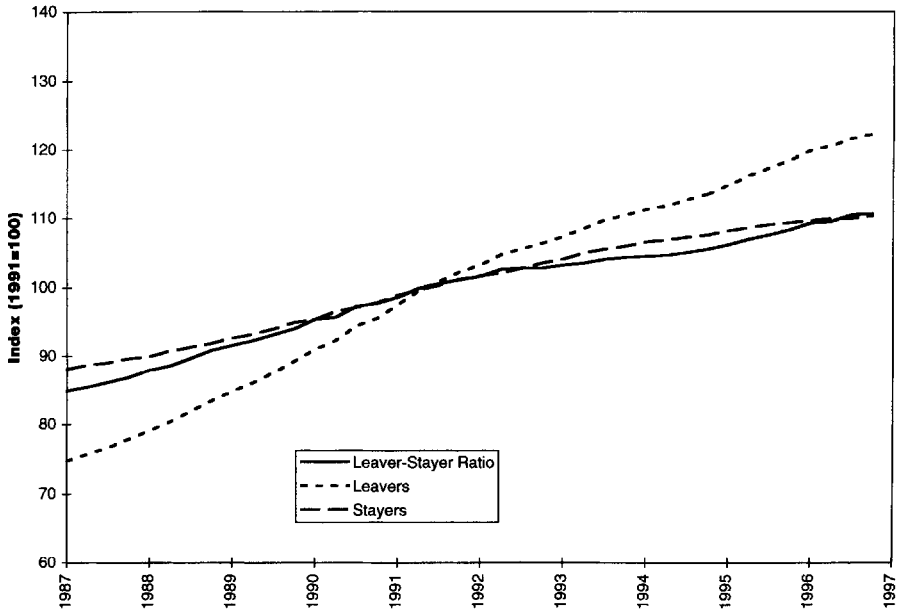


Fig. 7.7 GDP deflator, 1987-96 (1991 = 100)

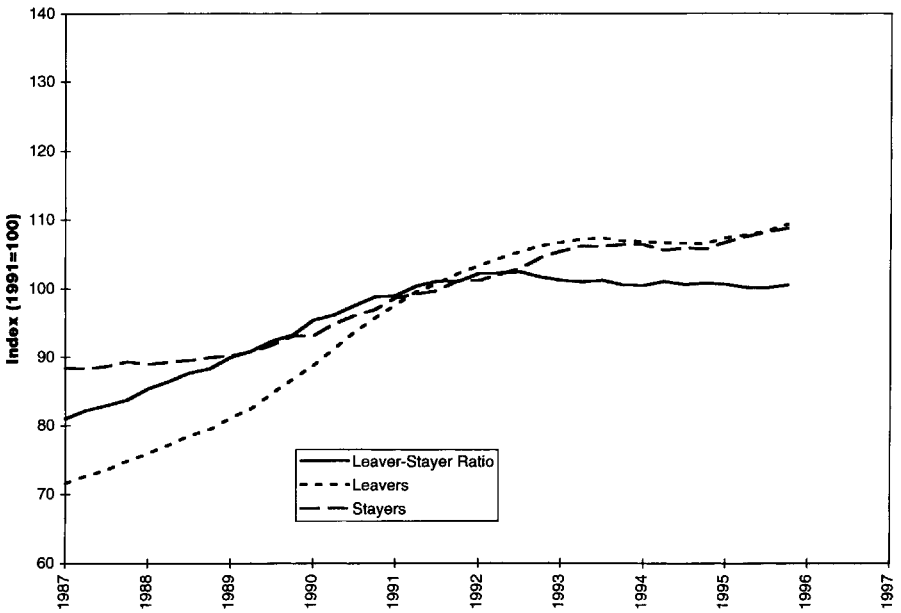


Fig. 7.8 Nominal unit labor cost, 1987-96 (1991 = 100)

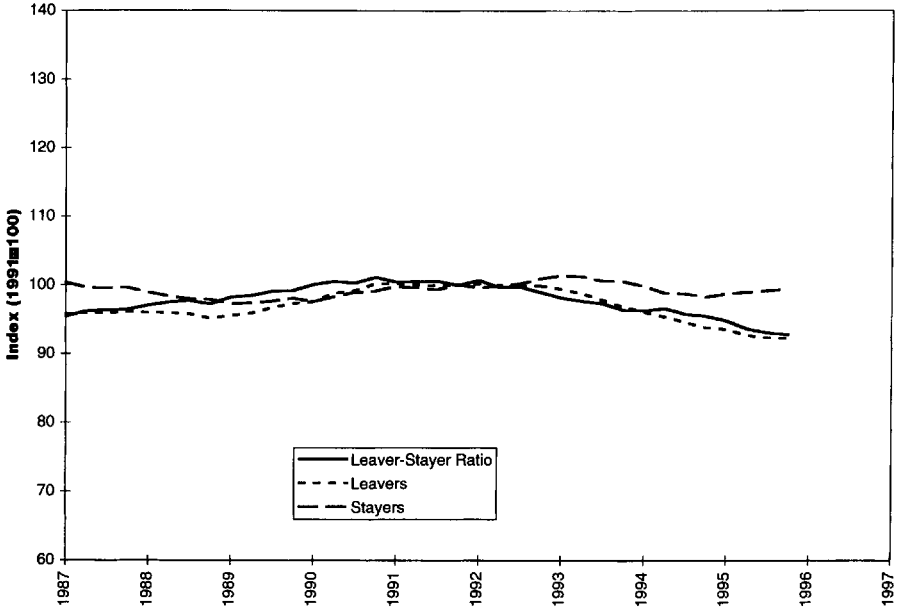


Fig. 7.9 Real unit labor cost, 1987-96 (1991=100)

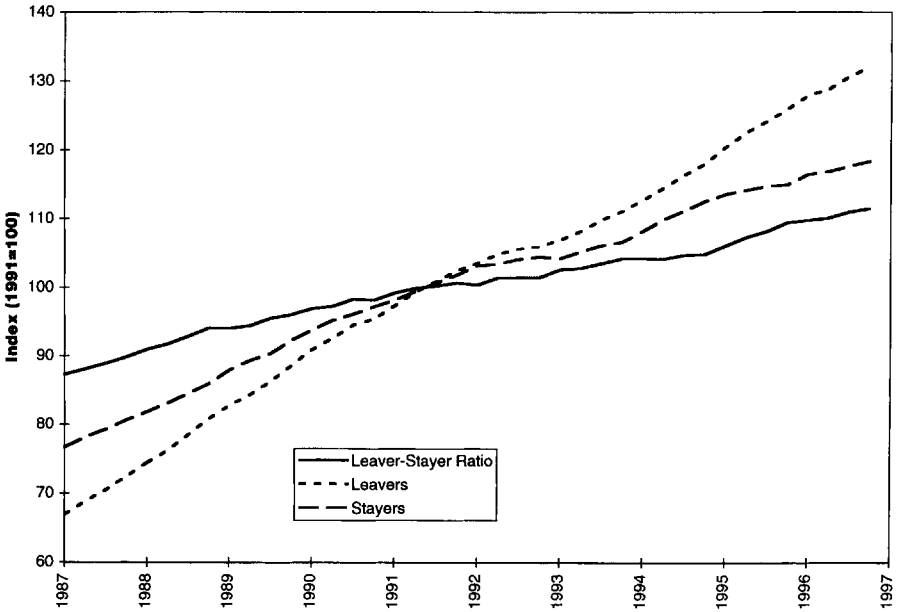


Fig. 7.10 Nominal GDP, 1987-96 (1991=100)

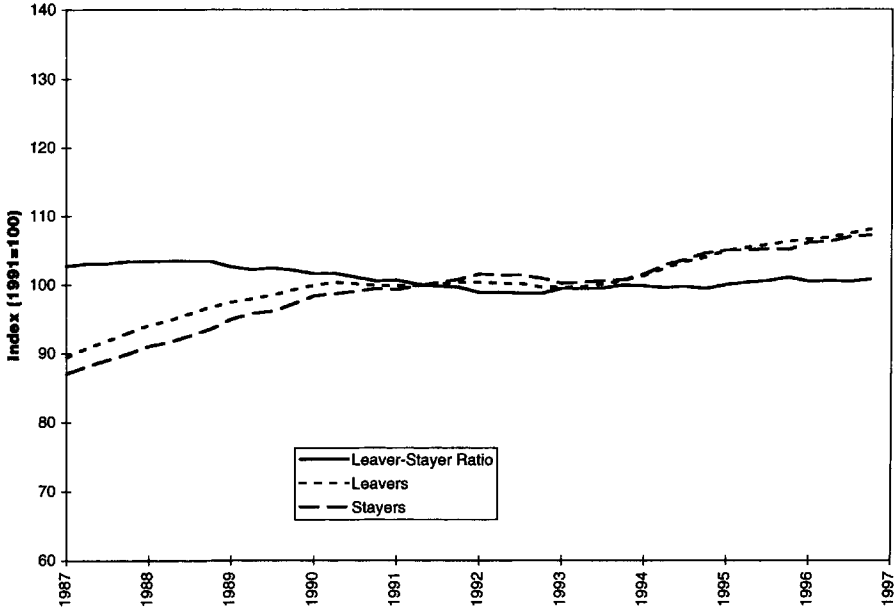


Fig. 7.11 Real GDP, 1987-96 (1991=100)

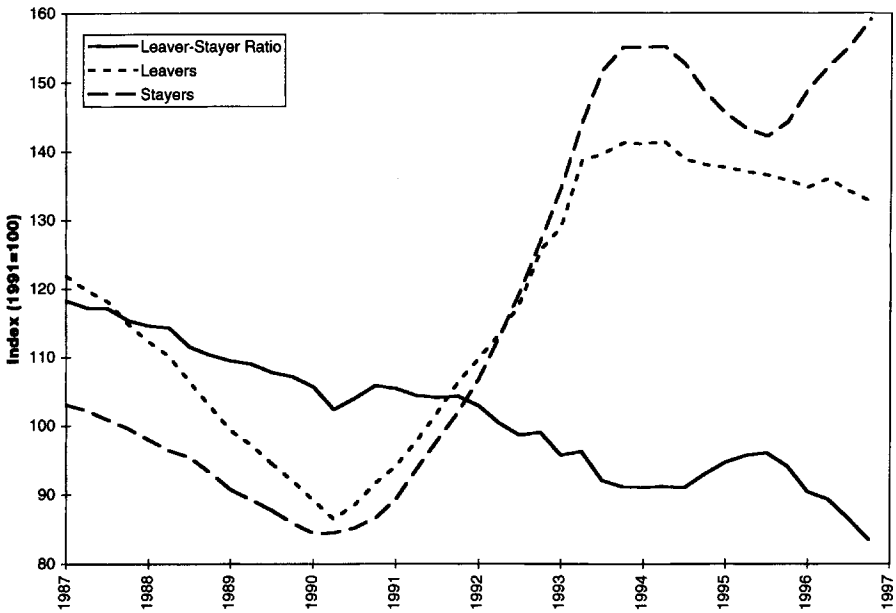


Fig. 7.12 Unemployment rate, 1987-96 (1991=100)

performance after 1992. The post-1992 analysis is further divided into three sections corresponding to three main classes of macroeconomic variables.

7.3.1 Differences in Behavior, 1987–92

Did the leavers reveal themselves to be candidates for crisis in the years prior to 1992? Our theoretical discussion suggests that both leavers and stayers were pressured by German reunification to tighten monetary policy, which should have reduced output and raised the unemployment rate in a similar fashion in the two groups of countries. While numerous papers, especially Svensson (1993) and Rose and Svensson (1994), demonstrate that the 1992 crisis was not anticipated on the exchange markets in the preceding months, a longer view covering five years prior to the crisis, instead of just a few months, reveals some systematic differences between the leavers and the stayers.

Since the leavers and the stayers remained aligned in the ERM during 1987–92, it is not surprising to find the nominal effective exchange rate for both groups of nations hovering around 100 during that period, as in figure 7.3. However this alignment did not extend to the real effective exchange rate, displayed in figure 7.4. There we see that the real exchange rate for the leaver aggregate rose relative to the stayers by 20.6 percent between 1987:Q1 and 1992:Q2, surely enough to raise the possibility that some or all of the leaver currencies had become overvalued. Dornbusch et al. (1995, 243) and Krugman (1996, 370–72) also call attention to the possibility of overvaluation for some of the individual leavers. Figure 7.4 raises a question about timing. Most of the real appreciation in the leaver-stayer ratio (14 percent of the total 20.6 percent) had already occurred by the end of 1988, more than three years before the crisis, and only the remaining 6 percent occurred between 1989:Q1 and 1992:Q2.

This appearance of mild relative appreciation disguises substantial differences over this thirteen-quarter interval. Three of the leavers experienced significant real appreciations of about the same amount over this period, 8.0 percent for Italy, 9.2 percent for Spain, and 10.5 percent for Sweden. In contrast, the real appreciation for the United Kingdom was only 2.4 percent. Outliers with very different experiences were Portugal, with a real appreciation of 25.5 percent, and Finland, where a collapsing economy held inflation well below that in the other countries and resulted in a real depreciation of 10.1 percent over the same interval. In contrast, the stayers were much more homogeneous, with real appreciations of less than 1 percent in Austria, France, the Netherlands, and Switzerland and of less than 3 percent in Belgium.

As shown in figure 7.5, much of the real appreciation in the leaver countries can be traced to more rapid inflation during the entire period before

the crisis. The GDP deflator for the leaver aggregate rose by 40.0 percent from 1987:Q1 to 1992:Q2, more than double the 15.8 percent increase registered by the stayer aggregates.¹⁵ The contrast with the stayer countries is sharper and more uniform than is the case for the real exchange rate. The cumulative price increases in four of the leavers clustered in the narrow range of 36.8 to 40.2 percent, with Portugal's 80.0 percent and Finland's 25.9 percent as the outliers. In contrast, the inflation rates in the stayer countries were uniformly lower; in Austria, Belgium, and France the cumulative price increase clustered within 2 percentage points of Germany's 17.5 percent, while the Netherlands registered 11.3 percent and Switzerland 22.0 percent. This stark difference in inflation behavior between the leavers and the stayers seems largely to have been overlooked in the previous literature. It appears to reflect a difference in the behavior of nominal unit labor costs (fig. 7.8), which increased cumulatively over the same period by 45.7 percent for the leavers and just 14.0 percent for the stayers and 18.5 percent for Germany.

In contrast to the differing inflation performance of the two groups, there was virtually no difference in the two central measures of real performance, namely, real GDP growth and the unemployment rate (figs. 7.11 and 7.12). The cumulative increase in real GDP from 1987:Q1 to 1992:Q2 was 12.0 percent for the leaver aggregate and a slightly greater 16.4 percent for the stayers. Over the same interval unemployment fell by 7.2 percent (not percentage points) for the leavers and rose by a trifling 1.3 percent for the stayers. This period spans the 1988–90 European boom, when unemployment fell by 29 percent through 1990:Q2 for the leavers and by 19 percent for the stayers and subsequently reversed course, rising by almost the same amounts. The larger downward and upward swings in leaver unemployment were entirely accounted for by the United Kingdom, where unemployment fell by almost half between early 1987 and mid-1990 and then reversed course, by mid-1992 reaching close to the initial level.

Some of the accounts of the “fundamentals” in 1992 stress the sharp increase in unemployment between mid-1990 and mid-1992, creating a presumption among speculators that policymakers would opt for easier monetary policy if they were not bound by the ERM peg. However, unemployment behavior does not differentiate the leavers from the stayers, which both found themselves in a situation like point D in figure 7.1 above. Instead, what seems misleading about the theoretical analogy in figure 7.1 is the depiction of Germany as having a higher relative level of output (in the left-hand panel of fig. 7.1) than the stayers or the leavers (in the middle and right-hand panels). Germany's unemployment rate actually increased

15. Our data set also includes the CPI for the same countries and time period, but the time path of the CPI mimics that of the GDP deflator almost exactly, so no separate comments are made in the text about the CPI. Subsequent notes comment on CPI changes.

between 1990:Q4 and 1992:Q2 by 31.4 percent, more than the leavers' 23.6 percent or the stayers' nearly identical 24.2 percent.

While differences in real GDP growth and changes in unemployment did not differentiate the leavers from the stayers in the run-up to 1992, a starkly different inflation performance clearly sets the leavers apart. Cumulative inflation during 1987–92 for every leaver but Finland was more than double the cumulative inflation registered by every stayer but Switzerland. Creeping overvaluation was sufficiently pervasive to suggest that a breakdown of ERM was inevitable at some point.

7.3.2 The Aftermath of 1992: Real Depreciation, Prices, and Labor Costs

We set our analysis of the post-1992 aftermath in the context of the conventional wisdom (based on the quotes in the introduction) that what has been most surprising is the absence of inflation among the leavers, who are sometimes viewed as having gained a burst of growth at little or no cost. If this view were correct, it would raise the issue of how the leavers had managed to overturn the laws of economics, which predict a substantial pass-through of exchange rate depreciation to import prices and subsequently to domestic inflation. It would also lead us to ask whether this “escape from inflation” had been uniformly enjoyed by all the leavers, or just some of them, and why.

Our tour of the data begins by returning to figures 7.3 and 7.4. They exhibit the sharp nominal and real depreciations of the leavers, which reached their maximum extent in 1995:Q2, at which point the real depreciation had reached 20.8 percent from 1992:Q2. Because the stayers experienced a real appreciation that reached almost 7 percent over the same twelve-quarter interval, the leaver-stayer real exchange rate ratio dropped by a full 26.0 percent. After 1995:Q2 the real exchange rates of the leavers and stayers began a reversal that by 1997:Q2 had reduced the cumulative real depreciation of the leavers to 11.1 percent and the leaver-stayer ratio to 12.5 percent. The changes for the nominal exchange rate are remarkably similar, a maximum nominal depreciation of 21.4 percent in 1995:Q2, a decline in the leaver-stayer ratio of 30.4 percent, and a partial reversal during 1995–97.

Does the post-1995 reversal of the initial real depreciation confirm the “monetarist” and “classical” views that price adjustment soon eliminates a real depreciation as the domestic price level adjusts with unit elasticity to the nominal exchange rate depreciation? Only about 4 percentage points of the turnaround in the leaver-stayer real exchange rate ratio after 1995:Q2 can be attributed to excess inflation in the leaver countries compared to the stayers. The remainder can be attributed to a sharp nominal appreciation of the British pound, and to a lesser extent the Italian lire, together with a substantial nominal depreciation of the mark and those

currencies tied to the mark (real exchange rate changes from 1995:Q2 to 1997:Q2 were +19.6 percent for the United Kingdom, +17.5 percent for Italy, +12.2 percent for the leaver aggregate, -8.5 percent for Germany, and -5.3 percent for the stayer aggregate). While a graphical display of data for each country would expand this paper beyond manageable size, table 7.1 does provide, for each country in 1996:Q4, a set of index numbers (1991 = 100) for the values of each variable plotted in figures 7.3 through 7.12.

Figures 7.5 and 7.6 display, respectively, the nominal and real import price deflators. Nominal import prices shot up in the leaver countries immediately following the ERM breakdown. The leaver-stayer ratio in figure 7.5 increased by 15 percent in the first year ending in 1993:Q3, and the increase in this ratio peaked at 29 percent in 1995:Q3, followed by a slow decrease to 25 percent in 1996:Q4. The equivalent changes for the leaver-stayer ratio computed from the real import deflators are 13.1, 22.7, and 15.4 percent. Subsequently we shall examine the dynamic path of the pass-through ratio, that is, the percentage adjustment of the real import deflator expressed as a ratio to the real exchange rate change. To preview those results, the pass-through ratio indicates that between half and two-thirds of the exchange rate depreciation was passed through to import prices for the leaver country aggregate, but the ratio varies substantially across the leaver countries.

Clearly, the difference in the behavior of the nominal and real import deflators demonstrates that the conventional wisdom is wrong, that the leaver countries did experience more rapid inflation than the stayers. As shown in figure 7.7, the leavers experienced almost twice as much inflation as the stayers between mid-1992 and the end of 1996. Translated into compound annual inflation rates, the leaver aggregate rate over this eighteen-quarter interval was 3.45 percent and the stayer aggregate registered 1.75 percent.¹⁶ The leaver aggregate disguises a substantial dispersion between the maximum annual rate of 4.29 percent for Portugal and the minimum annual rate of 1.11 percent for Finland. The stayers exhibit a much narrower dispersion, between a maximum annual rate of 2.67 percent for Austria and a minimum annual rate of 1.56 percent for Switzerland.¹⁷

When we turn to unit labor costs, however, we do find a surprise consistent with the thrust of the conventional wisdom. Although, as we have seen, the leavers had substantially more rapid growth in nominal unit labor costs prior to 1991, after that point the leaver-stayer ratio for nominal unit labor costs was absolutely flat, as shown in figure 7.8. Thus none of the differentially more rapid inflation passed through to domestic labor

16. The equivalent figures for the CPI are 3.32 and 1.91 percent, respectively.

17. These data on the dispersion of inflation rates refer to the CPI, for which our data extend further in time for some small countries than for the GDP deflator.

Table 7.1 Values of Selected Variables for Leaver and Stayer Aggregates and Each Country, 1996:Q4 (1991 = 100)

	Nominal Exchange Rate (1)	Real Exchange Rate (2)	Nominal Import Deflator (3)	Real Import Deflator (4)	GDP Deflator (5)	Nominal Unit Labor Cost ^a (6)	Real Unit Labor Cost ^a (7)	Nominal GDP (8)	Real GDP (9)	Unemployment Rate (10)
Leavers	83.6	88.7	123.0	100.7	122.3	109.4	92.2	137.1	108.1	132.8
Stayers	108.6	104.4	98.5	89.2	110.4	108.8	99.5	118.4	107.2	159.1
Leaver-stayer ratio	77.0	85.1	124.9	112.9	110.8	100.5	92.8	111.6	100.8	83.4
Germany	107.8	109.7	99.3	85.9	115.6	110.8	96.2	125.2	108.3	159.7
Leavers										
Finland	88.1	82.2	119.9	111.9	107.2	99.6	92.0	117.8	109.9	207.3
Italy	78.2	86.3	130.2	103.0	126.3	108.9	89.7	133.0	105.3	139.5
Portugal	n.a.	108.8	109.1 ^a	82.5 ^a	132.1 ^a	n.a.	n.a.	139.7 ^a	105.8 ^a	173.6
Spain	80.0	87.1	123.0	97.0	126.7	114.8	92.9	136.6	107.8	139.2
Sweden	89.5	87.4	114.4	103.6	110.4	103.5	92.8	116.5	105.6	281.5
United Kingdom	90.1	90.8	118.7	101.2	117.2	107.5	94.7	130.9	111.7	87.4
Stayers										
Austria	105.5	106.6	102.6 ^a	90.1 ^a	113.8 ^a	112.0	98.4	121.9 ^a	107.1 ^a	120.4
Belgium	106.3	103.2	96.1 ^a	85.7 ^a	112.1 ^a	109.3	97.6	117.7 ^a	105.0 ^a	134.5
France	109.6	103.9	98.6	90.0	109.6	108.9	100.2	117.1	106.9	139.3
Netherlands	106.8	105.4	99.5	90.4	110.0	106.6	98.4	124.0	112.7	115.8
Switzerland	109.6	104.8	92.6	84.1	110.0	108.8	99.0	109.1	99.2	468.1

Source: See data appendix.

^aValue shown is for 1995:Q4 due to early truncation of this series in the source data.

costs. This finding conceals substantial variation within the group of leaver countries, just as there is variation in the inflation experience. Italy and the United Kingdom exhibit increases in unit labor costs that are almost exactly the same as in the leaver and stayer aggregates (which are roughly equal to each other). The more rapid growth in unit labor costs in Spain and Portugal are balanced by much slower growth in Finland and Sweden. In fact, nominal unit labor costs for Finland were actually lower in late 1996 than in 1991.

The combination of extra inflation among the leaver countries with no pass-through to unit labor costs implies that real unit labor costs (equivalent to an index of labor's income share) must have fallen. As shown in figure 7.9, the leaver-stayer ratio of real unit labor costs dropped steadily after 1992, by a cumulative 7.5 percent. However, the leaver countries were not unique in displaying this evidence of real wage flexibility, as the real unit labor cost index for Germany also declined over the same period (see table 7.1).

7.3.3 The Aftermath of 1992: Output, External and Domestic Demand, and Unemployment

The absence of pass-through from import prices to nominal unit labor cost, made possible by the flexibility of real unit labor cost, is the first surprising aspect of the 1992 aftermath. A second and doubtless greater surprise lies in figures 7.10 and 7.11 containing the index numbers (again with 1991 = 100) for nominal and real GDP. Here we find that *virtually all of the leaver-stayer excess of nominal GDP growth was chewed up by extra inflation, with almost nothing at all remaining for real GDP growth.* Real GDP growth was absolutely identical in the leavers and stayers not just on average over the 1992–96 period but in each individual year! As a result, the leaver-stayer ratio for real GDP was a rock-solid 100 percent for virtually the entire period after 1992, growing infinitesimally from 98.9 percent in 1992:Q2 to 100.8 percent in 1996:Q4. Another way to state this surprising result is that the excess growth of nominal GDP in the leavers was divided 80–20, with 80 percent going into extra inflation and only 20 percent going into real GDP growth.¹⁸

How could the stimulus to the external sector coming from a substantial real depreciation fail to boost real GDP growth by more than a tiny fraction? Further insight is provided in table 7.2, based on annual OECD data for each country, where the leaver and stayer aggregates are formed with the same weights as in the quarterly database. In the top two rows we see the enormous burst of real export growth in the leavers, at more than double the rate of import growth over the four-year period. However, real

18. The leaver-stayer ratios on a base of 1992:Q2 = 100 are 109.99 for nominal GDP, 107.95 for the GDP deflator, and 101.99 for real GDP. The ratio for the CPI is 106.56.

Table 7.2 External and Domestic Demand and Real GDP, 1992–96 (cumulative percent increase)

	Real Exports (1)	Real Imports (2)	Real Exports/ Real Imports (3)	Real Domestic Demand (4)	Real GDP (5)	1992–96 Change in Structural Deficit (6)
Leavers	36.9	17.2	16.8	3.2	7.3	+3.2
Stayers	17.4	14.2	2.9	4.4	5.3	+1.4
Leaver-stayer ratio	19.5	3.0	13.9	-1.2	2.0	+1.8
Germany	14.1	10.8	3.0	4.4	5.2	+1.2
Leavers						
Finland	48.5	27.0	16.9	3.7	11.5	+0.2
Italy	34.4	6.3	26.4	-0.6	4.6	+5.9
Portugal	34.5	25.8	6.9	5.5	6.0	+1.7
Spain	51.1	23.5	22.3	1.3	6.0	+1.8
Sweden	45.9	26.0	15.8	-0.5	5.8	+4.5
United Kingdom	29.8	22.2	6.2	8.7	10.9	+1.3
Stayers						
Austria	13.5	19.9	-5.4	9.5	6.4	-1.2
Belgium	21.7	20.6	0.9	2.9	4.2	+5.6
France	17.5	10.9	5.9	3.4	5.1	+0.9
Netherlands	20.4	18.8	1.3	8.0	9.3	+2.2
Switzerland	10.8	16.9	-5.2	2.5	-0.4	n.a.

Source: OECD (1997, annex tables A8, A9, A10, A31).

domestic demand growth in the leavers fell slightly short of that in the stayers, keeping the excess real GDP growth in the leavers at a mere 2 percent, or only 0.5 percent per year.¹⁹ This table displays the extent to which the United Kingdom is an outlier among the leavers, with much faster domestic demand growth than its leaver colleagues. In Italy, Spain, and Sweden domestic demand growth was virtually zero. One possible link between the two surprises, those of flexible real unit labor costs and of stagnant domestic demand growth, is that falling real wages (adjusted for productivity) restrained the growth of domestic real consumption. Another cause of sluggish domestic demand growth was a concurrent fiscal tightening, as shown in table 7.2, column (6), where the leaver aggregate reduced its structural deficit by 3.2 percent of GDP between 1992 and 1996, as compared with a reduction of just 1.4 percent for the stayer aggregate.

While the leavers display little benefit from faster real GDP growth in figure 7.11, their real exchange rate depreciations did yield a slightly better

19. The cumulative excess real GDP growth of 2 percent in table 7.2 is roughly the same as in the quarterly data displayed in table 7.1, col. (8), and in fig. 7.10.

unemployment performance in figure 7.12 than achieved by the stayers or by Germany. The data displayed in column (9) of table 7.1 show that from 1991 to 1996:Q4 the unemployment rate in the leavers increased by 33 percent and in the stayers by 59 percent, so that the leaver-stayer unemployment ratio fell by 17 percent. However, these leaver-stayer aggregates are almost meaningless, as the variance of the unemployment changes is much greater across countries within the leaver and stayer groups than for the other variables in table 7.1. Here we see that the relatively poor performance of the stayers is entirely due to the order-of-magnitude jump in Swiss unemployment, and that the other stayers experienced increases in unemployment that were roughly equal to the leaver aggregate or, in the case of Austria and the Netherlands, considerably lower. Similarly, the leaver aggregate disguises a huge difference between the United Kingdom, which actually enjoyed a decline in unemployment, and the two Nordic countries, where the unemployment rate doubled in the case of Finland and almost tripled in the case of Sweden.

7.3.4 The Aftermath of 1992: Gaps and Deficits

A final array of data, based on OECD annual data, is presented in table 7.3. Here we see three more aspects of pre-1992 economic performance in the leaver countries that might appear, at least in retrospect, to be auguries of the impending ERM breakdown. First, if we can believe the OECD output gap estimates (which are based on a simple detrending procedure rather than derived from inflation equations), there was considerably more excess demand in the leaver countries in 1989–90 than in the stayer countries. Second, the leavers had structural budget deficits in 1989–92 that

Table 7.3 Gaps and Deficits, 1989–96 (percent of GDP)

	1989	1990	1991	1992	1993	1994	1995	1996
Output gap								
Leavers	3.9	3.3	1.1	-0.1	-2.7	-1.9	-1.3	-1.7
Stayers	0.9	2.0	1.3	0.5	-1.5	-0.6	-1.0	-1.2
Germany	0.0	2.1	2.7	2.7	-0.9	-0.6	-0.9	-1.4
Structural budget surplus								
Leavers	-5.4	-6.7	-6.4	-7.4	-7.1	-6.8	-5.6	-4.2
Stayers	-3.1	-3.4	-3.1	-4.0	-3.7	-4.1	-3.7	-2.5
Germany	0.1	-3.1	-4.3	-4.3	-3.0	-2.1	-3.1	-3.1
Current account surplus								
Leavers	-2.7	-2.7	-2.1	-2.3	-0.4	0.2	1.0	1.6
Stayers	0.6	0.2	0.4	0.9	1.8	1.7	1.9	2.1
Germany	4.8	3.3	-1.1	-1.0	-0.7	-1.0	-1.0	-0.6

Source: OECD (1997, annex tables 11, 31, 51, resp.).

were roughly twice as high as those of the stayers. Third, the leavers on average had relatively large current account deficits throughout the period 1989–92.

The OECD output gap data show that the cumulative change in the output gap between 1991 and 1996 was roughly the same for the leavers and the stayers, thus supporting our earlier conclusion that there was no payoff in extra real GDP from the 1992 depreciations. Further insight into the post-1992 adjustment is provided by the remaining sections of table 7.3. While the leavers did achieve an improvement in the current account amounting to 3.9 percent of GDP between 1992 and 1996, the demand expansion provided by this external stimulus was largely cancelled out by a 3.2 percent of GDP reduction in the structural budget deficit. The concurrence of fiscal tightening with external expansion suggests that the 1992 aftermath is not a “clean experiment” of the effects of an exchange depreciation, and that the leaver economies would have experienced a more buoyant increase in output, and less of an increase in unemployment, if they had not been forced by their adherence to the Maastricht criteria to put their fiscal houses in order.

7.4 The Pass-through from Exchange Rate Depreciation to Import Prices

As we have seen there is no support for the conventional wisdom that the leavers did not experience extra inflation. Nevertheless, it is interesting to compare the extent of pass-through of the exchange rate devaluation to import prices with the main results in the vast previous literature on pass-through. The consensus for the United States that emerges from Hooper and Mann (1989) and previous studies is that the extent of pass-through is 20 percent in the short run (defined as one quarter) and about 70 percent in the “long run” after about two years. A much broader range of estimates is summarized in the survey by Menon (1995), who finds that incomplete pass-through is “common and pervasive.”

Several of the studies cited by Menon (1995, 224–25) find systematic differences in pass-through elasticities, although little agreement. Some studies find that the pass-through elasticity tends to vary inversely with the size of the country, while others find larger pass-throughs for the United States, Germany, and Japan than for smaller countries. For any given country, results also vary. The long-run adjustment for the United States ranges from 49 to 91 percent, with a mean of 70 percent. The range of studies surveyed by Menon yield long-run ratios from 60 to more than 100 percent, although very few systematic studies have been carried out for smaller countries.

Two methods can be used to measure the pass-through elasticity for the leaver countries. In evaluating the above-cited conventional wisdom, we are interested in whether the measured pass-through elasticities for the

leaver countries are systematically lower than in the previous literature and whether they are lower than in the stayer countries. One simple method of measuring the pass-through elasticity would be to take the percentage change in the nominal import deflator from 1992:Q2 and divide it by the percentage change in the nominal real effective exchange rate from the same date. However, this calculation would overstate the pass-through elasticity, since the numerator would combine the response of the import deflator to the exchange rate devaluation with general inflation that is shared by leavers and stayers alike. Stated another way, at a constant nominal exchange rate we would expect a steady increase in the nominal import deflator at the rate of inflation shared by the leavers and stayers. To correct for common inflation we compute a real import deflator, where the nominal import deflator in each country is deflated by the GDP deflator for the stayer aggregate.

The resulting elasticities can be plotted over time, as in figure 7.13, where the elasticities are displayed for the leaver and stayer aggregates. The elasticities for the two groups of countries are fairly close together between mid-1995 and late 1996, in the range of -80 to -100 percent, higher than the ratios that emerge from most studies surveyed by Menon. As shown in figure 7.14, the individual leaver countries have ratios that cover a broader range, with Spain at the low end in most quarters and the United Kingdom at the high end.²⁰

An alternative measure of the pass-through elasticity can be obtained from a regression of import prices on exchange rate changes. Menon (1995, 222–24) cites numerous problems in previous pass-through studies, including autocorrelation, spurious regressions, trended variables, and specification error. Many of these problems are avoided by specifying the pass-through relation in terms of the import deflator expressed net of stayer inflation (thus eliminating common trends), by including changes in real oil prices as a determinant of changes in real import prices, and by eliminating serial correlation through the inclusion of the lagged dependent variable. Our preferred specification is

$$(1) \quad (\mu - \pi)_t = \sum_{i=1}^4 \alpha_i (\mu - \pi)_{t-i} + \sum_{i=0}^4 \beta_i \eta_{t-i} + \sum_{i=0}^4 \gamma_i \phi_{t-i} + \varepsilon_t.$$

In this formulation the rate of change of the real import price $(\mu - \pi)_t$ is regressed on four of its own lagged quarterly values, the current and four lagged rates of change of the real exchange rate (η_t) , and the current and four lagged rates of change of the real price of oil (ϕ_t) .

Results for the leaver and stayer aggregates and the twelve countries are displayed in table 7.4, with the estimates obtained over the 1973–96 sample

20. The exclusion of Finland and Portugal reflects their bizarre ratios, ranging up to 400 percent.

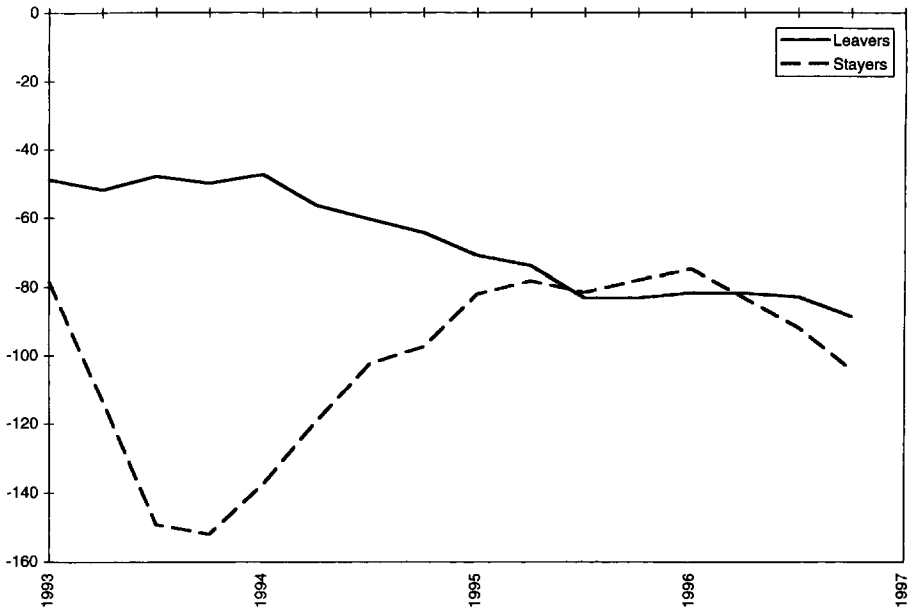


Fig. 7.13 Dynamic pass-through ratios: leavers and stayers, 1993:Q1–96:Q4

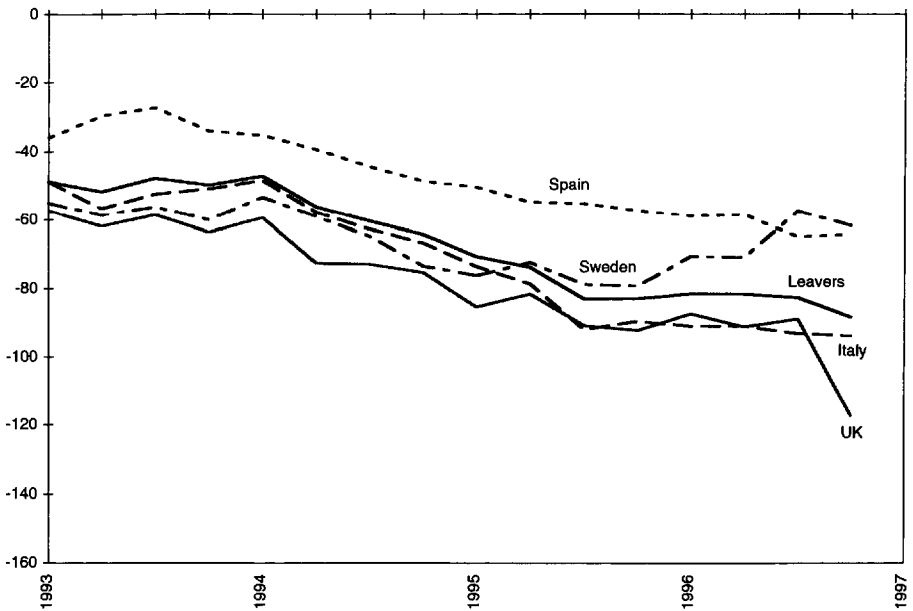


Fig. 7.14 Dynamic pass-through ratios: individual leavers, 1993:Q1–96:Q4

Table 7.4 Pass-through Regressions Explaining Change in Real Import Price, 1973:Q1–96:Q4

	Sum of Coefficients				Long-Run Response	
	Real Import Price: Lags 1–4	Nominal Exchange Rate: Lags 0–4	Real Oil Price: Lags 0–4	\bar{R}^2	1973:Q1–96:Q4	1991:Q1–96:Q4
	(1)	(2)	(3)	(4)	(5)	(6)
Leavers	0.36**	–0.38**	0.11**	0.74	–0.59	–0.81
Stayers	0.49	–0.30**	0.06**	0.79	–0.59	–0.65
Germany	0.51**	–0.22**	0.03**	0.65	–0.45	–0.65
Leavers						
Finland	0.38	–0.20**	0.10**	0.60	–0.32	–0.49
Italy	0.22	–0.51**	0.15**	0.73	–0.65	–0.71
Spain	0.72**	–0.07	0.04**	0.83	–0.25	–0.39
Sweden	0.18**	–0.53**	0.12**	0.76	–0.65	–0.59
United Kingdom	0.06	–0.52**	0.15**	0.59	–0.55	–0.56
Stayers						
Austria	0.11	–0.71*	0.07**	0.27	–0.80	–0.77
Belgium	0.74**	–0.10	0.01**	0.85	–0.38	–1.00
France	–0.03	–0.60**	0.22**	0.78	–0.58	–0.50
Netherlands	0.47**	–0.31**	0.04**	0.64	–0.58	–1.44
Switzerland	0.14	–0.64**	0.04**	0.55	–0.74	–0.74

Source: See data appendix.

Note: Significance values refer to an F -test on the exclusion of the set of lagged variables.

*Significant at the 5 percent level.

**Significant at the 1 percent level.

period. The sum of coefficients on the change in the real exchange rate in column (2) represents a medium-term response, and column (5) gives the long-term response:

$$\sum \beta / (1 - \sum \alpha).$$

The long-run responses lie in a narrower range than the short-run responses. For the leaver and stayer aggregates, Germany, and four of the individual leaver or stayer nations, the long-run response lies in the relatively narrow range of -0.59 to -0.81 , which seems roughly consistent with the previous literature and a bit lower than the elasticities plotted from the raw data in figures 7.13 and 7.14.

As the final empirical exercise in this section, we can ask to what extent the nominal exchange devaluations of 1992 were transmitted to the real exchange rate, and whether the subsequent adjustment of domestic prices eliminated the real exchange rate response as the classical view and the Mundell quote (see subsection 7.2.1 above) would imply. Plotted in figure 7.15 is the percentage of the nominal exchange rate change after 1992:Q2 that was transmitted to the real exchange rate. The Mundell approach would predict a percentage remaining above zero only for the duration of labor contracts, say one to three years. Yet the leaver ratio was as high as

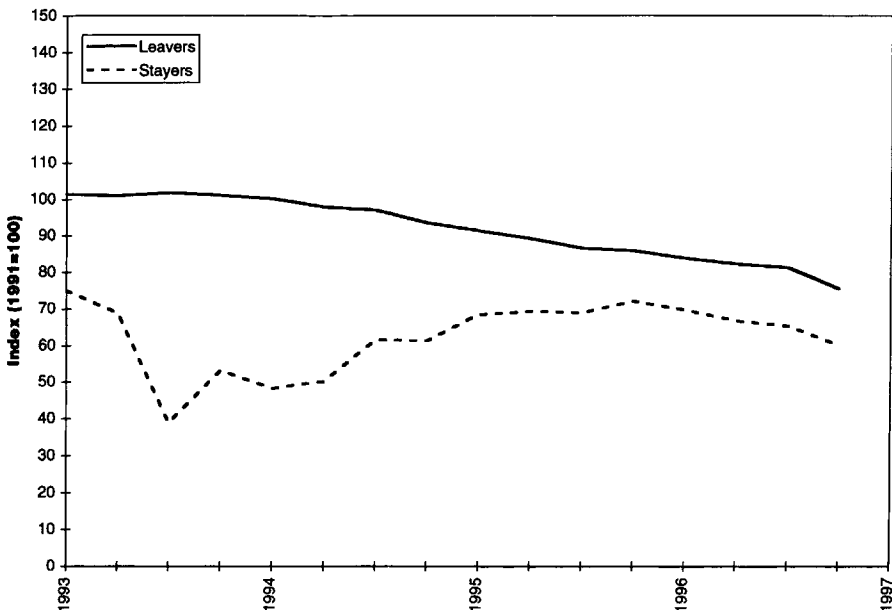


Fig. 7.15 Ratio of real to nominal depreciation: leavers and stayers, 1993:Q1–96:Q4

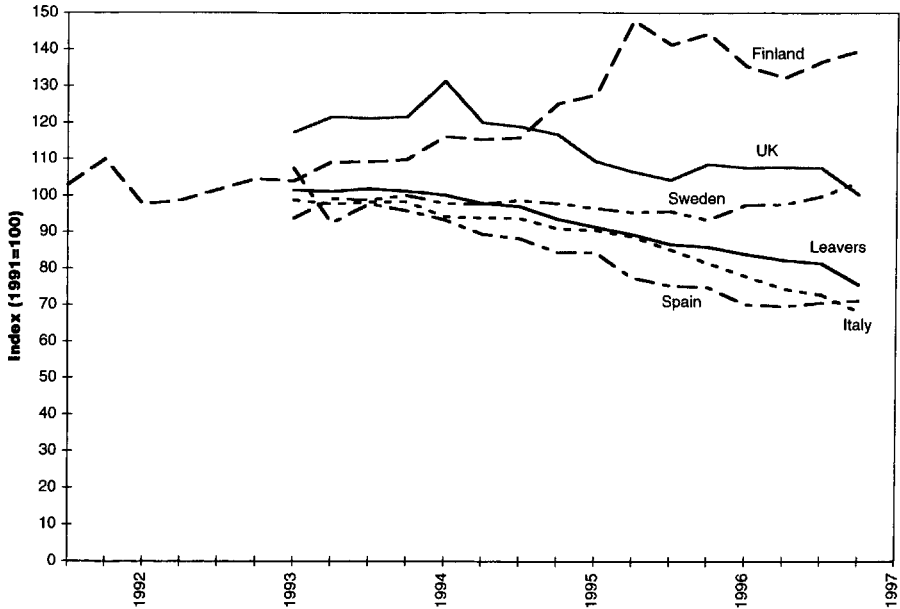


Fig. 7.16 Ratio of real to nominal depreciation: individual leavers, 1991:Q3–96:Q4

75 percent in 1996:Q4, four years after most of the devaluations occurred, and the stayer ratio was at 60 percent (after an initial dip). The ratios for the individual leaver countries are shown in figure 7.16, and these equaled or exceeded 100 percent for Finland, Sweden, and the United Kingdom. The explanation for the behavior of the ratio for Finland is straightforward—a virtual depression in the economy caused inflation after its 1991–93 depreciation to drop below the average for the stayer countries. Finland, by experiencing a reduction of inflation together with a nominal exchange rate depreciation, registered a real depreciation that was greater than its nominal depreciation.²¹

7.5 Inflation and Labor Cost Econometrics

“Phillips curve” has become a generic term for any relation between the *rate of change* of a nominal price or wage and the *level* of a real indicator of the intensity of demand in the economy, such as the unemployment rate. In the 1970s, the simple Phillips relation was amended by incorporat-

21. The base year in fig. 7.16 for the Finland calculation is taken as 1991:Q2 rather than 1992:Q2, the base year for all the other countries. Nominal exchange rate data for Portugal were not available from our data source.

ing supply shocks and a zero long-run trade-off. What emerged was an interpretation of the Phillips curve that I have called the “triangle” model of inflation—a label summarizing the dependence of the inflation rate on three basic determinants: inertia, demand, and supply.

For example, a general specification of this framework would be

$$(2) \quad \pi_t = a(L)\pi_{t-1} + b(L)D_t + c(L)z_t + e_t.$$

Lowercase letters designate first differences of logarithms; uppercase letters designate logarithms of levels, and L is a polynomial in the lag operator. The dependent variable π_t is the inflation rate. Inertia is conveyed by the lagged rate of inflation π_{t-1} . D_t is an index of excess demand (normalized so that $D_t = 0$ indicates the absence of excess demand), z_t is a vector of supply shock variables (normalized so that $z_t = 0$ indicates an absence of supply shocks), and e_t is a serially uncorrelated error term.

Usually, equation (2) includes several lags of past inflation rates. If the sum of the coefficients on these lagged inflation values equals unity, then there is a “natural rate” of the demand variable (D_t^N) consistent with a constant rate of inflation. Subsequently, we will supplement equation (2) with an alternative version that replaces the current and lagged price inflation variables with measures of wage inflation. Note that equation (2) is a reduced form that solves out wages, which requires strong assumptions about the absence of an independent role of wage changes that is not captured by the D and z variables in equation (2). Our empirical results presented below test for this restriction by allowing both lagged prices and wages to influence either price or wage inflation.

The equations estimated in this paper use current and lagged values of the output gap as a proxy for the excess demand parameter D_t .²² In turn the output gap is defined as the log ratio of actual to trend real GDP, with the Hodrick-Prescott filter used to detrend actual real GDP.²³ Inflation depends on both the level and change in the demand variable. The rate-of-change effect is automatically allowed to enter as long as the output gap variable is entered with more than one lag; in other words, if the gap variable is entered as, say, the current value and one lagged value, this contains precisely the same information as entering the current level and change from the previous period.

22. In my research on the United States (Gordon 1997), I have found it possible to use the unemployment gap in equations like eq. (2) and to estimate a time-varying NAIRU (natural rate of unemployment). This technique did not seem to be workable for Europe, presumably due to the sharp increase in the NAIRU in many countries. The alternative approach of using a detrended output series to create the output gap seems to work well and yield sensible results.

23. The smoothing parameter used in Hodrick-Prescott’s original paper is 1,600; this results in a trend that is too “wavy” and responsive to the actual series. The output trends computed in this paper use a parameter of 10,000, which seems more consistent with the behavior of natural output in the United States because it is derived from inflation equations.

The third set of variables consists of proxies for supply shocks. Here we use the change in the real price of imports and the real price of oil, in both cases deflated by each country's GDP deflator. When the rate of change of the GDP deflator, the import deflator, and the price of oil are all identical, then the supply shock terms are zero and inflation depends only on its own lagged values and on the effect of the output gap.

7.5.1 Wage-Price Feedback

Thus far we have restricted the inflation process to rule out any feedback from wage changes to price changes. Yet we have seen in figures 7.8 and 7.9 that one of the most remarkable aspects of the post-1992 performance of the leaver countries was the absence of any response of unit labor costs to the increase in import prices. The leaver-stayer ratio of nominal unit labor costs was flat at 100 percent on a 1991 base throughout 1992–96 (fig. 7.8), while the leaver-stayer ratio for real unit labor costs—the same as labor's income share—declined by about 7 percent.

One direct indicator of the role of wages in the inflation process is labor's share in national income. The change in labor's share (s_t) is by definition equal to the growth rate of the real wage ($w_t - \pi_t$) minus the growth rate of labor's average product (θ_t):

$$(3) \quad s_t = w_t - \theta_t - \pi_t.$$

It can be shown that changes in labor's share become a source of "cost push" that is on an equal footing with any other type of supply shock (Franz and Gordon 1993); an increase in labor's share pushes upward on the rate of inflation at any given level of the output gap.

A straightforward analogy of our basic inflation equation (2) is an equation explaining changes in wage rates (w_t) relative to productivity (θ_t) by its own lagged values and the same set of demand and supply variables that enter into the price equation.²⁴ The difference between the growth rate of wage rates and productivity is unit labor cost ($w - \theta$):

$$(4) \quad (w - \theta)_t = g(L)(w - \theta)_{t-1} + b(L)D_t + c(L)z_t + e_t.$$

As discussed by Franz and Gordon (1993), the identification of a wage equation that is separate from the price equation is problematic. One approach would be to include as explanatory variables in the wage equation sets of demand and supply terms different from those included in the price equation. However, this is implausible a priori, since any variable relevant as a determinant of price change may also be relevant for participants in

24. It is preferable to express wage rates relative to the trend of productivity rather than to its actual levels, which tend to exhibit procyclical fluctuations. It did not prove possible to obtain the data needed to carry out this decomposition for the purposes of this paper.

the wage-setting process, and vice versa for prices. Another approach is to restrict the contemporaneous coefficient of wages on current prices or prices on current wages, but this is arbitrary as well.

In this paper we estimate equation (4) as a direct analogy to equation (2) by including the same explanatory variables (substituting lagged changes in unit labor cost for lagged inflation), based on the notion that the same variables are relevant for wage behavior that are relevant for price behavior. An alternative wage equation that leaves open the relative importance of wage-wage and price-wage feedback can be written as follows:

$$(5) \quad (w - \theta)_t = g(L)(w - \theta)_{t-1} + h(L)\pi_{t-1} + b(L)D_t + c(L)z_t + e_t.$$

Equation (5) is identical to equation (4) except for the addition of the lagged price inflation terms. A simple method of estimating the relative importance of lagged wage and price inflation is to transform equation (5) by adding and subtracting $h(L)$ times the lagged trend unit labor cost terms:

$$(6) \quad (w - \theta)_t = [g(L) + h(L)](w - \theta)_{t-1} + h(L)(\pi - w - \theta)_{t-1} \\ + b(L)D_t + c(L)z_t + e_t.$$

The sum of the $g(L)$ and $h(L)$ coefficients can be constrained to sum to unity, which imposes the natural rate hypothesis, while the freely estimated sum of coefficients (Σh) indicates the weight on lagged prices in the determination of trend unit labor cost, while $1 - \Sigma h$ indicates the weight to be applied to wage-wage feedback. A direct analogy to equation (6) can test for feedback from wages to overall inflation:

$$(7) \quad \pi_t = [a(L) + g(L)]\pi_{t-1} + g(L)(w - \theta - \pi)_{t-1} + b(L)D_t \\ + c(L)z_t + e_t.$$

Notice from equation (4) that the second term in equation (7) is the change in labor's share, and the second term in equation (6) is minus the change in labor's share. In this framework, labor's share enters directly into the determination of both price and wage inflation if the sum of the coefficients on the labor's share terms is significant, in which case this variable plays a role analogous to the supply shock term z_t .

7.5.2 Estimation Results

Our main interest in estimating equations for price and wage inflation, using the specifications written down in equations (2), (4), (6), and (7), is to determine what was surprising about price and wage behavior in the leaver countries after 1992. After presenting estimates of the equations

fitted to data for 1963–96, we shall assess the post-1992 “surprise” by two alternative methods, first by entering a zero-one dummy variable for the period 1993:Q1–96:Q4 and second by computing dynamic simulations for 1993–96 based on an alternative version of the equation estimated for 1963–92.

The estimation results are presented in table 7.5 for the leaver aggregate in the top panel and the stayer aggregate in the bottom panel. The rows in order correspond to the specifications written above as equations (2), (7), (4), and (6). The set of lagged inertia terms in column (1) is highly significant in all variants, with sums of coefficients almost exactly equal to the 1.0 implicit in the natural rate hypothesis. The labor’s share change in column (2) is also highly significant (except in the wage equation for the stayer countries), indicating that the inflation rate in both the stayer and leaver countries incorporates a feedback from wage behavior with coefficients of 0.39 and 0.44 respectively. The output gap coefficients are all highly significant for the leaver countries and for the wage equations in the stayer countries, but not in the price equations in the stayer countries. Also, we note that the output gap effect on wages is considerably higher than for prices. The import price coefficients are, not surprisingly, larger and more significant in the price equations for the leaver countries but are not significant in the stayer countries. The oil price coefficients are uniformly insignificant.

Table 7.6 exhibits the two different ways of assessing the post-1992 surprise in price and wage behavior. Column (1) displays the coefficient on a dummy variable defined as zero for 1963–92 and unity for 1993–96. According to the pure price inertia approach (top row), the dummy variable was zero, so inflation in the leaver countries was exactly on track. The positive coefficient of 0.81 in the next row indicates that price inflation was surprisingly high, taking into account the low rate of change in unit labor cost that should have fed back into holding inflation down. The third row, the pure wage inertia equation, indicates that despite its appearance of being low, wage inflation was actually surprisingly high. This unexpected result reflects the large coefficients on the output gap in the wage equations and the fact that the output gap in the leaver countries was quite large, especially in 1992–94. The fourth row indicates that wage inflation was too low, taking account of feedback from price inflation.

For the stayer countries, the dummy variable approach in column (1) indicates that inflation was on track not just in the first row (pure inflation inertia) but also in the second row (wage-price feedback). Both of the wage equations suggest that wage inflation was higher than predicted, a result that (as in the leaver countries) reflects large coefficients on the output gap and the sizable output gap in the stayer countries in 1992–94.

The coefficients in column (2) represent an alternative test of post-1992 surprises. The equations are all reestimated with a sample period ending

Table 7.5

Regressions Explaining Change in GDP Deflator and Unit Labor Cost, 1963:Q1–96:Q4

Equation Number, Dependent Variable, Type of Feedback	Sum of Coefficients: Long-Run Response					S.E.E. (6)
	Lagged Dependent Variable: Lags 1–8 (1)	Change in Labor's Share: Lags 1–4 (2)	Output Gap: Lags 0–4 (3)	Change in Real Import Price: Lags 1–4 (4)	Change in Real Oil Price: Lags 1–4 (5)	
Leavers						
(2) π , π	1.00**	–	0.31**	0.14**	–0.01	1.80
(7) π , π and w	1.01**	0.39**	0.08**	0.14**	–0.01	1.67
(4) w , w	0.98**	–	0.46**	0.10	0.01	2.88
(6) w , w and π	0.99**	–0.71**	0.74**	0.09	0.01	2.74
Stayers						
(2) π , π	0.99**	–	0.15	0.08	–0.00	1.53
(7) π , π and w	0.94**	0.44**	0.00	0.08	–0.01	1.47
(4) w , w	0.97**	–	0.71**	0.11*	0.01	2.99
(6) w , w and π	1.09**	–0.99	0.76*	0.09	0.01	2.95

Source: See data appendix.

Note: Significance values refer to an F -test on the exclusion of the set of lagged variables.

*Significant at the 5 percent level.

**Significant at the 1 percent level.

Table 7.6 Measures of Shifting Behavior after 1992

Equation Number, Dependent Variable, Type of Feedback	Sample to 1996:Q4: Dummy Variable on 1993:Q1-96:Q4 (1)	Sample to 1991:Q2: Postsample Dynamic Simulations	
		Mean Error (2)	Root Mean-Squared Error (3)
Leavers			
(2) π , π	0.09	0.37	0.81
(7) π , π and w	0.81	2.25	2.73
(4) w , w	0.71	4.04	4.30
(6) w , w and π	-0.71	1.39	2.66
Stayers			
(2) π , π	-0.12	-0.01	0.57
(7) π , π and w	0.18	1.21	1.48
(4) w , w	1.02	2.40	3.21
(6) w , w and π	0.42	1.99	2.70

Source: Regression equations as specified in table 7.5.

in 1992:Q2, and the estimated coefficients are used to compute dynamic simulations for 1992:Q3-96:Q4 in which the lagged dependent variable is computed and fed back endogenously rather than assumed to be exogenous. Again, as shown on the first row of each section of table 7.6, the pure inertia version of the inflation equation fits very well, but all the other equations substantially underpredict the price and wage equation that occurred. For the second row, in which wages are allowed to feed back into price inflation, the simulations indicate that inflation was higher than predicted, presumably because the slow rate of wage increase should have held down inflation more than occurred. The wage equations in the third and fourth rows, however, indicate that even though wage inflation seemed low, it was still higher than predicted in view of the substantial output gaps in both the leaver and stayer countries in 1992-94.

We emerge with a rather complex characterization of price and wage behavior after 1992. Given lagged inflation, the output gap, and the acceleration of import price inflation caused by the 1992-93 devaluations, inflation behaved just as would have been expected. But in view of the slow rate of wage growth and the decline in labor's share, inflation "should have" been slower. Wage growth itself looks modest in the leaver countries when compared with the stayers, but according to these equations it should have been even slower in view of the large output gap coefficients estimated from historical data applied to the substantial output gaps that occurred.

7.6 Conclusions

The point of departure for this paper was the conventional wisdom that the countries that had devalued their currencies and departed from the ERM in 1992–93 (the leavers) achieved an enviable combination of more rapid output growth and more rapid decline in unemployment with little if any extra inflation, as contrasted with the stayer countries that had kept their currencies pegged to the deutsche mark. The favorite example of the practitioners of the conventional wisdom is the contrast between the United Kingdom and France. With a standardized unemployment rate roughly the same as in France in 1991, the United Kingdom managed to cut its unemployment rate to half of the French level by mid-1997, presumably in large part due to the policy freedom afforded by the 1992 ERM breakup.

This paper is the first to provide a systematic analysis of the macroeconomic aftermath of 1992. Instead of presenting scattered data on individual countries, it constructs quarterly time series for six leaver and five stayer nations, as well as for Germany, covering the main macroeconomic variables of interest. To focus on the main differences between the leavers and the stayers it aggregates its indexes into leaver aggregates and stayer aggregates, and these reveal numerous surprises that overturn much of the conventional wisdom.

A preliminary to the theoretical analysis is a review of reasons why the real exchange rate can be a policy variable. There are many “slips twixt cup and lip,” between the initial nominal exchange rate devaluation and the ultimate adjustment of the domestic price level, and this accounts for the fact that changes in real exchange rates are highly correlated with changes in nominal exchange rates over a longer time horizon than the five years that have elapsed since the 1992 ERM breakup. The main filters that prevent the nominal exchange rate from altering the domestic price level with unitary elasticity are the partial pass-through of exchange rate changes to import prices and the subsequent partial adjustment of domestic labor costs to changes in import prices.

The paper frames its analysis with a simple exposition of textbook IS-LM and Phillips curve diagrams. These focus the origin of the 1992 crisis on German reunification, which can be interpreted as a shift to easy fiscal and tight monetary policy, raising European interest rates and forcing both the stayers and leavers to accept a reduction in output and an increase in unemployment. The leavers that chose (or were forced) to devalue were pushed in a direction that is quite unambiguous, according to this standard theory. Real demand and output should have accelerated relative to the stayers, due to the stimulus coming from the external sector that should have spilled over to domestic demand. As long as there is any short-run trade-off between output and inflation, some fraction of the

extra nominal demand created by the devaluations should have been dissipated in extra inflation, leaving only a fraction for real growth and a decline in unemployment.

The empirical analysis of the paper begins by reviewing differences between leaver and stayer nations during the five years prior to the 1992 ERM breakup. In contrast to the previous literature, which tends to cite only scattered evidence that individual nations may have developed overvalued currencies during the pre-1992 period, our technique of aggregating the economic indicators for the leavers and the stayers reveals a stark and unambiguous contrast between the economic performance of the two groups. Our leaver-stayer ratios reveal a steady upward creep in the real exchange rate and a continuous excess of inflation, together with more vigorous output booms and excess demand in 1988–90, larger fiscal deficits, and larger current account deficits. This evidence confirms the assertions of those who attribute the 1992 breakup to the fundamentals, since the fundamentals were out of line to a more extreme extent that has heretofore been recognized.

The main analysis of the paper concerns the aftermath of the 1992 breakup. Simply stated, the results of this paper flip the conventional wisdom almost completely on its head. When we compare the actual performance of the leavers to that of the stayers, far from having no extra inflation, the leavers had almost double the inflation rate of the stayers from 1992 to 1996. Exactly 80 percent of the extra nominal GDP growth enjoyed by the leavers was chewed up by extra inflation, leaving only 20 percent to spill over to real GDP. While external demand stimulated the leaver economies, as expected, domestic demand actually grew more slowly than in the stayer economies. The paper attributes slow domestic demand growth in the leaver countries to two factors, the flexibility of real wages, which caused nominal labor costs to rise at a slower rate than domestic inflation, and the quite extraneous and unrelated pressure of the Maastricht criteria, which caused the external demand stimulus to be almost entirely cancelled by a fiscal tightening.

The role of the Maastricht-imposed fiscal convergence needs special emphasis. The coincidence of the 1992 ERM breakdown and the almost simultaneous Maastricht fiscal criteria must ultimately qualify our ability to generalize from the post-1992 experience of the leaver countries. Several of these, particularly Italy, were forced to impose a draconian fiscal tightening at the same time that their exchange rate devaluation provided an external stimulus. In this sense our conclusion that there was virtually no stimulus to real GDP is not a clean reading on the effects of devaluation, but rather on the combined effects of devaluation and fiscal tightening. This paper, then, provides a nice complement to Alesina, Perotti, and Tavares's recent (1998) conclusion that it is possible to achieve fiscal tightening without demand contraction, since some of the countries in Alesina

et al.'s sample were enjoying an external stimulus that offset much of the contractionary effect of the Maastricht tightening.

Much discussion of the 1992 aftermath begins with a contrast between the buoyant economic performance of the United Kingdom and the sluggish performance of France. Yet the United Kingdom was only one of the leavers and in many ways was the least typical. It alone (of the twelve economies studied here) enjoyed a decline in unemployment from 1991 to 1996. It had a greater 1992–96 increase in domestic demand than any of the other leavers and (with Finland) the greatest increase in real GDP over the same period. If we are interested in generalizing about the results of sharp nominal devaluations, surely the experience of all six leavers matters more than the extreme case of the United Kingdom. And here the results were much less scintillating—real domestic demand actually declined over 1992–96 in Italy and Sweden and barely grew in Spain. Far from being nonexistent, extra inflation was almost explosive in Italy, Portugal, and Spain. In fact, if we omit the sick case of the stayers (Switzerland) and the star of the leavers (United Kingdom), there was no excess growth of real GDP in the remaining leavers as contrasted to the remaining stayers.

Contrary to my expectations when beginning this research project, the post-1992 outcome seems to ratify old verities in international macroeconomics more than it validates any new free lunch counterrevolution. Of course, no macroeconomic era provides a clean controlled experiment. There are special stories for each of the leavers. The United Kingdom appears to have an unusually flexible labor market, which yields a high extent of adjustment of the unemployment rate to minor real GDP deviations, not just in the 1994–97 boom but also in the previous 1988–90 boom and subsequent recession. Finland and Sweden are well known to have experienced extreme overexpansions and asset inflations in the late 1980s that had to crash, sooner or later (Dornbusch et al. 1995, 233–37; Andersen 1997; Lindbeck 1997), and this adjustment for Finland was greatly amplified by the evaporation of Finland-USSR trade. Spain and Portugal are both strange economies that obey few of the rules of macroeconomics and labor economics and that contribute many of the outlier relations uncovered in this study.

Data Appendix

Annual Variables. Sources are indicated in notes to individual tables.

Quarterly Variables. Data on particular variables were obtained as follows.

Nominal oil price in dollars, Federal Reserve of St. Louis Economic Data Base (“FRED”).

Real effective exchange rate and bilateral dollar exchange rates (used to create the nominal price of oil in local currency) from International Monetary Fund, *International Financial Statistics* (Washington, D.C., December 1997), CD-ROM. Nominal effective exchange rates come from the same source dated February 1998.

All other variables were obtained from Douglas Laxton of the IMF.

All leaver and stayer aggregates were created using 1991 PPP GDP weights from OECD (1997, A2). Quarterly national accounts variables were missing for the year 1996 for Portugal, Austria, and Belgium. Leaver and stayer aggregates were extended from 1995 to 1996 by ratio-linking in 1995:Q4 the aggregates respectively including and excluding these three countries.

References

- Alberola, Enrique, Juan Ayuso, and J. David López-Salido. 1997. When may peseta depreciations fuel inflation? Banco de España Working Paper no. 9719. Madrid: Banco de España.
- Alesina, Alberto, Roberto Perotti, and José Tavares. 1998. The political economy of fiscal adjustments. *Brookings Papers on Economic Activity* 29 (1): 197–248.
- Andersen, Palle. 1997. Macroeconomic developments in the Nordic countries. In *Monetary policy in the Nordic countries: Experiences since 1992*. Policy Paper no. 2. Basel: Bank for International Settlements.
- Bergin, Paul, and Mathias Moersch. 1997. EMU and outsiders: Fixed versus flexible exchange rates. In *European monetary union: Transition, international impact, and policy options*, ed. Paul J. J. Welfens, 71–130. Berlin: Springer.
- Borenstein, Eduardo, and José De Gregorio. 1998. Devaluations and inflation after currency crises. February. Draft manuscript.
- Branson, William H. 1989. Discussion of “Exchange rate pass-through in the 1980s,” by Peter Hooper and Catherine L. Mann. *Brookings Papers on Economic Activity* 20 (1): 330–33.
- . 1993. Discussion of “The unstable EMS,” by Barry Eichengreen and Charles Wyplosz. *Brookings Papers on Economic Activity* 24 (1): 125–29.
- Dornbusch, Rudiger, Ilan Goldfajn, and Rodrigo O. Valdés. 1995. Currency crises and collapses. *Brookings Papers on Economic Activity* 16 (2): 219–70.
- Eichengreen, Barry, and Chang-Tai Hsieh. 1995. Sterling in decline again: The 1931 and 1992 crises compared. In *European economic integration as a challenge to industry and government*, ed. Richard Tilly and Paul J. J. Welfens, 355–92. Berlin: Springer.
- Eichengreen, Barry, Andrew K. Rose, and Charles Wyplosz. 1995. Exchange market mayhem: The antecedents and aftermath of speculative attacks. *Economic Policy*, no. 21 (October): 251–96.
- Eichengreen, Barry, and Charles Wyplosz. 1993. The unstable EMS. *Brookings Papers on Economic Activity* 24 (1): 51–124.
- Feldstein, Martin. 1997. EMU and international conflict. *Foreign Affairs* 76, no. 6 (November/December): 60–73.
- Frankel, Jeffrey A., and Andrew K. Rose. 1995. A panel project on purchasing

- power parity: Mean reversion within and between countries. CEPR Discussion Paper no. 1128. London: Centre for Economic Policy Research, February.
- Franz, Wolfgang, and Robert J. Gordon. 1993. Wage and price dynamics in Germany and America: Differences and common themes. *European Economic Review* 37 (May): 719–54.
- Gordon, Robert J. 1997. The time-varying NAIRU and its implications for economic policy. *Journal of Economic Perspectives* 11 (February): 11–32.
- . 1998. *Macroeconomics*, 7th ed. Reading, Mass.: Addison-Wesley.
- Hooper, Peter, and Catherine L. Mann. 1989. Exchange rate pass-through in the 1980s: The case of U.S. imports of manufactures. *Brookings Papers on Economic Activity* 20 (1): 297–337.
- Kenen, Peter B. 1995. *Economic and monetary union in Europe: Moving beyond Maastricht*. Cambridge: Cambridge University Press.
- Krugman, Paul R. 1979. A model of balance-of-payments crises. *Journal of Money, Credit, and Banking* 11:311–25.
- . 1996. Are currency crises self-fulfilling? In *NBER macroeconomics annual 1996*, ed. Ben S. Bernanke and Julio J. Rotemberg, 345–78. Cambridge, Mass.: MIT Press.
- Lindbeck, Assar. 1997. The Swedish experiment. *Journal of Economic Literature* 35 (September): 1273–1319.
- McKinnon, Ronald I. 1997. EMU as a device for collective fiscal retrenchment. *American Economic Review Papers and Proceedings* 87, no. 2 (May): 717–25.
- Menon, Jayant. 1995. Exchange rate pass-through. *Journal of Economic Surveys* 9 (2): 197–231.
- Mundell, Robert. 1998. The case for the euro, I. *Wall Street Journal*, 24 March, A22.
- Nickell, Stephen. 1997. Unemployment and labor market rigidities: Europe versus North America. *Journal of Economic Perspectives* 11, no. 3 (summer): 55–74.
- Obstfeld, Maurice. 1995. International currency experience: New lessons and lessons relearned. *Brookings Papers on Economic Activity* 26 (1): 119–96.
- . 1996. Comment on “Are currency crises self-fulfilling?” by Paul Krugman. In *NBER macroeconomics annual 1996*, ed. Ben S. Bernanke and Julio J. Rotemberg, 393–403. Cambridge, Mass.: MIT Press.
- . 1997. Europe’s gamble. *Brookings Papers on Economic Activity* 28 (2): 241–300.
- . 1998. A strategy for launching the euro. *European Economic Review* 42, no. 6 (June): 975–1007.
- OECD (Organization for Economic Cooperation and Development). 1997. *Economic outlook*. Paris: Organization for Economic Cooperation and Development, June.
- Pelagidis, Theodore. 1997. Divergent real economies in Europe. *Economy and Society* 26, no. 4 (November): 546–59.
- Rebelo, Sergio. 1997. What happens when countries peg their exchange rates? (The real side of monetary reforms). NBER Working Paper no. 6168. Cambridge, Mass.: National Bureau of Economic Research, September.
- Rose, Andrew K., and Lars E. O. Svensson. 1994. European exchange rate credibility before the fall. *European Economic Review* 38, no. 6 (June): 1185–1216.
- Svensson, Lars E. O. 1993. Assessing target zone credibility: Mean reversion and devaluation expectations in the ERM, 1979–1992. *European Economic Review* 37, no. 4 (May): 763–93.
- Taylor, Christopher. 1995. *EMU 2000? Prospects for European monetary union*. London: Royal Institute of International Affairs.
- von Hagen, Jürgen, and Barry Eichengreen. 1996. Federalism, fiscal constraints,

and European monetary union. *American Economic Review Papers and Proceedings* 86, no. 2 (May): 134–38.

Wyplosz, Charles. 1997. EMU: Why and how it might happen. *Journal of Economic Perspectives* 11, no. 4 (fall): 3–22.

Comment Paul Krugman

Human beings—even economists—are not natural statisticians. Our views tend to be driven by the most arresting anecdote rather than the best t -statistic. And this creates a bias toward neophilia: man bites dog is more interesting than dog bites man, so when it happens there is a strong temptation to quickly adopt a revisionist theory that says that dogs are more likely to be bitten than to bite.

What Robert Gordon is saying here is that this is more or less what happened in the aftermath of the ERM breakup. In 1992 many Europeans believed that devaluation would be a disappointment, perhaps even a disaster; when it did not lead to massive inflation in the depreciating countries, and when the United Kingdom in particular did rather well in the years following, a number of people were inclined to stand that orthodoxy on its head, to claim not just that the costs of exiting the ERM were less than some had thought but that they were less than anyone had thought. This view, which Gordon calls the conventional wisdom (I guess it depends which convention you attend), is the subject of his paper.

What he finds is that the successes of the “leavers,” of those countries that chose not to do whatever was necessary to stay in the ERM, are not that obvious when you actually look at the numbers. The leavers achieved a bit better unemployment performance than the stayers but did so at the price of somewhat higher inflation. There is no sign of a free lunch, and certainly not the huge bonus some have claimed. All in all, European experience is more or less what you might have expected from textbook macroeconomics—specifically, the Gordon macroeconomics text or my own international text with Obstfeld.

I have a few quibbles about the methodology by which Gordon arrives at this conclusion, but I doubt that they would change the basic picture. So perhaps my main complaint about the paper is the way it portrays the debate.

In Europe, at least, the battle lines in 1992—or for that matter today—were not between IS-LM-Phillips curve modelers, on one side, and “free lunchers,” on the other; they were between ISLMic economists and what

Paul Krugman is professor of economics at Princeton University and a research associate of the National Bureau of Economic Research.

we might call Maastricht monetarists, who believed that currency depreciation would be quickly dissipated in inflation and would actually raise unemployment because of the loss of credibility. I happen to have been in Sweden in the interregnum between the devaluation of sterling and that of the kronor and had the opportunity to meet with the then finance minister. Her view, shared by many other Europeans, was that letting the kronor float would mean a replay of the mid-1980s, a runaway surge in prices followed by a severe slump. As someone who believed in my own textbook, I was way out on the left in the European debate. And from my point of view, the failure of the supposed terrible consequences of depreciation to emerge validates my view. (Yes, I am aware that this is an illustration of the Frankel theory of modern econometrics cited at the beginning of the paper.)

Let me turn briefly to some technical quibbles. I am a bit unhappy with the use of effective exchange rate indexes in this paper. The reason is that the ratio of effective exchange rates need not track the actual bilateral exchange rate between two countries. Consider, for example, an imaginary world in which there are only three countries: Germany, Luxembourg, and the United States, and imagine that each country has an effective exchange rate based on trade shares. Germany will then carry considerable weight in the Luxembourgish index, but Luxembourg will not count much in Germany's. Now suppose that both European currencies depreciate against the dollar, by exactly the same amount. Well, Germany's effective rate—which basically only considers the dollar—will depreciate by more than Luxembourg's, even though their bilateral rate has not changed. I think there is a bit of that sort of illusion going on in Gordon's data, though it probably does not much alter the conclusions.

An even more trivial quibble involves measuring unemployment rates with index numbers. Is an increase in the German rate from 2 to 3 really equivalent to an increase in the Spanish rate from 12 to 18?

A more fundamental issue is that of reversed causation. A determined defender of devaluation might argue that since all European governments were reluctant to devalue and did so only under duress, almost by definition the leavers were economies in trouble—more trouble, on average, than the stayers. So one might have expected the leavers to have had worse performance than the stayers, even if the exchange rate regime were irrelevant. The fact that the leavers actually did about as well or even a bit better than the stayers, then, represents a success! (This Frankel method of econometrics is a wonderful thing if you use it cleverly.)

The answer to that sort of problem is, of course, econometrics—which is what Gordon does, to very good effect, in the later sections of the paper. As Gordon suggests, these results seem “to ratify old verities in international macroeconomics” rather than some new free lunch interpretation.

But in Europe itself, there has been a widespread rejection of precisely those old verities—which would seem to suggest that monetary union is a project of questionable virtue, likely to prove more costly than EMU rhetoric allows. If the old verities remain true, then Europe may have just made a rather serious mistake.

Current Account Reversals and Currency Crises Empirical Regularities

Gian Maria Milesi-Ferretti and Assaf Razin

8.1 Introduction

Three waves of external crises have swept international capital markets during the 1990s: the European Monetary System crisis in 1992–93, the collapse of the Mexican peso with its induced “tequila” effects, and, most recently, the financial crisis in East Asia. In Italy and Mexico, the currency crisis was followed by a sharp reversal in the current account; Italy went from a deficit of 2.4 percent in 1992 to an average surplus of close to 2 percent in 1993–96 and Mexico from a deficit of 7 percent in 1993–94 to virtual balance in 1995–96. A similar outcome has occurred in East Asia after the 1997 baht crisis and its aftermath, as table 8.1 shows.

Are external crises characterized by large nominal devaluations invariably followed by sharp reductions in current account deficits? And what is the impact of crises and reversals in current account imbalances on economic performance? Our paper addresses these questions by characterizing real and nominal aspects of sharp external adjustments in low- and middle-income countries. It presents stylized facts associated with sharp reductions in current account deficits (reversals) and with large

Gian Maria Milesi-Ferretti is senior economist in the Research Department of the International Monetary Fund and a research fellow of the Centre for Economic Policy Research, London. Assaf Razin is professor of economics at Tel Aviv University and Stanford University and a research associate of the National Bureau of Economic Research.

The authors' discussant, Jaume Ventura, and Enrica Detragiache, Pietro Garibaldi, Michael Mussa, Eswar Prasad, conference participants, and IMF seminar participants gave useful comments. The authors are grateful to Andy Rose for sharing his STATA programs, and to Yael Edelman and especially Maria Costa for excellent research assistance. Work for the conference was supported in part by a grant to the NBER from the Center for International Political Economy. The opinions expressed do not necessarily reflect those of the International Monetary Fund.

Table 8.1 Current Account Reversals and Real Depreciation in Asia

	Indonesia	Korea	Malaysia	Philippines	Thailand
Current account reversal ^a	6.8	15.1	19.6	6.8	18.8
Real depreciation ^b	40.5	21.9	18.0	14.1	19.6

Source: International Monetary Fund.

^aDifference in the ratio of current account to GDP between 1998 and the average for 1995–97.

^bReal effective exchange rate depreciation between July 1997–December 1998 and January 1995–June 1997 (period averages).

nominal devaluations (currency crises) and examines what pre-event factors are associated with macroeconomic performance after such events occur.

Recent episodes of external instability have stimulated new theoretical and empirical research on crises, in an attempt to provide a conceptual framework that helps to elucidate these traumatic events and, possibly, to improve policy design so as to minimize the likelihood of their occurrence. In principle, a reversal in capital flows can cause a currency crisis and force a reduction in current account deficits because sources of external financing dry up. However, a reversal can also occur in response to a change in macroeconomic policy designed to forestall the possibility of future speculative attacks or capital flow reversals, or as a consequence of a favorable terms-of-trade shock. Speculative attacks leading to currency crises can follow a collapse in domestic asset markets (as seems to have been the case recently in Asia), accumulation of short-term debt denominated in foreign currency, a persistent real appreciation and deterioration of the current account (as was the case in Mexico), or a political choice to abandon a rigid exchange rate system (as was the case in the United Kingdom in 1992).

How well does theory match the variety of these different experiences? So-called first-generation models of currency crises are built on an inevitable collapse of a fixed exchange rate system, in which the central bank mechanically expands domestic credit, for example, by monetizing a persistent fiscal deficit (e.g., Krugman 1979; Flood and Garber 1984). After a period of gradual reserve losses, a perfectly foreseen speculative attack wipes out the remaining reserves of the central bank and forces the abandonment of the fixed exchange rate. Second-generation models of currency crises endogenize government policy (e.g., Obstfeld 1994). Private agents forecast the government's choice as to whether or not to defend the peg, based on trading off short-term flexibility against long-term credibility. The peg is abandoned either as a result of deteriorating fundamentals, as in first-generation models, or following a speculative attack driven by self-fulfilling expectations. Note that a self-fulfilling attack can (but need not) occur only with "vulnerable" fundamentals.

The latest waves of currency crises referred to above have brought explanations of crises based on multiple equilibria or on contagion effects to the forefront (on the former see, e.g., Eichengreen, Rose, and Wyplosz 1995; Jeanne and Masson 2000; among others; on the latter, Eichengreen et al. 1996; Calvo and Mendoza 1999; Jeanne 1997; Masson 1998).¹ Empirical tests of crisis models use various indicators of fundamentals, such as the ratio of reserves to money, fiscal balance, and the rate of domestic credit creation. The issue is whether (some) fundamentals are steadily deteriorating in the period leading up to a speculative attack or not. However, it is difficult to infer from the data whether the collapse of the peg is a result of deteriorating fundamentals or self-fulfilling prophecies (see, e.g., Eichengreen et al. 1995; Krugman 1996). A growing body of research is devoted to studying the mechanics of crises in developing countries. Edwards (1989), who studied the link between devaluation, the current account, and output behavior, is an important precursor of our work. Kaminsky and Reinhart (1999), Kaminsky, Lizondo, and Reinhart (1998), and Demirgüç-Kunt and Detragiache (1998) focus on leading indicators of balance-of-payments and banking crises; Sachs, Tornell, and Velasco (1996b) explore the spillover effects of the Mexican crisis on other emerging markets; closest to our work, Frankel and Rose (1996) undertake a cross-country study of currency crashes in low- and middle-income countries.

The focus of the literature on the intertemporal aspects of the current account goes back to work by Sachs (1981, 1982) and follows up on our own research on current account sustainability (Milesi-Ferretti and Razin 1996a, 1996b) and on current account reversals (Milesi-Ferretti and Razin 1998). Recent empirical research in the area includes Debelle and Faruquee (1996), who undertake a cross-country study of determinants of the current account, Kraay and Ventura (2000), who argue that debtor and creditor countries respond asymmetrically to income shocks, and Lane and Perotti (1998), who investigate the impact of fiscal policy on the trade balance in OECD countries. A number of authors have instead focused on capital account developments, and in particular on capital flows to emerging markets, underlining the importance of both “push” and “pull” factors in explaining capital flows (see, e.g., Calvo, Leiderman, and Reinhart 1993; Corbo and Hernández 1996; Fernández-Arias 1996; Fernández-Arias and Montiel 1996).

In this paper we put together these related strands of literature and undertake a study of indicators and consequences of current account reversals and currency crises in a large sample of low- and middle-income countries over the period 1970–96. We try to answer four questions: First, what

1. Contagion effects, broadly defined, can (but need not) have “fundamental” origins; e.g., a large depreciation in a country can imply a loss of competitiveness and a decline in external demand for a neighboring country. Eichengreen et al. (1996) try empirically to distinguish between different types of contagion.

triggers large and persistent reductions in current account deficits? Second, what triggers sharp exchange rate depreciations (currency crises)? Third, what are the consequences of these events for output and consumption? Fourth, is there a link between current account reversals and currency crises? Although our study does not focus directly on reversals in capital flows, it uses data on size and composition of external liabilities in its characterization of external crises, and it includes “push” factors, such as interest rates and economic growth in industrial countries, among factors systematically associated with current account reversals and currency depreciation. Our findings concerning indicators of reversals and crises are in line with what is suggested by theoretical models, with both domestic factors (such as the level of reserves) and external factors (such as the terms of trade and world interest rates) playing a role in triggering reversals and crises. We also find that output performance before and after a currency crisis exhibits much more “continuity” than before and after a current account reversal, and that the majority of reversals are not preceded or accompanied by a currency crisis.

In undertaking this empirical exercise, we attempt to characterize a broad set of stylized facts associated with reversals and crises. However, caution must be exercised in interpreting these regularities as a reliable predictive model. The burgeoning analytical literature on financial crises has highlighted several mechanisms that can generate such an outcome: inconsistency between deteriorating fundamentals and the maintenance of a fixed exchange rate (Krugman 1979), self-fulfilling crises à la Obstfeld (1994), and models of crises based on bank runs à la Diamond and Dybvig (1983) (Goldfajn and Valdés 1997; Chang and Velasco 1998). Although these mechanisms generating crises are different, the models point to an overlapping set of indicators (e.g., the level of reserves, the rate of growth in domestic credit, world interest rates, etc.). Hence empirical exercises relating the probability of a crisis to a large set of indicators cannot discriminate between different explanations for crises. Failure to identify the (potentially different) mechanisms underlying crises limits the usefulness of these exercises as predictive tools because the reduced-form relation between crisis events and indicators averages the particular pattern of crises prevailing in the sample, which may not be repeated in the future (as in the standard Lucas critique). In addition, policy inference is hindered by the fact that the crisis-generating mechanisms, which we cannot disentangle, can have different policy implications (e.g., tight monetary policy is called for in a standard Krugman-type crisis, while a more flexible monetary policy is called for in the event of bank runs).

8.2 Theoretical Determinants of Reversals and Currency Crises

We can cast the analysis of sharp reversals in the current account in terms of the standard transfer problem, which is illustrated following

Krugman (1999). Consider a small open economy producing goods that are imperfect substitutes for traded goods produced abroad. Assume that the world marginal propensity to spend on the country's product (set to zero for simplicity) is smaller than the country's marginal propensity to spend on domestic goods, $1 - \mu$. World demand for domestic exports is fixed at X . A share μ of both consumption and investment demand (C and I) falls on foreign goods. Market clearing for gross domestic product Y implies

$$Y \equiv (1 - \mu)I + (1 - \mu)C + pX = (1 - \mu)I + (1 - \mu)(1 - s)Y + pX,$$

where s is the marginal propensity to save and p is the relative price of foreign goods in terms of domestic goods (a measure of the real exchange rate). For given Y and X it is possible to solve for p as a function of investment:

$$p = \frac{1}{X}([1 - (1 - \mu)(1 - s)]Y - (1 - \mu)I).$$

Suppose that investment financing depends on external capital flows. A reversal in capital flows will cause a decline in investment and, for given output, a real depreciation. In terms of the transfer problem, the assumption that domestic residents have a higher marginal propensity to spend on domestic goods than do foreign residents implies that a transfer of resources from the home to the foreign country will increase world demand for foreign goods and decrease demand for domestic goods, thus implying the need for a real depreciation. To the extent that domestic output falls, this will mitigate the need for a real depreciation because of the induced fall in supply of domestic goods.

The first theoretical framework in which to describe currency crises was provided by Krugman (1979) and Flood and Garber (1984). In this framework, the source of the crisis is an inconsistency between the exchange rate peg and the rate of domestic credit expansion that leads to a gradual depletion of foreign exchange reserves, culminating in a speculative attack in which the remaining reserves are wiped out instantly. The attack takes place once the "shadow exchange rate," e^s , defined as the implicit floating exchange rate that would prevail once reserves are exhausted, equals the pegged rate, e . In the simple monetary model on which this analysis is based, a measure of the vulnerability to speculative attacks is usefully given by

$$\frac{e^s}{e} = \frac{1 - \mu(eR/M2)}{1 - \eta\pi},$$

where μ is the base money multiplier, $M2$ is broad money, R is the level of foreign exchange reserves, η is the interest semielasticity of the demand for money, and π is the rate of credit expansion. In this context, Calvo

(1997) emphasizes the importance of the ratio $eR/M2$ and of the ratio of reserves to short-term debt as measures of the adequacy of international reserves. This class of models does not yield clear predictions with regard to the link between exchange rate crises and the behavior of the trade balance. However, if the model is amended to allow for capital controls (as in Wyplosz 1986) reserve depletion can take place through the current account as well, with trade deficits eventually leading to an exhaustion of reserves and a collapse of the peg.

Chang and Velasco (1998) provide a link between the literature on bank runs and the literature on international financial crises. A reduction in the availability of international liquidity can exacerbate the illiquidity of domestic banks, leading to a collapse in the banking system. This would cause an output decline and a collapse in asset prices. Under a fixed exchange rate, a run on the banks becomes a run on the currency if the central bank attempts to act as a lender of last resort. For example, Korea's banks had sizable short-term foreign currency liabilities and matching long-term foreign currency assets. At the beginning of the crisis foreign banks refused to roll over their short-term foreign currency assets vis-à-vis offshore and onshore Korean banks. The attempts by the central bank to shore up the foreign liquidity position of banks simply led to the rapid loss of foreign currency reserves and the collapse of the currency.

Insofar as current account reversals occur in periods of economic distress, with liquidity constraints due to a reversal in capital flows, we would expect a link between reversals and large currency depreciations. However, this may not be the case when reversals are induced by other factors, such as favorable terms-of-trade developments. The empirical work of the next three sections characterizes empirical regularities associated with both current account reversals and currency crashes, attempts to shed light on what indicators provide a signal of the likelihood of these events occurring, and looks at whether reversals and currency crises are related.

8.3 The Data

Our data set consists of 105 low- and middle-income countries (48 African countries, 26 Asian countries, 26 countries from Latin America and the Caribbean, and 5 European countries). A complete list of countries is given in appendix A. In the empirical analysis we also make use of a reduced sample, comprising 39 middle-income countries with population above one million.² These countries are indicated with an asterisk in appendix A. The main source of data is the World Bank (*World Tables and*

2. These countries had income per capita (Summers and Heston definition) above \$1,500 and population above one million in 1985, as well as an average current account deficit during the sample period below 10 percent of GDP.

World Development Indicators and *Global Development Finance*); appendix B describes data sources and definitions. In addition to standard macroeconomic and external variables, the data set includes a number of financial sector variables and variables reflecting the composition of external liabilities, whose role in determining the likelihood of external crises has been emphasized in the recent literature (see, e.g., Calvo 1997). The data belong to different categories:

Macroeconomic variables such as economic growth, real consumption growth, rate of investment, fiscal balance, and level of GDP per capita

External variables such as the current account balance (exclusive and inclusive of official transfers), real effective exchange rate, degree of real exchange rate overvaluation,³ degree of openness to trade, and level of external official transfers as a fraction of GDP

Debt variables such as the ratio of external debt to output; interest burden of debt as a fraction of GNP; shares of concessional debt, short-term debt; public debt, and multilateral debt in total debt; and ratio of FDI flows to debt outstanding

Financial variables such as the ratio of M2 to GDP, credit growth rate, and ratio of private credit to GDP

Foreign variables such as the real interest rate in the United States (as a proxy for world interest rates), rate of growth in OECD countries, and terms of trade⁴

Dummy variables such as regional dummies, a dummy for the exchange rate regime that takes the value one if the country's exchange rate is pegged and zero otherwise, and a dummy that takes the value one if the country has an International Monetary Fund (IMF) program in place for at least six months during the year

8.4 Indicators of Current Account Reversals

In the definition of reversal events we want to capture large and persistent improvements in the current account balance that go beyond short-run current account fluctuations as a result of consumption smoothing. The underlying idea is that "large" events provide more information on determinants of reductions in current account deficits than short-run fluctuations. These events have to satisfy three requirements:

3. For the CPI-based real effective exchange rate (period average = 100), an increase represents a real *appreciation*. The degree of real overvaluation, calculated using a bilateral rate vis-à-vis the U.S. dollar, is for every country the percentage deviation from the country's sample average, as in Frankel and Rose (1996). Goldfajn and Valdés (1999) study the dynamics of real exchange rate appreciations and the probability of their "unwinding."

4. For the terms-of-trade index, we take for each country the average value over the sample to equal 100. An increase in the index represents an improvement in the terms of trade.

1. Average reduction in the current account deficit must be at least 3 (5) percentage points of GDP over a period of three years with respect to the three years before the event.

2. The maximum deficit after the reversal must be no larger than the minimum deficit in the three years preceding the reversal.

3. The average current account deficit must be reduced by at least one-third.

The first and second requirements should ensure that we capture only reductions of sustained current account deficits, rather than sharp but temporary reversals. The third requirement is necessary to avoid counting as a reversal a reduction in the current account deficit from, say, 15 to 12 percent.

Since we define events based on three-year averages, the actual sample period during which we can measure reversal events is 1973–94. According to our definition, reversals can occur in consecutive years; in this case, however, they are not independent events. In the empirical analysis that follows we therefore exclude reversals occurring within two years of a previous reversal. Table 8.2 summarizes the number of events according to different definitions.

The first notable feature is that reversal events are by no means rare. For example, for a 3 percent average reduction in the current account deficit (excluding official current transfers), we find 152 episodes in 69 countries; for a 5 percent reduction, 117 episodes in 59 countries. If we exclude reversals occurring within two years of a previous reversal, the total is 100 episodes (77 for a 5 percent reduction). The geographical distribution of reversals is relatively uniform across continents, once we adjust for the number of countries in the sample. An analysis of the time distribution shows, not surprisingly, that a significant share of total reversals occurred in the period immediately following the debt crisis, as well as in the late 1980s. The number of reversals during the 1970s is instead fairly low.⁵ The size of the reversals is also noteworthy. For 3 percent events (excluding transfers), the median reversal (which is smaller than the average) is 7.4 percentage points of GDP, from a deficit of 10.3 percent to a deficit of 2.9 percent. Malaysia, for example, had an average current account deficit of over 11 percent in 1981–83, but only of 2.5 percent in 1984–86.

These numbers confirm that reversal episodes are associated with major changes in a country's external position. What are their implications for the path of other macroeconomic and financial variables? In order to address this question, we follow a methodology developed in Eichengreen et

5. In this respect, note that several oil-producing countries in the Middle East (such as Iraq, Saudi Arabia, Kuwait, United Arab Emirates, and Bahrain) are excluded from the sample.

Table 8.2 **Current Account Reversals**

A. Geographical Distribution					
Size of Reversal ^a	Total	Africa (48 countries)	Asia (26 countries)	Europe (5 countries)	Latin America and Caribbean (26 countries)
3% (no transfers)	152	67	48	4	33
3%, window (no transfers)	100	43	29	3	25
5% (no transfers)	117	55	38	2	22
5%, window (no transfers)	77	35	22	1	19
3%	167	76	48	4	39
3%, window	107	47	30	3	27

B. Time Distribution					
Size of Reversal ^a	Before 1978	1978–81	1982–85	1986–89	1990–94
3% (no transfers)	7	17	66	41	21
3%, window (no transfers)	7	14	41	23	15
5% (no transfers)	4	13	54	35	12
5%, window (no transfers)	4	10	34	21	8
3%	7	20	67	49	24
3%, window	7	17	39	29	15

^aReversal of 3 (5)% is a reduction in the current account deficit by at least 3 (5) percent over three years with respect to the preceding three years. “No transfers” excludes official transfers from the current account. “Window” excludes crises occurring within three years of another crisis.

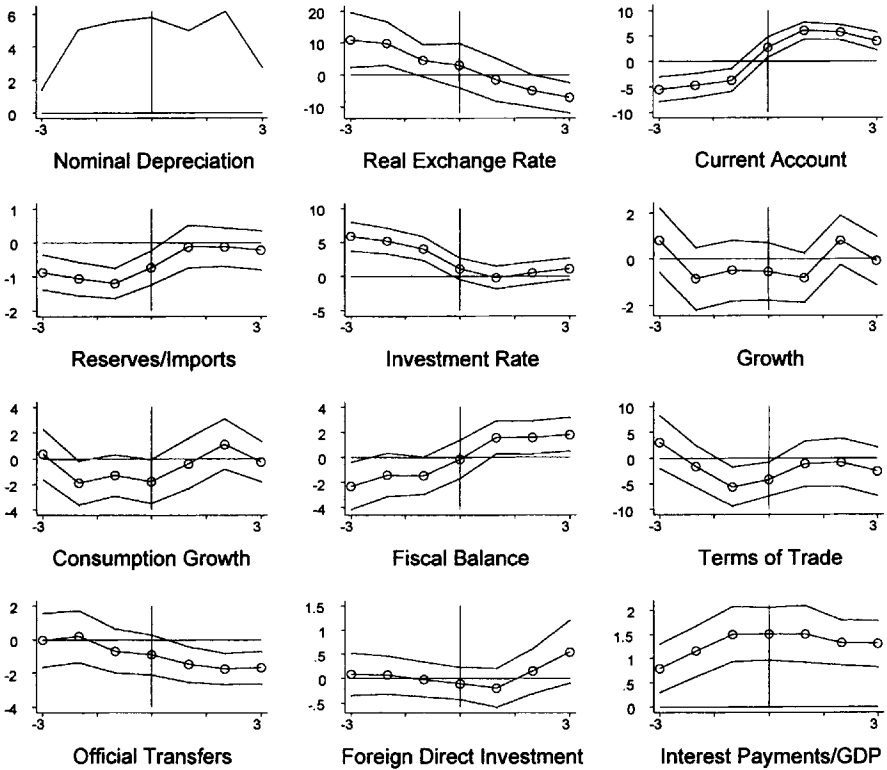


Fig. 8.1 Current account reversals: whole sample

Note: Data for 100 reversals from 105 countries, 1970–96. A reversal is defined as an average improvement in the current account (net of official transfers) of at least 3 percent over a period of three years with respect to the previous three years. “Turbulent” periods are those within three years of a current account reversal, and “tranquil” periods are those that are not within three years of a reversal. For each variable, the plots depict the difference between the variable mean during turbulent periods and its mean during periods of tranquility, as well as the 2-standard-deviation band. The upper left-hand panel depicts instead the difference between the medians during the two periods. Scales and data vary by panel.

al. (1995). The basic idea of this event-study methodology is to distinguish between periods of “turbulence”—here those within three years of a reversal event—and the remaining, “tranquil” periods. Graphs allow a comparison of variables during turbulent periods with their (average) values during tranquil periods.

Figures 8.1 and 8.2 depict the behavior of a set of variables during periods of turbulence (around the time of reversals) for the whole sample and for the reduced sample comprising thirty-nine middle-income countries, respectively. Each panel shows deviations of these variables from their means during periods of tranquility, except for the upper left-hand panel,

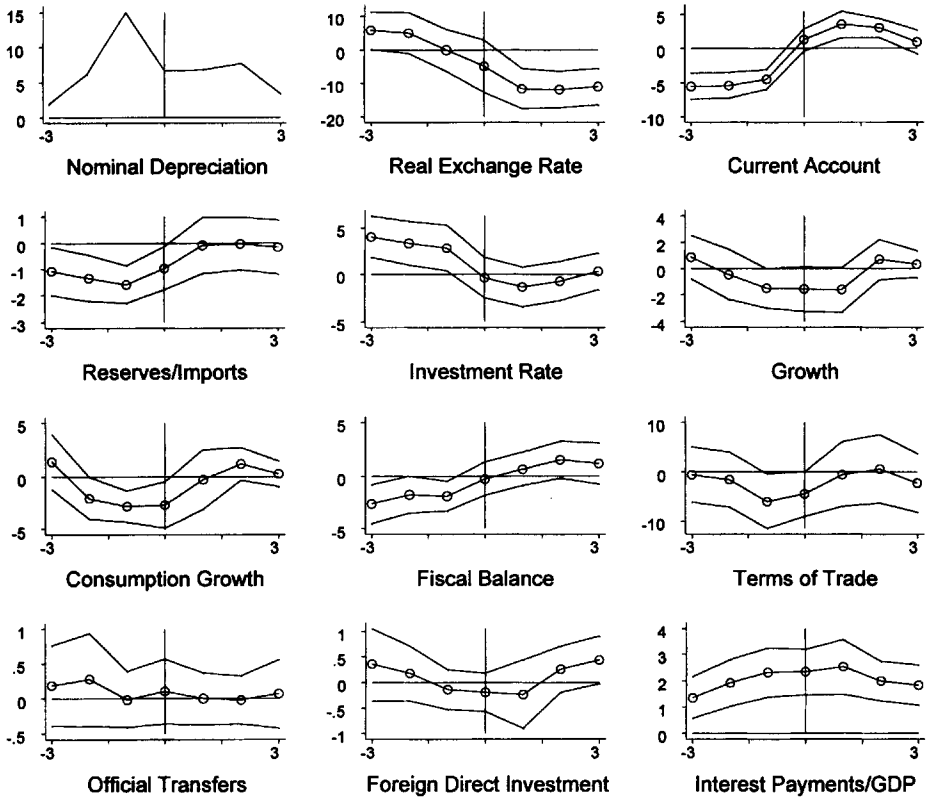


Fig. 8.2 Current account reversals: middle-income sample
 Note: Data for 47 reversals from 39 countries, 1970–96. See fig. 8.1 note.

which plots the *median* rate of depreciation in turbulent periods, as a deviation from the sample median in tranquil periods. The plotted values for the remaining panels refer to reversal events and are the means (plus or minus 2 standard deviations) of the variable during each year of the reversal episode (from $t - 3$ to $t + 3$) as a deviation from the sample mean of the variable during tranquil periods. Hence a positive value for a variable indicates that it tends to be higher in turbulent than in tranquil periods.⁶

The figures show that the real exchange rate starts out more appreciated than average before reversal periods and then depreciates throughout the

6. One potential problem with this methodology is that the time distribution of reversal episodes is concentrated in the 1980s, and therefore the characteristics of the reversal events we identify are in part influenced by the characteristics of the 1980s with respect to the 1970s and the 1990s. However, the graphs restricted to the 1980s show the same overall pattern as fig. 8.1.

period. This comovement between the real exchange rate and the current account is clearly in line with the standard analysis of the transfer problem. The panel depicting the behavior of the nominal exchange rate shows indeed an acceleration in the median rate of currency depreciation that occurs a couple of years before reversals. Reversals tend also to be preceded by unfavorable terms of trade, low foreign exchange reserves, a high interest burden of external debt, low consumption growth, and a high but declining fiscal deficit. After a reversal occurs, reserves tend to rise, and the fiscal balance continues to improve, and the real exchange rate to depreciate. Note also that no clear pattern for output growth characterizes the period preceding or following a reversal. This finding runs counter to the conventional wisdom that sharp reductions in current account deficits reflect an external crisis and that they are achieved by protracted domestic output compression so as to reduce import demand.

We then use multivariate probit analysis to examine whether a set of explanatory variables helps to predict whether a country is going to experience a reversal in current account imbalances. More specifically, we estimate the probability of a reversal occurring at time t (meaning a 3 percent average decline in the current account deficit between t and $t + 2$ with respect to the period between $t - 1$ and $t - 3$) as a function of variables at $t - 1$ and of contemporaneous exogenous variables (terms of trade, industrial country growth, and world interest rates). The choice of the set of explanatory variables is motivated by existing research on currency and banking crises, as well as by our previous work comparing episodes of persistent current account deficits, which identified a number of potential indicators of sustainability. Among them we include the current account deficit (CA), economic growth (GROW), investment rate (INV), GDP per capita (GDP), real effective exchange rate (RER), openness to trade (OPEN), foreign exchange reserves as a fraction of imports (RES), external official transfers as a fraction of GDP (OT), ratio of external debt to GDP (DEBTY), share of concessional debt in total debt (CONRAT), share of public debt in total debt (PUBRAT), and ratio of credit to GDP (CRED—a proxy for financial development). Other variables, such as the ratio of FDI flows to GDP (FDI) and the share of short-term debt in total debt (SHORT) were excluded from the probit because they turned out to be economically and statistically insignificant. We excluded the fiscal deficit because of problems with data availability—it did not enter significantly in the probit analysis, and it reduced sample size considerably. Note that the definition of the event is based on changes in the current account balance, and we therefore believe it is important to control for the level of the current account balance prior to the reversal.

Among the “exogenous” variables we include the lagged and contemporaneous real interest rate in the United States (RINT—as a proxy for world interest rates), lagged and contemporaneous rate of growth in

OECD countries (GROECD), lagged level of the terms of trade (TT), and change in the terms of trade in the reversal period ($\Delta TT(t + 1)$). We also use the dummy for the exchange rate regime (PEG) and the dummy for an IMF program (IMF).⁷ For some of the lagged explanatory variables, namely, the current account, the rate of growth, and the investment share, we use a three-year average (over the period $t - 1$ to $t - 3$) rather than their level at $t - 1$, to ensure consistency in the way we measure reversals.

It is clearly incorrect to interpret this probit analysis in a “structural” way, given that many of the explanatory variables are endogenous. Nevertheless, the analysis can provide a useful multivariate statistical characterization of reversal events as well as identify potential “leading indicators.” Probit results are presented in table 8.3.

Overall, the empirical analysis identifies a number of robust predictors of reversals in current account imbalances, regardless of the sample definition:

Current account deficit. Not surprisingly, reversals are more likely in countries with large current account deficits. This result is consistent with solvency and willingness-to-lend considerations.

Foreign exchange reserves. Countries with lower reserves (expressed in months of imports) are more likely to experience reversals. Clearly, low reserves make it difficult to sustain large external deficits and may reduce the willingness to lend of foreign investors. The ratio of reserves to M2, indicated by Calvo (1997) and others as a key predictor of balance-of-payments crises, also appears to signal reversals ahead of time in our sample.

GDP per capita. Countries with higher GDP per capita are more likely to experience reversals. The coefficient on this variable captures the difficulty extremely poor countries have reversing external imbalances. The positive coefficient is also consistent with the theory of stages in the balance of payments: as a country gets richer, a reduction in deficits (or a shift to surpluses) is more likely.

Terms of trade. Reversals seem more likely in countries with worsened terms of trade. One interpretation of this finding is that countries that have suffered terms-of-trade deterioration are more likely to experience reversals of capital flows and may therefore be forced to adjust. The evidence is also in line with what is suggested by Kraay and Ventura (2000), since the countries in our sample are almost entirely net debtors, and by Tornell and Lane (1998), who argue that the “common pool problem” may be exacerbated by favorable terms-of-trade shocks, thus leading to a more than proportional increase in absorption.

7. Santaella (1996) and Knight and Santaella (1997) study the determinants of IMF programs and characterize the stylized facts that precede them.

Table 8.3

Indicators of Reversals

Variable	With Adjacent Events: Full Sample (1)	No Adjacent Events		
		Full Sample (2)	Average CA > -10% (3)	Middle-Income Countries (4)
Average CA	-0.60** (0.11)	-0.44** (0.10)	-0.63** (0.20)	-0.62** (0.21)
Average GROW	-0.05 (0.13)	-5.7E-3 (0.10)	0.070 (0.11)	-0.10 (0.15)
Average INV	0.145* (0.082)	0.075 (0.063)	0.12** (0.068)	0.19** (0.095)
GDP	1.2E-3** (4.6E-4)	7.8E-4** (4.1E-4)	6.5E-4** (3.6E-4)	1.2E-3** (5.3E-4)
OPEN	-0.028 (0.019)	-0.013 (0.014)	-0.013 (0.015)	-0.017 (0.020)
RES	-0.81** (0.24)	-0.60** (0.21)	-0.45** (0.17)	-0.50** (0.22)
RER	0.007 (0.012)	7.4E-3 (0.012)	0.016** (0.009)	7.0E-3 (0.016)
OT	-0.64** (0.20)	-0.49** (0.17)	-0.44* (0.29)	
DEBTY	-0.019** (0.009)	-0.024** (0.009)	0.012 (0.009)	0.029* (0.017)
PUBRAT	0.050 (0.035)	0.036 (0.025)	0.045** (0.022)	

CONRAT	-0.091** (0.032)	-0.076** (0.026)	-0.074** (0.030)	
CRED	0.018 (0.029)	0.029 (0.023)	0.024 (0.021)	0.061** (0.031)
TT	-0.074** (0.026)	-0.054** (0.021)	-0.044** (0.020)	-0.042** (0.025)
$\Delta TT(t + 1)$	4.4E-3 (2.8E-3)	1.8E-3 (0.019)		
RINT	0.83** (0.32)	2.72* (1.60)	0.12 (0.16)	0.24 (0.22)
GROECD	-0.37 (0.33)	-0.20 (0.24)	-0.18 (0.22)	-0.49* (0.37)
GROECD($t + 1$)	1.28** (0.41)	0.58** (0.28)		
PEG	-2.22* (1.32)	-1.77* (1.13)	-1.62** (1.02)	-2.03** (1.36)
IMF	1.52 (1.09)	1.38* (0.91)	0.37 (0.72)	-0.12 (1.14)
Pseudo R^2	0.22	0.26	0.36	0.36
N	1,301	1,044	762	489

Note: Dependent variable takes the value one if a reversal of at least 3 percent takes place at time $t + 1$, and zero otherwise. Estimation by probit. The table reports probit slope derivatives (and associated z -statistics in parentheses) multiplied by 100. Standard errors are corrected using the Huber/White sandwich estimator of variance. The variables CA, GROW, and INV are averages over the three years preceding the event. The variables OPEN, CONRAT, PUBRAT, OT, RER, TT, GDP, RINT, and GROECD are levels. The first three probits include continent dummies (coefficients not reported). Omitted variables in models (3) and (4) were excluded based on a joint F -test.

*Statistically significant at the 90 percent level.

**Statistically significant at the 95 percent level.

We also find some evidence that reversals are more likely in countries with high *investment*. Insofar as high investment contributes to export capacity, it can lead to a narrowing of external imbalances. Reversals also appear less likely in countries that peg their exchange rates. If a peg precludes an adjustment in the nominal (and real) exchange rate, it can hamper the reduction of external imbalances.

When we consider the full sample, which includes a large number of very poor countries, we find the following additional indicators:

Concessional debt. The higher the share of concessional debt in total debt, the less likely a current account reversal. Concessional debt flows are less likely to be reversed, and they are likely to be higher in those countries that have more difficulties reducing their external imbalances and servicing their external obligations. The statistical significance of the share of concessional debt vanishes once we exclude the poorest countries from our sample, and therefore the variable was excluded from the last probit model (table 8.3, col. [4]).

Official international transfers. A current account reversal is less likely when official transfers are high. Clearly, higher official transfers reduce the need to adjust the current account (we are measuring the current account net of such transfers).

OECD growth. Reversals in developing countries are more likely to occur in years when the growth rate in industrial countries is high. High growth increases the demand for exports from developing countries, helping to narrow current account deficits.

U.S. interest rates. Reversals are more likely after a period of high real interest rates in industrial countries. High real interest rates increase the cost of borrowing for developing countries and reduce the incentive for capital to flow to developing countries.

Note that the coefficient on the level of external debt has the wrong sign in the first two probit models, reflecting the fact that several poor countries are highly indebted but have persistently high current account deficits, without reversals. Indeed, when these countries are eliminated from the sample the coefficient on external debt changes sign (see cols. [3] and [4]). Reversals do not appear to be systematically correlated with GDP growth before the event; we also do not find significant links between the level or rate of change of the real exchange rate (or degree of overvaluation) before the event and current account reversals (see, however, section 8.5). This finding is, of course, conditional on a given initial current account deficit (see also figs. 8.1 and 8.2).

Table 8.4 shows the goodness of fit of the probit model, under the assumption that a crisis is correctly predicted if the estimated probability is above 0.5. Note that the fit improves considerably when we eliminate very poor countries. This is not surprising—indeed, one can think that the

Table 8.4 Goodness of Fit: Reversal Models

Actual	Predicted		
	0	1	Total
	Model (1)		
0	1,186	7	1,193
1	101	7	108
Total	1,287	14	1,301
	Model (2)		
0	972	4	976
1	60	8	68
Total	1,032	12	1,044
	Model (3)		
0	695	6	701
1	44	17	61
Total	739	23	762
	Model (4)		
0	444	4	448
1	28	13	41
Total	472	17	489

determinants of swings in the current account can differ substantially between countries that rely exclusively on official transfers, mostly on concessional terms, and those that have more access to international capital markets.

The results presented so far have to be interpreted taking into account the fact that the empirical analysis aggregates reversal events that have quite different features; it includes such full-fledged balance-of-payments crises as, say, Mexico 1982 and improvements in the current account spurred by favorable terms-of-trade developments or timely corrections in macroeconomic policy. A better understanding of the dynamics of current account reversals and of the role of economic policy will require a classification of these events based on their salient features (terms-of-trade shocks, swings in capital flows, etc.). This would provide an opportunity for a closer match between intertemporal models of current account determination and developing country data.

8.5 Current Account Reversals and Output Performance

This section examines the behavior of output growth in countries that experienced sharp reductions in current account imbalances. We focus on two issues: first, whether reversals are costly in terms of output and, second, what factors determine a country's rate of growth during a reversal period. Output costs clearly arise when reversals are associated with macroeconomic crises and more generally can be due to macroeconomic ad-

justment and sectoral reallocation of resources. For the purpose of this “before and after” analysis we selected the 3 percent event definition and we eliminated adjacent events.⁸ This identifies 100 reversal episodes for the definition excluding official transfers.

The first interesting finding is that the median change in output growth between the period after and that before the event is around zero, suggesting that reversals in current account deficits are not necessarily associated with domestic output compression. However, output performance is very heterogeneous. For example, Uruguay’s average growth was –7 percent in the period 1982–84, compared to 4 percent in the period 1979–81; Malaysia went instead from growth of 2.4 percent in 1984–86 to growth of close to 8 percent over the following three years.

Our dependent variable in the regression analysis is the average rate of output growth during the three years of the reversal period, as a deviation from the OECD average during the same period. We take the deviation of growth from the OECD average because reversal events occur in different years, and we want to (roughly) correct each country’s performance for the overall behavior of the world economy during that period. Our explanatory variables include average growth (also as a deviation from the OECD average), average investment, average current account balance, GDP per capita (a “conditional convergence” term), ratio of external debt to GDP (DEBTY), overvaluation of the real exchange rate, official transfers, and U.S. real interest rates. They are all dated prior to the reversal.⁹ Results are presented in table 8.5.

The table shows that countries more open to trade and with less appreciated levels of the exchange rate before the event are likely to grow faster after the event. The size of the point estimates indicates that the effects of these variables are also economically significant: for example, a country that has an overvaluation of 10 percent before the reversal is likely to grow 0.7 percent slower for the following three years. We also find some evidence that countries with high external debt and those that receive high official transfers tend to grow more slowly. The latter finding could of course simply reflect the fact that poor countries that grow slowly tend to receive large transfers. Indeed, when we exclude countries with low per capita income, the coefficient on official transfers changes sign and becomes statistically insignificant (regression not reported). Note also that the correlation between growth before and after the event is low and statistically insignificant, with the exception of the regression for the group of middle-income countries.

Overall, the empirical analysis seems to provide a reasonable character-

8. In Milesi-Ferretti and Razin (1998) we grouped events occurring in adjacent years for the same country, counting them as a single, longer lasting reversal.

9. All averages are calculated over the three-year period preceding the reversal. The percentage change in the terms of trade between the two periods was statistically insignificant and was excluded from the regression so as to increase sample size.

Table 8.5 Consequences of Reversals

Variable	Full Sample	Regional Dummies		
		Full Sample	Average CA > -10%	Middle-Income Countries
Lagged dependent variable	0.10 (0.11)	0.10 (0.11)	0.10 (0.10)	0.32** (0.12)
CA	-0.10 (0.08)	-0.14* (0.07)	-0.13 (0.08)	-0.07 (0.09)
OVERVA	-0.076** (0.017)	-0.078** (0.016)	-0.069** (0.018)	-0.070** (0.023)
OPEN	0.030** (0.011)	0.021* (0.011)	0.026** (0.013)	0.031* (0.016)
DEBTY	-0.018** (0.07)	-0.016** (0.079)	-0.018 (0.011)	-0.025** (0.009)
RINT	-0.23 (0.17)	-0.29* (0.16)	-0.20 (0.17)	-0.42 (0.18)
OT	-0.29** (0.11)	-0.31** (0.10)	-0.55 (0.35)	
GDP	-3.1E-4 (2.4E-4)	-1.4E-4 (2.6E-4)	-3.0E-4 (2.9E-4)	-1.6E-4 (-2.8E-4)
INV	0.058 (0.044)	0.067 (0.048)	-0.067 (0.044)	-0.037 (0.067)
R ²	0.35	0.40	0.44	0.58
N	84	84	66	44

Note: Dependent variable is output growth during reversal period, a three-year average, expressed as deviation from the OECD average during the same period. Estimation by OLS with White's correction for heteroskedasticity. Numbers in parentheses are standard errors. The explanatory variables CA and INV are averages over the three years preceding the event; the variables OPEN, GDP, RER, TT, OT, and DEBTY are levels the year before the event.

*Statistically significant at the 90 percent level.

**Statistically significant at the 95 percent level.

ization of short- or medium-run output performance during periods of substantial reduction in external imbalances. A noteworthy finding is that reversal events seem to entail substantial changes in macroeconomic performance between the period before and the period after the crisis but are not systematically associated with a growth slowdown.

8.6 Predictors of Currency Crashes

In this section we extend and refine work by Frankel and Rose (1996), by considering a longer sample and alternative definitions of currency crises. We use four definitions of currency crises; the first (CRISIS1), used by Frankel and Rose (1996), requires an exchange rate depreciation vis-à-vis the dollar of 25 percent, which is at least 10 percent higher than the depreciation the previous year. The main problem with this definition is that it considers as a crisis an episode in which the rate of depreciation

increases from, say, 50 to 61 percent. To avoid capturing the large exchange rate fluctuations associated with high-inflation episodes, the second definition (CRISIS2) requires, in addition to a 25 percent depreciation, at least a doubling in the rate of depreciation with respect to the previous year *and* a rate of depreciation the previous year below 40 percent. The third and fourth definitions (CRISIS3 and CRISIS4) focus on those episodes in which the exchange rate was relatively stable the previous year and that therefore may be closer to the concept of currency crisis implicit in theoretical models. CRISIS3 requires a 15 percent minimum rate of depreciation, a minimum 10 percent increase in the rate of depreciation with respect to the previous year, and a rate of depreciation the previous year of below 10 percent. Finally, CRISIS4 is analogous to CRISIS3 with the additional requirement that the exchange rate be pegged the year before the crisis.

We do not consider as a crisis any event that occurs within three years of another crisis; we therefore construct a “window” around each crisis event that is distinguished from periods of tranquility. This reduces the total number of crises; table 8.6 summarizes the currency crisis episodes according to the different definitions.

There is clearly a large degree of overlap between these definitions of crises. Practically all episodes in CRISIS2 (138 of them) are also episodes of CRISIS1.¹⁰ The overlap between CRISIS3 and CRISIS1 (or CRISIS2) is smaller (109 cases) but still significant. Note also that the number of “crashes” depends crucially on whether one counts *countries* that experienced a crash or *currencies* that crashed. The six members of the Central African Economic and Monetary Union (Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, and Gabon), the seven members of the West African Economic and Monetary Union (Benin, Burkina Faso, Côte d’Ivoire, Mali, Niger, Senegal, and Togo) plus the republic of the Comoros share the same currency (the CFA franc), which was set at a fixed rate vis-à-vis the French franc until 1994 and then devalued by 50 percent.¹¹ Our definition of crisis therefore captures fourteen country episodes that year, and also in 1981 (because of the depreciation of the French franc vis-à-vis the dollar).

The geographical distribution of currency crashes shows that African and Latin American countries tend to experience more crashes than Asian countries (adjusting by the number of countries in the sample). Recall, however, that the recent Asian currency crashes are not in the sample. The time distribution of currency crashes is more uniform than the distribution of reversals, with the highest number of crashes in the early 1980s (the period of the debt crisis) and, more surprisingly, in the early 1990s. The

10. The effects of windowing account for the CRISIS2 episodes that are not also CRISIS1.

11. Technically, the Islamic Federal Republic of Comoros uses a different currency, the CV, which is tied to the French franc in an analogous fashion to the CFA.

Table 8.6 Currency Crashes

A. Geographical Distribution					
Type of Crisis ^a	Total	Africa (48 countries)	Asia (26 countries)	Europe (5 countries)	Latin America and Caribbean (26 countries)
CRISIS2, no window	168 (142)	85 (59)	30	6	47
CRISIS1, window	172 (146)	81 (55)	30	7	54
CRISIS2, window	142 (116)	73 (47)	27	4	38
CRISIS3, window	162 (136)	84 (58)	33	7	38
CRISIS4, window	119	67 (41)	17	7	28

B. Time Distribution						
Type of Crisis ^a	Before 1978	1978–81	1982–85	1986–89	1990–94	1995–96
CRISIS2, no window	15	33 (20)	33	29	52 (39)	6
CRISIS1, window	16	32 (19)	37	26	53 (40)	8
CRISIS2, window	14	30 (17)	28	20	45 (32)	5
CRISIS3, window	29	36 (23)	30	18	41 (28)	8
CRISIS4, window	21	30 (17)	19	14	30 (17)	5

Note: Numbers in parentheses count the depreciation of the CFA franc as a single crash.

^aCRISIS1: depreciation of 25 percent, at least 10 percent higher than the previous year. CRISIS2: depreciation of 25 percent, at least double the previous year, with the latter below 40 percent. CRISIS3: depreciation of 15 percent, at least 10 percent higher than the previous year, with the latter below 10 percent. CRISIS4: same as CRISIS3 plus pegged exchange rate the year before the crisis. "Window" excludes crises occurring within three years of another crisis.

increase in capital mobility during the latter period may be one possible explanation of this pattern.

Table 8.7 summarizes changes in the exchange rate regime in countries that suffered currency crashes. In the whole sample, the exchange rate is pegged 69 percent of the time. The data show that a number of countries abandon the exchange rate peg the year of the crisis, and a few more the following year.

As in the case of current account reversals, we present in figures 8.3 and 8.4 some evidence on the behavior of key variables around the time of crises for the whole sample and for the sample of middle-income countries,

Table 8.7 Currency Crashes and Exchange Rate Regime

Type of Crisis	Total ^a	Peg Year before Crisis	Peg Year of Crisis	Peg Year after Crisis
CRISIS1, window	164	99	87	79
CRISIS2, window	136	97	83	76
CRISIS3, window	146	114	98	89
CRISIS4, window	115	115	95	87

^aTotal number of crises for which data on exchange rate regime before and after crisis are available.

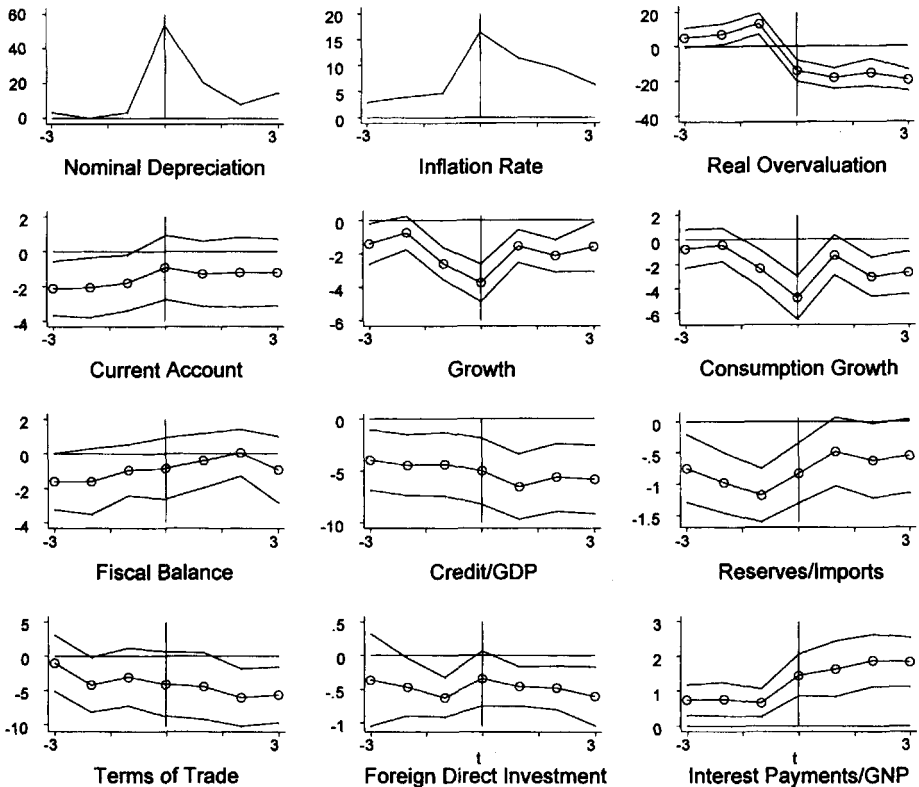


Fig. 8.3 Currency crashes: whole sample

Note: Data for 142 crashes from 105 countries, 1970–96. A crash is defined as a nominal exchange rate depreciation of at least 25 percent, which is at least double the previous year’s depreciation rate, as long as the latter is below 40 percent. “Turbulent” periods are those within three years of a currency crash, and “tranquil” periods are those that are not within three years of a crash. For each variable, the plots depict the difference between the variable mean during turbulent periods and its mean during periods of tranquility, as well as the 2-standard-deviation band. The upper left-hand and middle panels depict instead the difference between the medians during the two periods. Scales and data vary by panel.

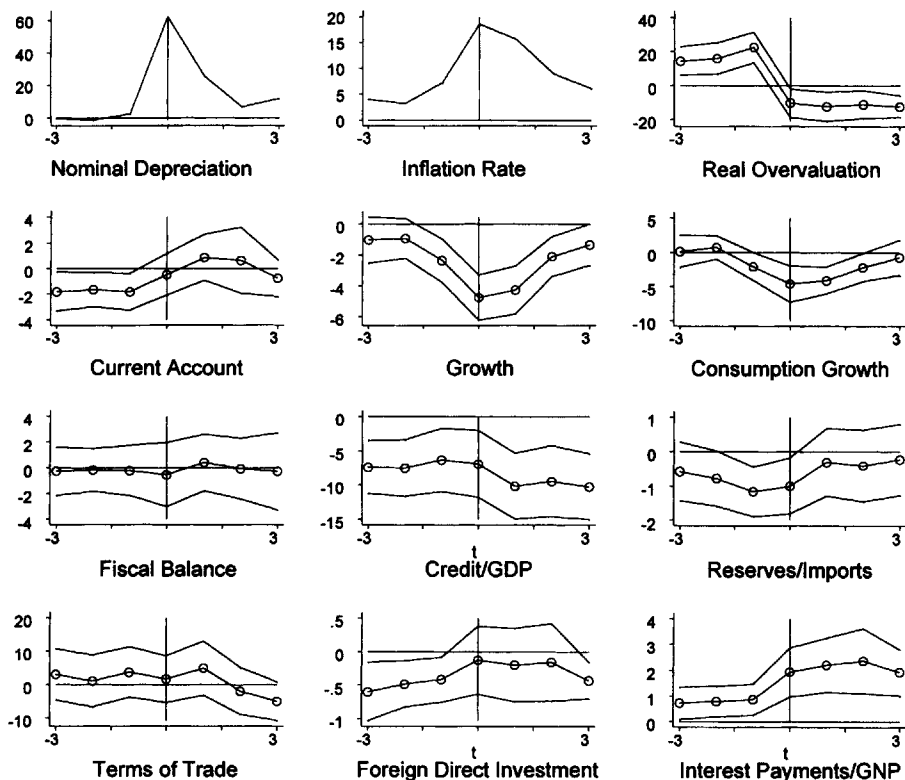


Fig. 8.4 Currency crashes: middle-income sample

Note: Data for 51 crashes from 39 countries, 1970–96. See fig. 8.3 note.

respectively (the graphs refer to CRISIS2—the graphs for the other types of crises are similar and are available on request). The upper left-hand and middle panels of figures 8.3 and 8.4 depict the behavior of the *median* rate of depreciation and of CPI inflation around the time of a currency crash, as deviations from the sample median during periods of tranquility. The other panels depict deviations from means and standard error bands (as in fig. 8.1 and 8.2). For the whole sample, the median rate of depreciation prior to crises is below 2 percent, close to the sample median; the median depreciation the year of the crisis is 53 percent, and after the crisis, it falls to 17 percent. A similar pattern emerges for the rate of inflation, although the increase during the year of the crisis is much smaller than the increase in the rate of depreciation. This is reflected in the behavior of the real exchange rate (or the degree of overvaluation): these increase prior to the crisis and fall the year of the crisis, and they do not seem to recover within the three-year window. Another notable feature of crisis years (and of the year preceding a crisis) is a decline in the rate of output and consumption growth,

with a rebound taking place after the crisis. The median consumption growth rate over the three years preceding a crisis is 3.3 percent, the year of the crisis, 0.2 percent, and the following three years, 2.2 percent. For output growth, we get 2.6, 1.4, and 3.1 percent, respectively. Not surprisingly, foreign exchange reserves around crisis periods tend to be lower than during tranquil periods and the terms of trade less favorable. There is some evidence that current account deficits are larger before crises than in tranquil periods; however, the figures show an improvement in the current account position after the devaluation only for middle-income countries.

We turn now to multivariate probit analysis. We estimate the probability of a currency crisis at time $t + 1$ as a function of a set of explanatory variables at time t and of external factors at time t and $t + 1$. The set of explanatory variables is similar to the set we used for reversals; here we also report results using the ratio of reserves to M2 (RESM2) as an alternative to reserves measured in months of imports (RES). Results are presented in table 8.8. Columns (1) through (4) report probit analysis using the full sample and the four different definitions of crises, while columns (5) and (6) report the results for the sample of thirty-nine middle-income countries. Overall, these results suggest some robust leading indicators of currency crashes, regardless of the precise definition of crash:

Foreign exchange reserves. Crashes are more likely in countries with low foreign exchange reserves, measured as a fraction of imports or as a fraction of M2.¹² This finding is clearly in line with theoretical models of currency crises.

Real exchange rate overvaluation. Crashes are more likely in countries in which the real exchange rate is appreciated relative to its historical average. This finding suggests that even the crude measure of exchange rate misalignments adopted here provides some useful information on the likelihood of exchange rate collapse.¹³

U.S. interest rates. Crashes are more likely when real interest rates in the United States are (or have been) high. Higher interest rates in industrial countries make investment in developing countries less attractive and are more likely to cause reversals in capital flows.

Growth in industrial countries. Crashes are more likely if growth in industrial countries has been sluggish. A possible channel is through lower demand for developing country exports, a decline in foreign exchange reserves, and a more likely collapse of the currency.

Terms of trade. A crisis is less likely when the terms of trade are favorable.

12. The regressions using RESM2 instead of RES are not reported but are available from the authors. Klein and Marion (1997) report similar results using the ratio of reserves to M1 for a sample of Latin American countries.

13. A potential problem with this finding is that the definition of the benchmark as the sample average implies a tendency for mean reversion.

Table 8.8 **Indicators of Currency Crashes**

Variable	Full Sample				Middle-Income Countries	
	CRISIS1 (1)	CRISIS2 (2)	CRISIS3 (3)	CRISIS4 (4)	CRISIS2 (5)	CRISIS3 (6)
CA	-0.25 (0.19)	-0.036 (0.16)	-0.11 (0.17)	-0.07 (0.09)	-0.36* (0.21)	-0.39** (0.19)
GROW	0.11 (0.23)	0.18 (0.20)	0.53** (0.22)	0.22* (0.12)	0.27 (0.23)	-0.02 (0.17)
INV	-0.15 (0.15)	-0.14 (0.14)	-0.21 (0.15)	-0.13 (0.08)	-0.12 (0.15)	-0.08 (0.10)
GDP	-1.9E-4 (8.5E-4)	-9.9E-4 (6.3E-4)	-1.6E-3* (8.4E-4)	-2.5E-4 (4.5E-4)	2.1E-4 (7.4E-4)	2.4E-4 (5.7E-4)
OPEN	-0.15** (0.04)	-0.054* (0.029)	0.038 (0.029)	0.028* (0.015)	0.05 (0.04)	0.11** (0.04)
RES	-1.37** (0.35)	-1.23** (0.32)			-0.75** (0.30)	
RESM2			-15.3** (-3.64)	-7.27** (2.26)		-15.5** (4.17)
OVERVAL	0.13** (0.04)	0.15** (0.04)	0.24** (0.04)	0.17** (0.03)	0.24** (0.06)	0.17** (0.06)
DEBTY	-0.001 (0.01)	0.007 (0.009)	0.014 (0.011)	0.009 (0.006)	0.037* (0.024)	0.01 (0.02)
VARRAT	-0.01 (0.07)	-0.16** (0.06)				
CONRAT	-0.17** (0.06)	-0.16** (0.05)	-0.042 (0.039)	0.009 (0.02)		
FDI	-0.43 (0.56)	-0.31 (0.41)	-0.012 (0.50)	0.23 (0.30)	-0.84 (0.61)	-0.56 (0.54)
CRED	0.07 (0.06)	-0.02 (0.05)	0.073 (0.051)	0.017 (0.03)	-0.03 (0.04)	-0.06* (0.035)

(continued)

Table 8.8 (continued)

Variable	Full Sample				Middle-Income Countries	
	CRISIS1 (1)	CRISIS2 (2)	CRISIS3 (3)	CRISIS4 (4)	CRISIS2 (5)	CRISIS3 (6)
TT	-0.11** (0.04)	-0.10** (0.04)	-0.061 (0.038)	-0.060** (0.023)	-0.064* (0.037)	-0.057** (0.030)
$\Delta TT(t + 1)$	-0.10* (0.06)	-0.08 (0.05)	-0.099* (0.053)	-0.066** (0.031)		
RINT	0.34 (0.55)	-0.20 (0.48)	-0.014 (0.50)	-0.31 (0.29)	1.15** (0.37)	0.45* (0.27)
$RINT(t + 1)$	1.24** (0.51)	1.08** (0.44)	1.36** (0.46)	0.62** (0.28)		
GROECD	-1.74** (0.54)	-1.34** (0.48)	-1.61** (0.50)	-0.49** (0.28)	-0.49 (0.48)	-0.84** (0.42)
$GROECD(t + 1)$	-0.20 (0.66)	-0.24 (0.57)	-0.53 (0.62)	0.13 (0.35)	1.32** (0.58)	0.37 (0.43)
PEG	-7.57** (2.51)	-2.61 (1.78)	1.34 (1.59)		-0.60 (1.43)	2.26* (1.38)
IMF	-2.84** (1.45)	-2.58* (1.30)	0.63 (1.64)	0.58 (0.99)	-2.32 (-1.38)	1.01 (1.44)
Pseudo R^2	0.29	0.24	0.27	0.29	0.36	0.36
N	838	897	878	985	474	472

Note: Dependent variable takes the value one if a currency crash occurs at time $t + 1$, and zero otherwise. Estimation by probit. The table reports probit slope derivatives (and associated z -statistics in parentheses) multiplied by 100. The variables CA, GROW, and INV are averages over the three years preceding the event. Variables are dated at time t unless otherwise marked. Regressions include continent dummies (coefficients not reported). Omitted variables in models (5) and (6) were excluded based on a joint F -test.

*Statistically significant at the 90 percent level.

**Statistically significant at the 95 percent level.

This is another intuitive finding: better terms of trade should improve a country's creditworthiness (and its cash flow) and make it less vulnerable to speculative attacks.

When we use the whole sample, a number of other factors are good leading predictors of crisis according to CRISIS1 and CRISIS2, but not CRISIS3 and CRISIS4:

Share of concessional debt. Crashes are less likely in countries with large shares of debt on concessional terms. This may be explained by the fact that these flows are less likely to be reversed.

Openness. More open economies are less likely to suffer exchange rate crashes. This evidence suggests that when we include crises associated with high-inflation episodes the benefits of trade openness outweigh the higher vulnerability to external shocks. This is not the case, however, when we focus on crashes that were preceded by more stable exchange rates (see cols. [3], [4], and [6]).¹⁴

IMF dummy. Countries with IMF programs in place are less likely to suffer crashes the following year. In addition to a possible "credibility effect," this finding could reflect the fact that programs are approved or remain in place in countries willing to strengthen their fundamentals.

For the sample of middle-income countries we also find that a crash is more likely when the *current account deficit* is large. For the full sample, which includes several low-income countries with very large current account deficits throughout the period, the current account has the expected sign but is statistically insignificant. The finding that countries with pegged exchange rates are less likely to suffer crashes of type 1 may simply reflect the fact that the rate of depreciation tends to be lower in countries with pegged exchange rates than in countries with floating exchange rates (the median rate of depreciation in the sample for countries that peg is zero, while it is 12 percent for countries with floating exchange rates). Indeed, when we limit the definition of crisis to countries with low initial rates of depreciation (CRISIS3 or CRISIS4) the coefficient on the peg variable changes sign.

Table 8.9 reports the goodness of fit of the model. As in the case of reversals, goodness of fit improves when the sample is restricted to middle-income countries. Note also the difference in the classification accuracy for the full sample between CRISIS1 and CRISIS2: this is due to the fact that the model predicts easily accelerations in the rate of depreciation associated with episodes of high inflation. Overall, these results are broadly in line with those reported by Frankel and Rose (1996). They highlight domestic factors, such as the degree of overvaluation and the level of re-

14. Klein and Marion (1997) find that openness significantly reduces the likelihood of a devaluation in a sample of Latin American countries that peg their exchange rate.

Table 8.9 Goodness of Fit: Currency Crash Models

Actual	Predicted		Total
	0	1	
	Model (1)		
0	725	9	734
1	71	33	104
Total	796	42	838
	Model (2)		
0	808	5	813
1	70	14	84
Total	878	19	897
	Model (3)		
0	779	7	786
1	69	23	92
Total	848	30	878
	Model (4)		
0	913	4	917
1	56	12	68
Total	969	16	985
	Model (5)		
0	430	3	433
1	26	15	41
Total	456	18	474
	Model (6)		
0	422	4	426
1	30	16	46
Total	452	20	472

serves, and external factors, such as growth and interest rates in industrial countries and the terms of trade, that tend to precede currency crashes.

8.7 Currency Crises and Output Performance

In this section we characterize output performance after a currency crisis. The objective is twofold: first, to identify stylized facts regarding the behavior of macroeconomic variables before and after crises and, second, to investigate which factors help to explain output growth after crises.

A stylized fact that emerged from the analysis of the previous section is that output and consumption growth the year of the crisis are lower than the averages during the three preceding years and during the three following years. This finding suggests that we are indeed picking up events that have disruptive effects on macroeconomic activity, at least in the short run. One telling example is Korea, which experienced a currency crisis (according to the first three definitions) in 1980. Its average growth in the three years preceding the crisis was above 10 percent; in 1980 output fell by close to 3 percent, and in the three successive years growth was back

at 8 percent. In the regression analysis we explore the determinants of output performance in the three years following a currency crash. Our dependent variable is the average growth rate in the three years following the crash, as a deviation from the OECD average during the same period. Our independent variables include the average growth rate in the three years preceding the crisis and growth rate the year of the crisis (both expressed as deviations from the OECD average during those periods), average investment rate and current account balance the three years prior to the crisis, change in the terms of trade between the two periods, as well as ratio of debt to GDP, degree of real exchange rate overvaluation, GDP per capita, real interest rate in the United States, and ratio of external transfers to GDP, all measured the year before the crisis. Results are presented in table 8.10.

Overall, the most robust predictor of output performance after a crisis appears to be the average growth rate before the crisis. We also find evidence that countries more open to trade tend to grow faster after currency crises. While the latter finding is in line with what we reported in section 8.5 for the before-and-after analysis of current account reversals, the former is different and suggests a stronger degree of “continuity” in output performance in the case of currency crises than in the case of reversals, especially for the sample of middle-income countries. The growth rate the year of the crisis and the current account balance prior to the crisis are not good predictors of subsequent performance, after controlling for other growth determinants. It is interesting to note that the real exchange rate (or the degree of overvaluation), which seems to play an important role both in explaining output performance after reversals and in triggering currency crises, is not a good predictor of economic performance after a currency crash. A regression of the growth rate the year of the crisis on the set of lagged dependent variables (not reported) also does not find any economically and statistically significant effect of the degree of overvaluation. Finally, in the sample of middle-income countries the investment rate prior to the crisis is statistically significant but has the wrong sign.

These findings also suggest that currency crashes and reversals in current account imbalances have indeed different characteristics and have different impacts on macroeconomic performance. The next section explores this issue in more detail.

8.8 Crises and Reversals: A Comparison

Are reversals usually preceded by currency crises? The stylized facts presented in figures 8.1 through 8.4 and especially the time profile of crashes and reversals presented in tables 8.2 and 8.6 suggest that these two events have different characteristics. Indeed, table 8.11 shows that only around a third of reversals are accompanied by, or preceded by, currency crises; the median rate of depreciation in the year of a current account

Table 8.10 **Consequences of Currency Crashes**

Variable	Full Sample			Middle-Income Countries		
	CRISIS1	CRISIS2	CRISIS3	CRISIS1	CRISIS2	CRISIS3
Lagged dependent variable	0.37** (0.12)	0.33** (0.14)	0.21* (0.12)	0.54** (0.17)	0.59** (0.20)	0.65** (0.21)
Growth crisis year	0.03 (0.07)	0.07 (0.08)	0.13 (0.08)	-0.05 (0.08)	0.07 (0.17)	0.08 (0.12)
CA	0.14 (0.12)	0.16 (0.14)	0.11 (0.09)	0.14 (0.14)	0.32* (0.17)	0.07 (0.15)
RER	-0.01 (0.02)	0.014 (0.009)	0.006 (0.01)	-0.01 (0.01)	0.008 (0.02)	-0.03 (0.02)
Δ TT	0.063** (0.026)	0.054* (0.030)	0.026 (0.023)	0.055* (0.029)	0.056 (0.033)	-0.005 (0.03)
OPEN	0.058** (0.021)	0.074** (0.023)	0.056** (0.018)	0.03 (0.02)	0.063** (0.031)	0.03 (0.03)

DEBTY	-0.010 (0.011)	-0.012 (0.012)	-0.011 (0.009)	-0.006 (0.01)	-0.017 (0.016)	-0.014 (0.014)
RINT	-0.06 (0.17)	-0.12 (0.21)	0.12 (0.15)	-0.04 (0.21)	-0.17 (0.26)	-0.003 (0.22)
OT	-0.13 (0.17)	-0.17 (0.18)	-0.17* (0.10)			
GDP	-4.0E-5 (5.1E-4)	-3.5E-4 (6.2E-4)	-4.1E-4 (6.5E-4)	6.4E-5 (3.2E-4)	-5.5E-5 (4.3E-4)	1.2E-4 (4.4E-4)
INV	-0.09 (0.10)	-0.07 (0.13)	0.02 (0.09)	-0.23** (0.09)	-0.25* (0.13)	-0.23** (0.11)
R^2	0.35	0.39	0.40	0.47	0.55	0.56
N	85	69	80	53	37	42

Note: Dependent variable is average output growth after a currency crash, a three-year average, expressed as deviation from the OECD average during the same period. Estimation by OLS with White's correction for heteroskedasticity. Numbers in parentheses are standard errors. The explanatory variables CA and INV are averages over the three years preceding the event; the variables OPEN, GDP, RER, OT, and DEBTY are levels the year before the event; the variable ΔTT is the percentage change in the average level of the terms of trade between the period after and the period before the event.

*Statistically significant at the 90 percent level.

**Statistically significant at the 95 percent level.

Table 8.11 **Currency Crashes and Reversals**

A. Number of Reversals Preceded by Currency Crashes ^a								
Size of Reversal	Total	No Window			Window			
		CRISIS1	CRISIS2	CRISIS3	CRISIS1	CRISIS2	CRISIS3	CRISIS4
3%, full sample	152	54	43	51				
3%, window, full sample	100				31	26	33	24
3%, window, middle-income countries	47				18	14	21	14
5%, full sample	117	43	36	43				
5%, window, full sample	77				25	22	27	20

B. Growth before and after Reversals ^b					
Size of Reversal and Type of Crisis	Total Observations	Growth before Reversal ^c		Growth after Reversal ^d	
		Average	Median	Average	Median
3%	97	3.5	3.2	3.6	3.6
3% + CRISIS1	30	2.7	2.9	3.1	3.1
3%, no CRISIS1	67	3.9	3.6	3.8	4.1
3% + CRISIS3	32	3.4	3.1	3.5	2.8
3%, no CRISIS3	65	3.6	3.3	4.0	3.6

^aNumber of reversals accompanied by currency crashes or preceded in at least one of the three previous years by crashes. The current account is defined net of official transfers.

^bReversals do not include adjacent events and are defined on the basis of the current account net of official transfers. They are divided into those accompanied or preceded by currency crises (in one of the previous three years) and those that are not. See table 8.6 note for definitions of CRISIS1 and CRISIS3.

^cGrowth before reversal: average (median) growth the three years prior to a reversal.

^dGrowth after reversal: average (median) growth rate the year of the reversal and the two successive years.

reversal and in the two preceding years is around 7 percent, well below all the thresholds we use for currency crashes.¹⁵ We now investigate this issue in more detail.

A first stylized fact is that as expected, when crises precede or accompany reversals they tend to occur one or two years prior to reversals. A second stylized fact is that reversals are more likely to be preceded by currency crises in Latin America and the Caribbean than they are in Asia. For example, for the Frankel-Rose definition of crisis, twelve reversals (out of twenty-five) in Latin America were preceded by crashes, but only five (out of twenty-nine) in Asia.¹⁶ If the definition of crisis is changed so as to exclude countries that had high rates of depreciation before crashes (i.e., we use CRISIS3), the numbers change (nine out of twenty-five for Latin America and six out of twenty-nine for Asia) but not the qualitative finding. For African countries, around 30 percent of reversals are preceded by crises. There are more similarities between the stylized features of reversals and crises for the sample of middle-income countries (see the exchange rate depreciation panel in fig. 8.2 and the current account panel in fig. 8.4). However, as shown in the third row of table 8.11, panel A, the fraction of reversals preceded by exchange rate crashes is still below 50 percent. In order to shed more light on this issue it would be necessary to “classify” reversals according to their most relevant features—a task for future research.

The final question we briefly address is whether countries that suffer currency crises prior to reversals tend to perform less well after the reversals. Table 8.11, panel B, provides summary statistics for median and average growth before and after reversals, separating those preceded by crises from those that are not.¹⁷ It shows that average and median growth performance after reversals is worse for countries that suffered currency crises of type 1, but not for crises of type 3. The explanation for this finding may lie in the worse growth performance of countries that suffered bouts of high inflation and currency depreciation (which are excluded from crises of type 3).

8.9 Concluding Remarks

This paper has provided a broad-brush characterization of sharp reductions in current account deficits and of currency crises in low- and middle-income countries. Reversals in current account imbalances are more likely

15. The crisis definition does not affect significantly the selection of reversal episodes preceded by crises.

16. This partly reflects the higher incidence of crashes in Latin America than in Asia (table 8.6).

17. Table 8.11, panel B, excludes CRISIS2; growth would be intermediate between CRISIS1 and CRISIS3.

to occur in countries that have run persistent deficits and that have low reserves and unfavorable terms of trade; they are less likely to occur in countries that receive high official transfers and whose debt is largely on concessional terms. Growth performance after reversals tends to be better in more open economies and in countries whose real exchange rates were less appreciated prior to the reversals. Reversals are not systematically associated with declines in growth; indeed, median growth after a reversal in the current account is the same as before the reversal. Currency crises are more likely to occur when reserves are low, real exchange rates are appreciated, and external conditions are unfavorable—high interest rates and low growth in industrial countries. Growth tends to decline the year of the crisis and to recover thereafter. Economies more open to trade seem to perform better after crises. A comparison of currency crashes and current account reversals shows that these are, in general, distinct events. Less than a third of all reversals are preceded by currency crises, however defined. This suggests that the conventional wisdom that large nominal depreciations precede turnarounds in the current account is not accurate and points to the need to look more closely at different types of reversals.

Several other questions remain open for future research. First of all, the probit analyses of both reversals and currency crises is based on a reduced-form approach that makes it difficult to give any “structural” interpretation to its findings. It would therefore be important to devise ways to distinguish empirically between different mechanisms underlying reversals and crises. A second important question is whether swings in the current account are merely a reflection of reversals in capital flows; addressing this question requires the construction of a measure of capital flows, combining current account and reserve data, taking into account the need to separate “rescue packages” from “normal” capital inflows. Finally, the behavior of economic policy around the time of reversals and crises could be examined in more detail, and the experience of developing countries could be compared to the experience in industrial countries.

Appendix A

List of Countries

Algeria*	Bhutan	Cameroon
Argentina*	Bolivia*	Cape Verde
Bangladesh	Botswana*	Central African
Barbados	Brazil*	Republic
Belize	Burkina Faso	Chad
Benin	Burundi	Chile*

China	Kenya	Romania*
Colombia*	Korea*	Rwanda
Comoros	Laos	São Tomé and Príncipe
Congo	Lebanon	Senegal
Costa Rica*	Lesotho	Seychelles
Côte d'Ivoire*	Liberia	Sierra Leone
Djibouti	Madagascar	Solomon Islands
Dominican Republic*	Malawi	Somalia
Ecuador*	Malaysia*	South Africa*
Egypt*	Maldives	Sri Lanka*
El Salvador*	Mali	St. Vincent and the Grenadines
Equatorial Guinea	Malta	Sudan
Ethiopia	Mauritania	Swaziland
Fiji	Mauritius*	Syria*
Gabon	Mexico*	Tanzania
Gambia	Morocco*	Thailand*
Ghana	Myanmar	Togo
Grenada	Nepal	Trinidad and Tobago*
Guatemala*	Nicaragua	Tunisia*
Guinea	Niger	Turkey*
Guinea Bissau	Nigeria	Uganda
Guyana	Oman*	Uruguay*
Haiti	Pakistan	Vanuatu
Honduras	Panama*	Venezuela*
Hungary*	Papua New Guinea	Western Samoa
India	Paraguay*	Yemen
Indonesia*	Peru*	Zaire
Iran*	Philippines*	Zambia
Jamaica*	Portugal*	Zimbabwe
Jordan		

*Indicates a middle-income country.

Appendix B

Data Sources and Definitions

CA Current account balance (excluding official transfers) as a fraction of GDP. *Source:* World Bank, *World Tables and World Development Indicators* (Washington, D.C., various issues)—hereafter *World Tables*.

GDP	GDP per capita (chain rule). <i>Source:</i> Robert Summers and Alan Heston, <i>Penn World Tables 5.6</i> , available at http://www.pwt.upenn.edu .
FISC	Fiscal balance (including grants) as a fraction of GDP. <i>Source:</i> <i>World Tables</i> .
OT	Official transfers in U.S. dollars. <i>Source:</i> <i>World Tables</i> .
INV	Share of investment in GDP. <i>Source:</i> <i>World Tables</i> .
GROW	Growth rate of real GDP (constant 1987 prices). <i>Source:</i> <i>World Tables</i> .
TT	Terms-of-trade index (period average + 100). <i>Source:</i> <i>World Tables</i> .
OVERVAL	Rate of real exchange rate overvaluation vis-à-vis the U.S. dollar, based on relative GDP deflators (percentage deviation from the average level for 1970–96).
RER	CPI-based real effective exchange rate index (period average + 100). <i>Source:</i> IMF and authors' calculations.
OPEN	Average share of exports and imports in GDP. <i>Source:</i> Authors' calculations based on <i>World Tables</i> .
RES	Foreign exchange reserves in months of imports. <i>Source:</i> World Bank, <i>Global Development Finance</i> (Washington, D.C., various issues).
RESM2	Foreign exchange reserves as a fraction of M2. <i>Source:</i> Authors' calculations based on <i>World Tables</i> and <i>Global Development Finance</i> .
DEBTX	Ratio of external debt to exports. <i>Source:</i> <i>Global Development Finance</i> .
DEBTY	Ratio of external debt to GNP. <i>Source:</i> <i>Global Development Finance</i> .
INTGNP	Ratio of interest payments on external debt to GNP. <i>Source:</i> <i>Global Development Finance</i> .
CONRAT	Share of concessional debt in total debt. <i>Source:</i> <i>Global Development Finance</i> .
PUBRAT	Share of public debt in total debt. <i>Source:</i> <i>Global Development Finance</i> .
VARRAT	Ratio of variable rate external debt to total external debt. <i>Source:</i> <i>Global Development Finance</i> .
CRED	Ratio of domestic credit to GDP. <i>Source:</i> <i>World Tables</i> .
SHORT	Share of short-term debt in total debt. <i>Source:</i> <i>Global Development Finance</i> .
FDI	Net FDI flows as a fraction of GDP. <i>Source:</i> <i>Global Development Finance</i> .
PORTF	Net portfolio flows as a fraction of GDP. <i>Source:</i> <i>Global Development Finance</i> .
RINT	U.S. prime lending rate, deflated by the U.S. GDP deflator.

- Source:* IMF, *International Financial Statistics* (Washington, D.C., various issues).
- GROECD Real growth rate in OECD countries. *Source:* *International Financial Statistics*.
- PEG Dummy variable taking the value one if the exchange rate is fixed or fluctuates within a narrow band, and zero otherwise. *Source:* Cottarelli and Giannini (1997) and IMF, *Exchange Arrangements and Exchange Restrictions* (Washington, D.C., various issues).
- IMF Dummy variable taking the value one if the country has an IMF program in place for at least six months during the year, and zero otherwise. *Source:* Cottarelli and Giannini (1997).

References

- Calvo, Guillermo A. 1997. Varieties of capital market crises. In *The debt burden and its consequences for monetary policy*, ed. G. A. Calvo and Mervyn King. New York: St. Martin's.
- Calvo, Guillermo A., Leonardo Leiderman, and Carmen M. Reinhart. 1993. Capital inflows and real exchange rate appreciation in Latin America: The role of external factors. *IMF Staff Papers* 40 (March): 108–51.
- Calvo, Guillermo A., and Enrique Mendoza. 1999. Rational contagion and the globalization of securities markets. NBER Working Paper no. 7153. Cambridge, Mass.: National Bureau of Economic Research, June.
- Chang, Roberto, and Andrés Velasco. 1998. Financial crises in emerging markets: A canonical model. NBER Working Paper no. 6606. Cambridge, Mass.: National Bureau of Economic Research, June.
- Corbo, Vittorio, and Leonardo Hernández. 1996. Macroeconomic adjustment to capital inflows: Lessons from recent East Asian and Latin American experience. *World Bank Research Observer* 11 (February): 61–85.
- Cottarelli, Carlo, and Curzio Giannini. 1997. Credibility without rules? Monetary frameworks in the post-Bretton Woods era. IMF Occasional Paper no. 154. Washington, D.C.: International Monetary Fund, December.
- DeBelle, Guy, and Hamid Faruqee. 1996. What determines the current account? A cross-sectional and panel approach. IMF Working Paper no. 96/58. Washington, D.C.: International Monetary Fund, June.
- Demirgüç-Kunt, Asli, and Enrica Detragiache. 1998. The determinants of banking crises in developed and developing countries. *IMF Staff Papers* 45 (March): 81–109.
- Diamond, Douglas W., and Philip H. Dybvig. 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy* 91 (June): 401–19.
- Edwards, Sebastian. 1989. *Real exchange rates, devaluation and adjustment*. Cambridge, Mass.: MIT Press.
- Eichengreen, Barry, Andrew K. Rose, and Charles Wyplosz. 1995. Exchange market mayhem: The antecedents and aftermath of speculative attacks. *Economic Policy* 21 (October): 249–312.

- . 1996. Contagious currency crises. CEPR Discussion Paper no. 1453. London: Centre for Economic Policy Research, August.
- Fernández-Arias, Eduardo. 1996. The new wave of private capital inflows: Push or pull? *Journal of Development Economics* 48:389–418.
- Fernández-Arias, Eduardo, and Peter Montiel. 1996. The surge in capital inflows to developing countries: An analytical overview. *World Bank Economic Review* 10 (January): 51–77.
- Flood, Robert, and Peter Garber. 1984. Collapsing exchange rate regimes: Some linear examples. *Journal of International Economics* 17:1–13.
- Frankel, Jeffrey A., and Andrew K. Rose. 1996. Currency crashes in emerging markets: An empirical treatment. *Journal of International Economics* 41 (November): 351–66.
- Goldfajn, Ilan, and Rodrigo Valdés. 1997. Capital flows and the twin crises: The role of liquidity. IMF Working Paper no. 97/87. Washington, D.C.: International Monetary Fund, July.
- . 1999. The aftermath of appreciations. *Quarterly Journal of Economics* 104 (February): 229–62.
- Jeanne, Olivier. 1997. Are currency crises self-fulfilling? A test. *Journal of International Economics* 43 (3/4): 163–86.
- Jeanne, Olivier, and Paul Masson. 2000. Currency crises, sunspots, and exchange rate regimes. *Journal of International Economics* 50 (2): 327–50.
- Kaminsky, Graciela, Saul Lizondo, and Carmen M. Reinhart. 1998. Leading indicators of currency crises. *IMF Staff Papers* 45 (March): 1–48.
- Kaminsky, Graciela, and Carmen M. Reinhart. 1999. The twin crises: The causes of banking and balance of payments problems. *American Economic Review* 89 (June): 473–500.
- Klein, Michael W., and Nancy P. Marion. 1997. Explaining the duration of exchange-rate pegs. *Journal of Development Economics* 54 (December): 387–404.
- Knight, Malcolm A., and Julio A. Santaella. 1997. Economic determinants of IMF financial arrangements. *Journal of Development Economics* 54 (2): 405–36.
- Kraay, Aart, and Jaime Ventura. 2000. Current accounts in debtor and creditor countries. *Quarterly Journal of Economics*, forthcoming.
- Krugman, Paul. 1979. A model of balance-of-payments crises. *Journal of Money, Credit, and Banking* 11 (August): 309–25.
- . 1996. Are currency crises self-fulfilling? In *NBER macroeconomics annual 1996*, ed. Ben S. Bernanke and Julio J. Rotemberg. Cambridge, Mass.: MIT Press.
- . 1999. Balance sheets, the transfer problem, and financial crises. In *International finance and financial crises: Essays in honor of Robert P. Flood, Jr.*, ed. Peter Isard, Assaf Razin, and Andrew K. Rose, 31–44. Boston: Kluwer.
- Lane, Philip, and Roberto Perotti. 1998. The trade balance and fiscal policy in the OECD. *European Economic Review* 42 (May): 887–95.
- Masson, Paul. 1998. Contagion: Monsoonal effects, spillovers, and jumps between multiple equilibria. IMF Working Paper no. 98/142. Washington, D.C.: International Monetary Fund, September.
- Milesi-Ferretti, Gian Maria, and Assaf Razin. 1996a. Current account sustainability. Princeton Studies in International Finance, no. 81. Princeton, N.J.: Princeton University, October.
- . 1996b. Current account sustainability: Selected East Asian and Latin American experiences. NBER Working Paper no. 5791. Cambridge, Mass.: National Bureau of Economic Research, October.

- . 1998. Sharp reductions in current account deficits: An empirical analysis. *European Economic Review* 42 (May): 897–908.
- Obstfeld, Maurice. 1994. The logic of currency crises. *Cahiers Economiques et Monétaires* (Bank of France) 43:189–213.
- Sachs, Jeffrey. 1981. The current account and macroeconomic adjustment in the 1970s. *Brookings Papers on Economic Activity*, no. 1:201–68.
- . 1982. The current account in the macroeconomic adjustment process. *Scandinavian Journal of Economics* 84 (2): 147–59.
- Sachs, Jeffrey, Aaron Tornell, and Andrés Velasco. 1996. Financial crises in emerging markets: Lessons from 1995. *Brookings Papers on Economic Activity*, no. 1:147–98.
- Santaella, Julio A. 1996. Stylized facts before IMF-supported macroeconomic adjustment. *IMF Staff Papers* 43 (September): 502–44.
- Tornell, Aaron, and Philip Lane. 1998. Are windfalls a curse? A non-representative agent model of the current account and fiscal policy. *Journal of International Economics* 44 (February): 83–112.
- Wyplosz, Charles. 1986. Capital controls and balance-of-payments crises. *Journal of International Money and Finance* 5 (June): 167–79.

Comment Jaume Ventura

This is the latest paper in a series by Milesi-Ferretti and Razin (1996a, 1996b, 1998) that has taught us much regarding current account sustainability and sharp reductions in current accounts. In this new installment of the saga, the authors also include a description of large depreciation episodes. In this brief comment, I focus on two issues. First, I raise a methodological point that I hope the authors interpret as a challenge for their future research. Second, I stress some of the implications of their findings regarding large depreciations.

Section 8.4, on current account reversals, contains a description of how the key macroeconomic variables (with special attention to growth) behave during a current account reversal.¹ In particular, they find that on average these episodes tend to be preceded by unfavorable terms of trade, low foreign exchange reserves, a high interest burden of external debt, low consumption growth, and a high budget deficit. After the sharp reduction in the current account deficit takes place, on average most of these indicators improve, although the growth rate remains at roughly the same level

Jaume Ventura is the Pentti Kouri Associate Professor of Economics at the Massachusetts Institute of Technology and research associate of the Centre for Economic Policy Research, London.

1. Section 8.4 also contains an attempt to use multivariate probit analysis to find good indicators of current account reversals. However, this effort is marred by the use of the current account variable as a regressor. This variable was used to construct the dependent variable, and as a result, it cannot be used as an explanatory variable. I suspect that the numbers might change substantially if the probit analysis were properly executed.

as before the reversal. These results regarding average behavior are beautifully summarized in figures 8.1 and 8.2.

But how do we interpret these findings? In other words, what is the question being answered by these figures? Before tackling this issue, it is worth remembering that economic theory offers a variety of reasons for why these reversals take place. Consider the following three possibilities:

1. A country receives a bad shock to productivity or the terms of trade, which is expected to last for an extended period of time. As a result, domestic investment falls and capital moves out of the country. The current account goes into surplus. In this story, the reversal is accompanied by a fall in output and a real depreciation.

2. A country receives a good transitory income shock. Spending increases by less than output, as agents try to smooth consumption over time. The current account goes into surplus. In this story, the reversal is accompanied by an increase in output and a real appreciation.

3. Foreign interest rates increase, international investors lose confidence in a country, or alternatively, the credit constraint of a country is tightened. Capital moves out of the country, spending falls, and the current account goes into surplus. In this story, there might be a fall in output if foreign financing is necessary to keep alive some investment projects with high future return. Also, the exchange rate might depreciate.

Stories 1 and 3 suggest that a current account reversal should be accompanied by a depreciation of the currency and a reduction in output. Story 2 suggests instead that a current account reversal should be accompanied by an appreciation of the currency and an increase in output. It should be obvious to the reader that other stories are possible with different implications. The only point I want to make here is that there are, in principle, many varieties of current account reversals, each of them caused by a different type of shock. With this in mind, consider the following two questions:

Q1. Assume we know that a reversal will take place but we do not know why: what should we expect the macroeconomic picture to look like?

Q2. Assume we know that a reversal will take place because of reason X: what should we expect the macroeconomic picture to look like?

Figures 8.1 and 8.2 are the response to Q1. The sample paths depicted in these figures could be roughly interpreted as weighted averages of the sample paths of each type of current account reversal, with weights that correspond to the frequency with which each type occurs in the data. For instance, the authors find that there is little effect on growth after a reversal. Is this because reversals have little impact on growth? Or is it because about half of the reversals in the sample are of type 1 or 3, while the other half are of type 2? The answer is not clear.

A much more interesting question is Q2. To answer it, we would have to establish a typology of current account reversals and then separate the observed episodes according to this typology. While the information provided in this paper is useful, I think the authors should try to address Q2. This effort would be more useful to the academic economist who wants to use the results of this paper to learn about parameters of the economy. It would also be more useful to the policymaker who has information regarding the shock that the country is experiencing.²

The second point I want to raise concerns the interpretation of the evidence on currency crises. The methodology used to determine episodes of "currency crisis" consists of picking periods in which there are large depreciations. Once we look at the data this way, the evidence in figures 8.3 and 8.4 can be interpreted as showing that countries follow textbook policy prescriptions (unless they receive a sizable amount of concessional debt). In particular, countries devalue whenever the terms of trade worsen, there is low growth and high interest rates in the OECD, reserves are low, and the currency is overvalued! In such circumstances, there is a temporary output loss, which is consistent with old-fashioned J-curve arguments.

References

- Milesi-Ferretti, Gian Maria, and Assaf Razin. 1996a. Current account sustainability. Princeton Studies in International Finance, no. 81. Princeton, N.J.: Princeton University, October.
- . 1996b. Current account sustainability: Selected East Asian and Latin American experiences. NBER Working Paper no. 5791. Cambridge, Mass.: National Bureau of Economic Research, October.
- . 1998. Sharp reductions in current account deficits: An empirical analysis. *European Economic Review* 42 (May): 897–908.

2. Clearly, the same set of issues arises in section 8.6, on currency crises.

This Page Intentionally Left Blank

Panel Presentation

The Asian Model, the Miracle, the Crisis, and the Fund

Jeffrey A. Frankel

Until recently, there were essentially two schools of thought regarding East Asian economic success. According to the first school, the Asian miracle illustrated the virtues of the capitalist system. According to the second, East Asian capitalism is different from Western capitalism, and its *differences* are the key to its success. Now, after a continent-full of disappointments, we are led to a third hypothesis. While it may be too strong to say that Asia's differences are the key to its recent failures, we have learned that the rules of economics after all apply to East Asia just like elsewhere, for better or worse.

I will address the policy response to the East Asian crisis on the part of the International Monetary Fund (IMF) and G-7 governments, including a number of criticisms of that response. But I begin by reviewing the origins of the crisis.

9.1 Origins of the Crisis

Macroeconomics played some role in the crisis, but not the lead role. Some mistakes of macropolicy were made in 1997 in Thailand, for ex-

Jeffrey A. Frankel is the Harpel Professor at Harvard University and a research associate of the National Bureau of Economic Research, where he directs the program in International Finance and Macroeconomics. At the time of the conference he was a member of the President's Council of Economic Advisers.

Versions of this speech were delivered at the Joint Economic Committee, U.S. Congress, 29 January 1998; Brookings Institution/George Mason Roundtable, 12 February 1998; Bretton Woods Committee Annual Meeting, 12 February 1998; Lehman Brothers' Investor Meeting, 25 February 1998; Milken Institute Global Conference, Los Angeles, 13 March 1998; Congressional Research Service Luncheon Series, Washington, D.C., 19 March 1998; and U.S. International Trade Commission, 16 April 1998.

ample. When current account deficit turned to overall balance-of-payments deficit, the government was too slow to follow the IMF's advice of allowing more exchange rate flexibility. As a result, much of Thailand's reserves were lost, and the crash that followed was worse than it otherwise would have been, once it occurred. In this respect, the episode resembled the Mexican peso crisis of 1994. It appears that current account deficits in excess of 4 percent of GDP are a sign of possible trouble ahead.

But large-scale borrowing by itself need not lead to a crisis. Statistical evidence suggests that a large current account deficit or high level of debt is not a highly significant predictor of crisis. More important than the magnitude of the current account deficit is *how it is financed* and *how the funds are used*. The composition of the capital inflow matters. East Asian countries in 1997 relied too much on short-term foreign-currency-denominated debt (again as in Mexico in 1994). Although securities were supposed to have achieved a new importance in these countries in the 1990s—indeed this was the origin of the phrase “emerging markets”—the banking sector turned out to be central. There was a mismatch between the banks' liabilities and their assets, with much of the money going to speculative real estate deals.¹

The main problem in East Asia was not macroeconomics but structural. Deep flaws afflicted the financial system. They include excessive leverage and a banking system based excessively on directed lending, connected lending, and other collusive personal relations. Ten years ago finance experts called it “relationship banking” and thought it might help to minimize “problems of asymmetric information and incentive incompatibility”; today we call it “crony capitalism.”

The U.S. financial model—shared with the United Kingdom and so sometimes called the “Anglo-American model”—is different. It emphasizes arm's-length market relations. For example, firms rely heavily on securities markets to finance investment. To be sure, banks play an important role. But even bank loans tend to be made on arm's-length terms. Certainly the government has little to say about where bank credit is allocated. One lesson now widely drawn from the crisis—and I believe correctly so—is that after all, the Anglo-American-style financial structure apparently works better than the Japanese-Asian model (at the risk of overgeneralizing across a heterogeneous set of countries).

The much-vaunted Japanese financial system is looking tarnished. Precisely the attribute of the system that previously appeared to be a virtue, the willingness of banks to go on lending to firms in distress (because the

1. In Frankel and Rose (1996), high short-term bank debt is shown to be a statistically significant positive predictor of the probability of currency crash, while high reserves and foreign direct investment (FDI) have the opposite effect. This is research I undertook before coming to the Council of Economic Advisers.

banks had “longer horizons” than impatient American investors), now turns out to have led to serious problems. Borrowers who should have been cut off were not, with the result that further billions were lost.

The Asian style of corporate governance tends in the direction of empire building, that is, maximizing capacity, sales, or market share, rather than what neoclassical economic theory says firms should maximize, namely, profitability or the price of the company’s stock. As a result, shareholders and consumers have lost out. For a while it looked like this was an arcane theoretical point, of interest to economists but not to real-world firm owners or workers. How could there ever be too much investment or too much growth? Now we see that Asian firms made precisely this mistake. They developed excess capacity in such sectors as steel and electronics and are now paying the price. This is what I had in mind when I said that the rules of economics turn out to apply to East Asia just like elsewhere.

9.2 Dangers of “Analysis by Hindsight”

In pronouncing this verdict, one must acknowledge the dangers of analysis by hindsight, dangers of American triumphalism, and dangers of excessive swings of the pendulum known as “conventional wisdom.” The dangers of 20/20 hindsight are clear. Until recently everyone thought that these countries had good fundamentals—as indeed they did, relatively speaking. Many of us warned of the drawbacks of the financial system,² but few thought it would lead to a very sharp slowdown, and nobody thought the crisis would be this big.

Financial crises are inherently hard to predict, and one should not after the fact perform contortions to explain why this one should have been obvious ahead of time. Statistical results produce warning factors that are significant, but they still do not tell us that the probability of a crisis is greater than 50 percent. Indeed, if there existed techniques that could predict financial crises with high reliability, the market would quickly invalidate them: the clever people on Wall Street would adopt the techniques, would sell the assets of any country that was entering the danger zone, and would thereby prevent the crisis situation from developing in the first place.

What are the dangers of excessive swings of pendulum and (now) of American triumphalism? Not everything about the East Asian economies was wonderful before 1997, contrary to much that was said in the 1980s; and conversely not everything about them is bad now.

On the negative side, I have already mentioned the structure of the fi-

2. My own record can be checked: Frankel (1995, 1997). In my view, the only commentator who can be truly proud of what he wrote about Asia beforehand is Krugman (1994, 1995).

nancial system. One should include on the list of Asian economic flaws industrial policy, as well as other excessive government interference in the economy, and corruption.³ I will even venture to cross over from economics to politics, at the risk of trespassing (whether on the sovereignty of the countries or the turf of political scientists—I am not sure which is the greater danger). We were told in the past that Asian values placed less weight than Western values on democracy, free speech, and other civil freedoms. I think many Asians may have concluded recently—even leaving aside the noneconomic benefits of such rights—that there are *financial* advantages to the rule of law, transparency, freedom of expression, and clearly established procedures for government succession.

Just as not everything about the East Asians was in fact admirable before 1997, so not everything about them is bad now. There was indeed an Asian economic miracle. Thirty years ago it seemed that industrialization was a privilege reserved *de facto* for the European-settled regions of the world, with the sole exception of Japan. The East Asians disproved this in a few short decades. In the original Industrial Revolution, it took the United Kingdom fifty-eight years to double its income (starting from 1780). It took the United States almost as long (forty-seven years, starting from 1839) and Japan thirty-five years (from 1885). Korea accomplished the feat in eleven years (from 1966) and then China just ten years (counting from 1977). Among the factors behind the East Asian accomplishment were high saving rates, hard work, a strong emphasis on basic education, and outward orientation (participation in international trade and investment). These are all important determinants of growth that work in other countries as well.

A full acknowledgment of the dangers of analysis by hindsight leaves a simple question: If the origins of the crisis lie in the structural flaws of the Asian financial system, why did it occur when it did? What in the economic structure or fundamentals changed between the Miracle and the Crisis?

Perhaps there exist natural stages of development, and the financial system associated with relationship banking was not poorly suited to countries at early stages of development. After all, when the alternative for a firm is financing all investments out of family savings or retained earnings from earlier investments, financial intermediation by banks is a tremendously important innovation. And as long as growth is rapid, high leverage (i.e., a high ratio of debt to equity) is sustainable, maybe even desirable. But when growth slows, the financial system needs to adapt. Firms need to reduce leverage.

Some slowdown in East Asian growth was inevitable after the break-

3. Economists do not have as much to be embarrassed about, in their 1980s writings on the Japanese financial system, as many political scientists and journalists do, in their writings on Japan's industrial policy.

neck pace of the preceding three decades. But the slowdown interacted badly with the highly leveraged financial system. The result was crisis.

Why do I say that a slowdown was inevitable? On the list of causes of rapid East Asian growth was a simple principle that economists call “convergence.” (This is in addition to such standard fundamentals as the accumulation of physical and human capital and the outward orientation of the economies.) A country that starts out behind the leaders in per capita income will tend to close part of the gap over time by growing more rapidly, conditional on those good fundamentals. The reasons are the high rate of return on capital and the opportunity to emulate frontier technology and management practices of the leader countries. But to the extent that the gap has been closed after a few decades, this source of growth is no longer there. Countries run into diminishing return to capital and constraints on infrastructure (including roads, water, and air). As they draw closer to the frontier, they no longer have more to learn from those that have gone before than vice versa. Japan achieved convergence by the 1980s, and Hong Kong and Singapore by the 1990s. Korea and the others still had a ways to go—a very long way in some cases. Nevertheless, the basic principle remains, that the smaller the remaining gap, the smaller this particular source of growth.

There were other reasons for the initial slowdown in output growth in East Asia, besides the inevitable convergence. One was the bursting of Japan’s pre-1990 asset market bubble.⁴ Another was the 1996 slowdown in the world electronics market, which sharply reduced the rate of growth of exports in these countries before any signs of financial crisis.

Whatever its origins, the slowdown that had already begun collided in mid-1997 with the long-standing limitations of the financial system.

9.3 Our Strategy for Dealing with the Crisis

I will now turn to the strategy that we—the U.S. administration—have used to deal with the crisis. It has three parts: supporting reform programs in individual afflicted countries; providing temporary financing where needed, conditional on those reforms; and encouraging action by our major trading partners, especially Japan, to promote global growth. The second of these measures requires a bit of elaboration. Public funds are not a substitute for private funds, only a catalyst or complement to private funds. Another way of saying this is that we are “bailing investors in,” not bailing them out. The aim is to restore investor confidence. This seems to

4. The bubble and its collapse were exogenous from the viewpoint of the rest of East Asia, but they were in themselves an example of the interaction that I am identifying. I might even go so far as to venture the hypothesis that asset market bubbles are a rite of passage marking the arrival of a new economic power on the global stage: Holland in the seventeenth century (Dutch tulip mania), England in the eighteenth (South Seas bubble), America in the 1920s (stock market and Florida real estate), and Japan in the late 1980s (stock and land markets).

be working: for example, Korea has recently been very successful at securing longer term private finance, returning to the private markets in just four months. By way of comparison, it took Mexico seven months in 1995, and seven years in the 1980s.

The central provider of public funds in crises, and monitor of conditionality, is the International Monetary Fund, with secondary roles for the World Bank and Asian Development Bank. The international financial institutions allow us to internationalize the financial burden, which the United States and other major countries would otherwise have to bear individually. Conditionality is better administered multilaterally as well. (Conditionality is the part of the program that spells out and then enforces requirements regarding country policies on which the financing is conditioned.) The IMF is the right institution for the job. It was originally established at U.S. initiative, it has the requisite technical expertise, and it allows us to exercise our influence in a highly leveraged way. I believe it is critical that the Congress approve the administration's requests for IMF funding, both the New Arrangements to Borrow (\$3.5 billion) and the regular capital increase (\$14.5 billion). These are not budget expenditures. They are more akin to investments, which will not—and historically have not—cost taxpayers one dime.

9.4 Critiques of the Management of the Crisis

I have heard a number of critiques of the strategy that we and the IMF are following. They fall into three areas: those concerning the efficiency of financial markets, those concerning the amount of financing, and those concerning policy conditionality. Many of the critiques contradict each other. One might say that for every critique, there is an equal and opposite critique. One cannot claim that they necessarily cancel each other out. But when a member of the public reads so many attacks on the Fund, he or she might be tempted to conclude that where there's smoke there's fire. Thus it is important to realize that the critiques come from different directions, and to consider carefully the specifics of each one.

9.4.1 Regarding Efficiency of Financial Markets

Critique 1. Financial markets work best with no government interference. There is no need for government action in this crisis. This is the view of the “no bailout” crowd. But I disagree that governments and the IMF have no role to play in a crisis such as this. There are three reasons why we need to be involved and should not simply try to allow the market to solve the problem on its own. First is the risk of financial contagion. Much as the crisis spread from Thailand to other East Asian developing countries, it could spread further, and not always to countries that deserve it.

Second is the large negative effect on our net exports to East Asia in 1998. I would not say that this is a tremendous concern as regards impacts

on aggregate U.S. growth or employment. Our economy had so much momentum going into this crisis—and still has—that we can withstand the loss of net exports, without losing much output and employment relative to what otherwise would have happened. But there is a danger that the fall in the trade balance, particularly the bilateral balances vis-à-vis East Asia, will lead to an isolationist or protectionist political backlash within the United States, which would in itself be harmful.

Third is the geopolitics. We have a stake in East Asian economic success. This success is a source of stability and progress in the region itself. Korea and Thailand have been and are our military allies, and Indonesia is a potential site of social instability. This success is also an example to other developing countries. As developing countries around the world have opted for capitalism over state planning, they have been inspired by the example of East Asia.

So we cannot walk away from East Asia.

Critique 2. This crisis shows that financial markets work badly; the countries should not have opened up to international investors in the first place, and we should not press them to continue to do so now. This critique takes the diametrically opposed view of the efficiency of financial markets from critique 1.

I would not claim that modern financial markets work perfectly. Even though some of the contagion in this case can be explained by cycles of competitive devaluation, it is true that it is hard to explain all the contagion in this way. Investors appear to have had excessive optimism up to last year and to suffer from excessive pessimism now. But we are better off with modern financial markets than without them.

There is a useful analogy from Robert Merton, recent Nobel Prize winner, which I will embellish. Today's financial markets are like superhighways. They get you where you want to go fast. By this I mean that they are useful: they help countries finance investment and therefore growth, and they smooth and diversify away fluctuations. But accidents do occur, and they tend to be big ones—bigger than they used to be when people were not able to drive so fast. The lesson is not that superhighways are bad. But drivers need to drive carefully, society needs speed limits, and cars need airbags.

9.4.2 Regarding Financing

Critique 3. Too much public finance is being used to respond to the crisis (vs. Critique 4. Not enough). There are two versions of the complaint that too much money is being channeled to the crisis countries. The first is the question, Why should we bail out countries that are such tough competitors for our own firms on world markets? The second variety of the critique has to do with moral hazard. Both raise important questions. But both have answers.

In the years prior to 1996, U.S. exports to East Asia grew very rapidly.

We would like to return to that path. The crisis strategy ultimately helps our firms sell to East Asia in three ways: short term, medium term, and long term: providing finance, so that the countries can continue to buy our goods this year (even if at reduced levels); helping to restore growth, so that they can buy more next year; and pursuing fundamental market opening, so that they can buy still more in the long term.

Everyone has now learned about moral hazard, the principle that bailing out investors and borrowers reduces their incentive to be more careful next time. The moral hazard point is a correct one, and it enters into the East Asian developments in a number of ways. But there is a danger of exaggerating it. It is a standard principle of economics that actions in one area can generate partly offsetting reactions in another. That is not in itself a reason not to take action. In our highway example, research demonstrates that drivers react to seatbelts and airbags by driving faster and less safely than they used to. But that is not a reason to dispense with airbags. If it were, that logic would also say that to discourage dangerous driving, we should put a spike in the steering wheel (as Michael Mussa of the IMF says).

Crisis countries already pay large penalties under the current system. Standards of living were severely reduced in Latin America after the 1982 crisis and in Mexico after the 1994 crisis; and incomes will also be sharply depressed in East Asian countries as a consequence of the 1997 crisis. These countries would not willingly repeat the experience.

On the creditor side, securities investors are suffering large losses as well (declines in prices of currencies, bonds, and stocks).

There has been a lot of concern that banks in creditor countries are not taking enough of a hit. First, many banks *are* taking hits. J. P. Morgan, Chase, and Citibank have reported adverse effects on profits. Second, it may not be altogether inappropriate that banks make out better than securities investors when times are bad—this is compensation for the fact that they do not make out as well when times are good.⁵ This is not to deny that the effort to contain the crisis has an element of moral hazard vis-à-vis the banks. If anyone can suggest how to make the banks (who are in a strong bargaining position, because they do not have as much to lose as in the 1980s) take a larger loss, without unraveling the whole package that is holding the line against default, I think Secretary Rubin would like to hear about it.

Beyond that, as we consider what if anything should be done to modify the international financial system so as to reduce the frequency and sever-

5. Spreads earned by banks were quite low before the crisis (Cline and Barnes 1997). The usual interpretation is that this was entirely a supply phenomenon: evidence that bankers did not sufficiently incorporate the risks of crisis into their behavior. But it is conceivable that there was also a demand aspect to it: that developing countries, observing the effects of earlier crises in Latin America, had become somewhat more reluctant to borrow than in the past.

ity of accidents in the future, perhaps we should consider that bank loans appear to be one of the more danger-prone modes of international capital flows. FDI has the advantage of greater stability. Equities investment has the advantage that risk is efficiently shared: in the event of trouble, market prices automatically decline. (Perhaps securities investors are less prone to panic in an attack than are bankers. They have an illusion of control—they can form a mental picture of themselves selling just before a crash—much like people seem to be more afraid of plane crashes than car crashes, because as drivers they have the illusion of control.) Statistical tests show that the percentage of capital inflows that is composed of bank loans, especially short-term or floating rate loans denominated in foreign currency, has a statistically significant effect on the probability of a currency crisis, while FDI has a significant beneficial effect.

9.4.3 Regarding Policy Conditionality

The reforms allow too much exchange rate flexibility (vs. not enough). The exchange rate policy debate in the current context has some of the flavor of the debate after the Mexican peso crisis. At that time you could read in any newspaper that a foolish mistake had been made regarding the currency; you had to read more carefully to figure out that half the commentators were saying that the mistake was not to have devalued the peso earlier and the other half that the mistake was to have devalued at all.

In the East Asian episode, there is justice in the statement that Thailand should have allowed its currency to depreciate earlier. But here as elsewhere, there is danger of exaggerating in hindsight how obvious this was. Most of the East Asians had long been described as successfully preventing their currencies from becoming overvalued in the way that Latin Americans have historically done. Many Westerners in fact had urged them to *appreciate* their currencies, in response to balance-of-payments surpluses and consistent with the Balassa-Samuelsun argument that rapidly growing countries should experience increases in the relative price of nontraded goods and therefore real appreciation of their currencies. The main point I wish to make with regard to exchange rate policy is that neither currency boards on the one hand nor pure floating rates on the other is a panacea. Following good policies is a complicated matter, with lots of pieces to the puzzle; one cannot solve all problems with a single wave of the currency wand. And it is important to realize that a fervent belief in the virtue of free markets does not help settle the debate. Free market monetarists are just as passionate in their belief that currencies should float, on the grounds that central banks have no business buying and selling foreign exchange, as are free market supply-siders in their belief that exchange rates should be fixed, on the grounds that central banks have no business exercising independent monetary policy. The right answer, fix versus float, depends on the circumstances of the country in question.

To elaborate on the currency board: a number of countries have found it useful. Indonesia does not currently have all the attributes of a country best suited to a currency board. It does have one: desperate circumstances, which make it worthwhile to give up some policy independence for monetary stability. But it lacks others: a small highly open economy, a strong desire for economic integration with a major currency country or set of countries, the rule of law, and enough reserves or a strong enough banking system to avoid converting what would otherwise be a currency crisis into a banking crisis. Perhaps the most important element in those countries where currency boards have worked is an explicit willingness to give up that policy independence, as well as to open the economy and to be ruled by the market.

But it is true that the combination of an overvalued currency and a lot of debt denominated in foreign currency (particularly short-term debt) was a major contributing factor, perhaps the major precipitating factor, to the crisis in Thailand, much as it was in Mexico three years earlier.

The reforms require too much macroeconomic austerity (vs. not enough). Macroeconomic retrenchment is not the central aspect of the country programs. The austerity and hardship that the countries are undergoing in these programs is the consequence of the crisis and the loss of investor confidence, not of the IMF's response to the crisis. It is probably inevitable, in circumstances where the priority is to reverse capital flight and attract wary investors, that interest rates be raised. If the programs are successful, interest rates can soon be brought back down before they do lasting damage to the real economy. As regards fiscal austerity, it is true that the initial agreements with the IMF were predicated on hopes regarding economic growth and corresponding budget surpluses that soon proved a bit overoptimistic; these targets have since been modified.

The reforms require too much structural change. The IMF is not simply applying the same cookie-cutter to East Asia that it applied in the past to Latin America or other problem debtors. The new country programs emphasize structural reform more than macroeconomic austerity. This is entirely appropriate, in that these countries have historically followed good monetary and fiscal policies. The Fund has evolved during its history—shifting from the balance-of-payments problems of industrialized countries in the 1950s and 1960s to the currency problems of developing countries after 1973 and their debt problems after 1982, and then adding the broader problems of the transition economies after 1989. Better that it continue to evolve after 1997, to address the financial and other structural problems in East Asia, than that (like some institutions) it fail to change with the times.

The most important source of moral hazard is between the Asian governments and their financial institutions and large corporations. Thus we are doing the right thing in pushing them to increase transparency and

supervision, improve governance, open their financial markets, and loosen banking relations (directed lending and connected lending). It is a historic opportunity to get them to undertake important structural reforms that they would not otherwise have done.⁶

This is not to say that a country with a primitive domestic financial system should necessarily be opened to the full force of international capital flows before the appropriate domestic market reforms and prudential financial regulations have been put into place. To conclude with a last application of the automobile analogy, if the planned route for a super-highway draws near to a primitive village, it is not a good idea to design an off-ramp that dumps high-speed traffic into the center of town before its streets are paved, intersections are regulated, and pedestrians learn the dangers of walking in the road. But neither is it practical or desirable to try to insulate the village from the modern world indefinitely. Emerging market countries should proceed with *both* domestic reforms and opening to the outside world. They need to accelerate the former so as to keep pace with the latter.

References

- Cline, William, and Kevin Barnes. 1997. Spreads and risk in emerging markets lending. Institute of International Finance Research Paper no. 97-1. Washington, D.C.: Institute of International Finance, November.
- Frankel, Jeffrey. 1995. Recent changes in the financial systems of Asian and Pacific countries. In *Financial stability in a changing environment*, ed. K. Sawamoto, Z. Nakajima, and H. Taguchi, 161–200. Sixth International Conference of the Institute for Monetary and Economic Studies, Bank of Japan. London: Macmillan.
- . 1997. Preventing bank crises: Lessons from recent global bank failures. Keynote speech to conference sponsored by the Federal Reserve Bank of Chicago, Lake Bluff, Ill., 11 June. In *Preventing bank crises*, ed. George Kaufman and William Hunter. Washington, D.C.: World Bank.
- Frankel, Jeffrey, and Andrew Rose. 1996. Currency crashes in emerging markets: An empirical treatment. *Journal of International Economics* 41 (3/4): 351–66.
- Krugman, Paul. 1994. The myth of Asia's miracle. *Foreign Affairs* 73, no. 6 (November/December): 62–78.
- . 1995. Dutch tulips and emerging markets. *Foreign Affairs* 74, no. 4 (July/August): 28–44.

6. The same applies to opening their economies to trade.

This Page Intentionally Left Blank

Panel Presentation

Involving the Private Sector in Crisis Resolution

Peter B. Kenen

My comments will focus mainly on crisis prevention and crisis management, but I will start with brief remarks on the causes and characteristics of the Asian crisis.

In chapter 4 of this volume, Steven Radelet and Jeffrey Sachs identify five types of financial crises—a rubric under which they implicitly subsume what we usually describe as currency crises. While financial and currency crises go together frequently, it is still useful to distinguish between them. The European Monetary System crisis of 1992–93 was a currency crisis. The savings and loan crisis in the United States was a financial crisis, although limited to a subsector of the financial system. It is still useful, moreover, to distinguish between crises due to weak fundamentals, including microeconomic fundamentals, and self-fulfilling crises that would not occur if market participants did not expect them.

I insist on the relevance of these distinctions, not for the purpose of arguing that the Asian crisis can be stuffed into one analytical box, but because that crisis can best be understood by drawing on several approaches.

The Thai crisis that touched off the general crisis can be blamed mainly on bad fundamentals. On the microeconomic side, inadequate prudential supervision allowed financial institutions to take on huge amounts of foreign currency debt and offset it by foreign currency lending to local borrowers having no foreign currency revenues. On the macroeconomic side, the current account deficit was large and growing, due to the Thai government's stubborn defense of an overvalued currency and to falling export

Peter B. Kenen is the Walker Professor of Economics and International Finance and director of the International Finance Section at Princeton University.

growth, reflecting excessive East Asian investment in a rather narrow range of export industries. In short, Thailand was an accident waiting to happen, and that was widely recognized long before the crisis. The International Monetary Fund (IMF) warned the Thai authorities repeatedly that they were courting disaster.

But were the other Asian countries accidents waiting to happen? Many people say so now. The involvement of Malaysia, Indonesia, and Korea has shown, they say, that the so-called Asian model was doomed to failure or had at least been rendered obsolete by its initial success. Absent the Thai crisis, however, would the stock markets and currencies of Indonesia and Korea have collapsed as they did? Some firms and banks were in trouble, serious enough perhaps to trigger a full-fledged crisis. But I am far from sure. Indonesia and Korea might have found “Asian solutions” to the problems of those firms and banks—solutions that would not satisfy us now but might well have earned admiration from some of the same people who now ascribe those problems to the fatal weakness of the Asian model.

Be that as it may, we should be quite cautious about recommending remedies to the Asian countries—the further, rapid liberalization of financial markets and the dismantling of long-standing links among banks, businesses, and bureaucrats. Greater transparency is needed to deter corruption and promote a sounder credit culture. But we will deceive ourselves and the Asian countries if we claim that these objectives can be achieved quickly, even when governments have agreed in good faith to undertake major reforms. Old habits cannot be altered rapidly. They will merely find new ways to manifest themselves.

I am intrigued by another aspect of the Asian crisis—the speed with which a so-called liquidity crisis can turn into a solvency crisis when it leads to a steep depreciation of the domestic currency. Whenever banks and firms have large foreign currency debts, they will scramble for cover when they begin to believe that their national currency might depreciate. That is what happened in Asia as soon as the depreciation of the baht raised doubts about other Asian exchange rates, and the problem was exacerbated by the sharp fall in stock markets. There was indeed a pernicious interaction between stock markets and currency markets. Falling stock markets led to large foreign sales of equities (see table 4.2 in chap. 4). These sales were then reflected in sales of the domestic currency, depressing its value and provoking additional sales of equities. The numbers suggest, moreover, that local banks and firms contributed to the process, as they sought—or were forced—to repay their foreign currency debts.

This cumulative process, however, made it increasingly expensive for banks and firms to service or repay the rest of their foreign currency debts, and those that were solvent at the exchange rates prevailing before the crisis became insolvent because of the crisis. Some might be solvent again,

however, if Asian currencies recover significantly, which leads me to ask whether there has been too much talk of the need for permanent debt workouts as distinct from short-term suspensions of debt service payments.

This comment leads me directly to my main point. There may be better ways to deal with financial crises.

At the Halifax summit in 1995, the G-10 countries were asked to establish a working group to study new ways to resolve sovereign liquidity crises. Jeffrey Sachs can take partial credit. He proposed a radical solution—a bankruptcy regime for sovereign debtors—although, in the end, the working group rejected his approach. Its recommendations were more like those of Barry Eichengreen and Richard Portes (see Sachs 1995; Eichengreen and Portes 1995; Group of Ten 1996).

The working group's views can be summed up in two sentences: The response to the Mexican crisis of 1994–95, massive financial assistance to avoid a default on the Tesobonos, was appropriate under the circumstances. Hereafter, however, debtor governments and private creditors should not expect that response.

What might be done instead? When a government cannot service its external debt, it should suspend its debt service payments temporarily and initiate negotiations with its private creditors in order to reschedule or reduce its debt. It should not be refused ordinary access to IMF credit if it adopts appropriate policies and is making a good faith effort to reach agreement with its private creditors. In other words, the IMF should “lend into arrears” when doing so would signal confidence in the debtor's policies and its long-term prospects. Finally, new foreign currency bonds should include certain clauses aimed at facilitating negotiations between a debtor government and its private creditors when debt service payments have been interrupted. These proposals were endorsed by the G-10 governments.

Although the working group's report was concerned chiefly with Mexico's problem—the inability of a national government to honor its own obligations—the group knew that the next crisis might well involve private sector debt. In fact, some of its members were already worried about Thailand, and the report contained two paragraphs that are directly relevant to the Asian crisis:

On the question of the spectrum of claims to be covered, a suspension of payments will in general be applied uniformly to all claims in a particular class but will differ in scope depending on the severity of the liquidity problem, the composition of the country's obligations, the prospective contribution of a particular creditor class to the restoration of balance-of-payments equilibrium and other considerations. . . . It may no longer be possible to exempt bonds and other claims because of their increased importance. Each case will have to be considered on its mer-

its, taking account of the fact that trade credits and interbank lines *are crucial for maintaining links with the world economy*. (Group of Ten 1996, par. 86; emphasis in original)

It must also be recognized that if the suspension of payments is extended to obligations of the private sector, this may require the use of formal or informal exchange controls. However, the resort to such controls, even temporarily, can have long-lasting adverse effects on a country's access to international capital markets and may not be practicable once a country has completely liberalized external payments and dismantled the machinery for imposing controls. Debtors may nonetheless be tempted to resort to such controls to slow a "rush for the exit" by holders of claims, including domestic holders, which have to believe that a suspension of payments can occur soon. In the case of marketable claims, however, sales may be discouraged by sharp falls in prices caused by the expectation that controls will be imposed; this effect can be reinforced by a depreciation of the domestic currency. When appropriate, a degree of exchange-rate flexibility could help to conserve the country's remaining foreign exchange reserves and may even obviate the need to obstruct the servicing of the private sector's obligations. (par. 88)

The predictions made about falling asset prices and depreciating currencies were not borne out in Asia; far from deterring the exit of foreign capital, they may have intensified the capital outflow. Nevertheless, some of the sentences in these two paragraphs help to explain why the working group's approach was not adopted in the Asian crisis—why it was not decided to impose a prompt, comprehensive ban on debt service payments by the private sector rather than provide increasingly big packages of official credit.

It might have been very hard to make the Thai government adopt the working group's approach and imprudent to count on strict enforcement. The Thais were in denial until they ran out of reserves. At that early stage in the crisis, moreover, the risk of exchange rate contagion was underestimated, and a suspension of debt service payments may have been viewed as being more dangerous to neighboring countries than a large devaluation of the Thai baht. But the objections listed in the G-10 report—the need to protect trade credits and interbank lines and the adverse effects on future creditworthiness—may have been the main objections to a suspension of debt service payments. The approach actually adopted, however, has had very grave effects of its own—not on the Asian countries themselves, but on future funding for the IMF.

Those who believe that the IMF should be abolished because it interferes with the workings of free markets would have been even more vociferous if the IMF had endorsed or required a suspension of debt service payments. Those who believe that the IMF should give more attention to the environment, labor standards, and human rights would not have been appeased if the Fund had followed the advice of the G-10 working group.

But the IMF has also been criticized for helping to hold open the exit by providing large-scale financing and thus helping foreign banks and others having foreign currency claims to leave without taking large losses. Some suffered very large losses on their loans to nonbank borrowers, especially in Indonesia, but others exited early enough to avoid large losses, and the banks that agreed to roll over their loans to Korean banks will not take large losses either. They could not obtain the big interest rate spreads on which they insisted initially, but their claims were guaranteed by the Korean government.

Bearing in mind the concerns expressed in the G-10 report itself—the need to keep trade credit flowing and maintain interbank lines and the concern about creditworthiness—let me propose amendments to the strategy described in the G-10 report. The fundamental premise is, I believe, unassailable. If a country with large foreign currency debts, whether those of the government or the private sector, faces an acute liquidity crisis, a comprehensive suspension of debt service payments may be superior to the mobilization of massive financial assistance. The latter tends to reward those who were doubly dumb—who lent too much initially and were not nimble enough to rush for the exit quickly.

Trade credit flows must not be cut off, and that aim can be achieved by the method now being devised for the Asian countries—concerted action by the export credit agencies of the country's chief trade partners to underwrite or supplement private sector credit flows, with IMF credit used perhaps to back up that effort. Interbank lines must be maintained but should be limited in advance. An emerging market country that is not ready to exercise rigorous prudential supervision of its own banks should be expected to impose strict ceilings on the gross foreign currency debts of its banks—gross, not net, to rule out the ridiculous practice of offsetting debt to foreign banks by making foreign currency loans to domestic entities. (Banks might be allowed to offset foreign currency debt with claims on foreign counterparties, such as forward contracts, but not with foreign currency claims on their own offshore affiliates.) How could such limits be enforced? By amending the Basle capital adequacy standard. Loans to banks in countries that fail to meet well-defined international standards for bank supervision and do not impose strict limits on their banks' foreign currency debts should be given high risk weightings.

Many problems would have to be solved to implement this scheme. It would require the creation of a new international agency or a new division in the IMF to assess the quality of bank supervision in emerging market countries. But that would be easier than trying to create a single supranational regulator for those countries' banks. The scheme would have the effect of limiting the size of interbank lines and thus limiting the moral hazard effect of exempting those interbank lines from a suspension of debt service payments.

One more observation to avoid misunderstanding. I am not proposing that the suspension of debt service payments be followed by a comprehensive negotiation between private sector debtors and their foreign creditors. When it comes time to end the suspension of debt service payments, some private sector debtors will be able to meet their obligations, including arrears accumulated during the suspension, without great difficulty. Much will depend, of course, on the level of their country's exchange rate when the suspension is ended. Other private sector debtors will have much more trouble and will have then to negotiate with their creditors or enter into bankruptcy. Which leads me to my last suggestion. Credit-rating agencies should be strongly encouraged to examine the bankruptcy laws and practices of emerging market countries when they rate corporate borrowers. It is not enough to assess the risk of default. It is also necessary to assess the consequences.

I have not tried to supply an agenda for full-fledged reform of the international financial system. Much more must be done. There is need to amend the IMF's Special Data Dissemination Standard to require that countries supply timely data on the foreign currency debts and claims of commercial banks and the rest of the private sector. There is need to take a fresh look at ways in which the IMF might punish member governments for failing to heed confidential advice on their exchange rate policies. And there is an obvious need to work long and hard on strengthening bank supervision in emerging market countries. My chief aim in these brief comments has been to revive and revise the main proposal in the G-10 report—to find an acceptable way of replacing massive financial support with short-term suspensions of debt service payments.

References

- Eichengreen, B., and R. Portes. 1995. *Crisis? What crisis? Orderly workouts for sovereign debtors*. London: Centre for Economic Policy Research.
- Group of Ten. 1996. *The resolution of sovereign liquidity crises: A report to the ministers and governors prepared under the auspices of the deputies*. Washington, D.C.: International Monetary Fund.
- Sachs, J. 1995. Do we need an international lender of last resort? Paper presented as Frank D. Graham Memorial Lecture, Princeton University, Princeton, N.J., April. Processed.

Contributors

Michael D. Bordo
Department of Economics
New Jersey Hall
Rutgers University
New Brunswick, NJ 08901

Guillermo A. Calvo
Department of Economics
University of Maryland
College Park, MD 20742

J. Bradford De Long
Department of Economics
601 Evans Hall
University of California
Berkeley, CA 94720

Allan Drazen
Department of Economics
University of Maryland
College Park, MD 20742

Sebastian Edwards
Anderson Graduate School of
Business
University of California
110 Westwood Plaza, Suite C508
Box 951481
Los Angeles, CA 90095

Barry Eichengreen
Department of Economics
549 Evans Hall 3880
University of California
Berkeley, CA 94720

Robert P. Flood
International Monetary Fund
700 19th Street NW
Washington, DC 20431

Jeffrey A. Frankel
Kennedy School of Government
Harvard University
79 JFK Street
Cambridge, MA 02138

Peter M. Garber
Department of Economics
Brown University
Providence, RI 02912

Robert J. Gordon
Department of Economics
Northwestern University
Evanston, IL 60208

Olivier Jeanne
Research Department
International Monetary Fund
700 19th Street NW
Washington, DC 20431

Peter B. Kenen
International Finance Section
300 Fisher Hall
Princeton University
Princeton, NJ 08544

Paul Krugman
Department of Economics
Fisher Hall
Princeton University
Princeton, NJ 08544

Gian Maria Milesi-Ferretti
Research Department, Room 9-700J
International Monetary Fund
700 19th Street NW
Washington, DC 20431

Frederic S. Mishkin
Graduate School of Business
Uris Hall 619
Columbia University
New York, NY 10027

Steven Radelet
Harvard Institute for International
Development
14 Story Street
Cambridge, MA 02138

Assaf Razin
Department of Economics
Tel Aviv University
Tel Aviv 69978 Israel

Carmen M. Reinhart
School of Public Affairs
Van Munching Hall, Room 4113D
University of Maryland
College Park, MD 20742

Roberto Rigobon
Sloan School of Management, Room
E52-447
Massachusetts Institute of Technology
50 Memorial Drive
Cambridge, MA 02142

Jeffrey Sachs
Center for International Development
79 John F. Kennedy Street
Cambridge, MA 02138

Miguel A. Savastano
Research Department, Room 9-718
International Monetary Fund
700 19th Street NW
Washington, DC 20431

Jaume Ventura
Department of Economics, E52-262F
Massachusetts Institute of Technology
50 Memorial Drive
Cambridge, MA 02139

Author Index

- Agenor, P. R., 188n7, 190n13
Aguilar, A., 223n36, 224, 230
Akerlof, G., 108
Alberola, E., 242n5
Alesina, A., 278
Alogoskoufis, G., 31
Andersen, P., 279
Andrews, D., 220n29
Aspe, P., 185nn1, 2, 187
Ayuso, J., 242n5
- Baillie, R., 194, 198
Bain, G. S., 31
Banco de México (BOM), 187
Barnes, K., 119, 334n5
Bartolini, L., 58n12
Bebelo, S., 243
Beenstock, M., 29
Benjamin, D., 30
Bensaid, B., 49
Bergin, P., 243n7
Bernanke, B., 12n10, 22, 222n33
Bikhchandani, S., 50
Blanchard, O., 101, 108
Bordo, M., 44
Borenzstein, E., 243n7
Branson, W. H., 247, 248
Broadberry, S. N., 29
Buitert, W., 8n1
Bulow, J., 86n16
Burns, E., 30, 40
- Cairncross, A., 15, 44–45
Calvo, G., 8n2, 68, 69, 71, 72, 77, 78n9, 80, 81, 85n15, 86n17, 91, 101, 188, 190, 287, 289–90, 291, 297
Canzoneri, M., 175, 176
Capie, F., 32
Carstens, A., 188n7, 189, 191
Chang, R., 4, 83n12, 288, 290
Clarida, R., 221, 222
Clay, H., 15, 19–20
Cline, W., 119, 334n5
Cole, G. D. H., 18
Cole, H. L., 71, 86n17, 101
Collins, M., 32
Committee on Finance and Industry (Macmillan committee), 17n15
Corbo, V., 287
Coricelli, F., 91, 101
Corsetti, G., 104
Cottarelli, C., 321
Cottrell, P. L., 16
Council on Foreign Relations, 189
Crafts, N. F. R., 31
- D'Amato, A., 190
Debelle, G., 287
De Grauwe, P., 164
De Gregorio, J., 243n7
De Long, B., 188n7
De Long, C., 188n7
Demirgüç-Kunt, A., 287

- Detragiache, E., 287
de Vries, C., 194, 208
Diamond, D. W., 82–83, 101, 108, 288
Dimsdale, N. H., 12n7, 29, 32
Dornbusch, R., 9, 183, 186–87, 188n7, 190,
241n1, 242, 246, 257, 279
Drazen, A., 48, 54, 55, 57n11, 58, 60n13
Dybvig, P. H., 82–83, 101, 108, 288
- Edwards, S., 69, 186, 188nn7, 8, 215n25,
222, 230, 231, 233, 287
Eichengreen, B., 2, 15, 18n16, 20n17,
31n33, 44–45, 47n1, 50n3, 51, 52, 60,
64–65, 68, 71, 241nn1, 2, 243, 246,
287, 292, 294, 341
Einzig, P., 40
European Monetary Institute (EMI),
168n8, 178
- Faruqee, H., 287
Federal Reserve Bank of Kansas City,
221n32
Feinstein, C. H., 11n4
Feldstein, M., 53, 160, 243n6
Fernandez, R. B., 88
Fernández-Arias, E., 287
Fischer, S., 190
Fisher, I., 21–22
Flood, R., 9n3, 209, 213–18, 232, 286, 289
Folkerts-Landau, D., 155
Foxwell, H. S., 145
Frankel, J., 68, 194, 214, 246, 287, 291n3,
303, 311, 328n1, 329n2
Franz, W., 272
Fraser, H. F., 17, 19
Friedman, M., 84n14, 105
Froot, K., 194
- Garber, P. M., 9n3, 157n1, 166n5, 167n7,
170n9, 180n4, 286, 289
Gerlach, S., 47n1, 51
Gertler, M., 22, 221, 222
Giannini, C., 321
Gil-Díaz, F., 188n7, 189, 191, 220, 223,
224
Goldfajn, I., 9, 70, 83n12, 188n7, 241n1,
242, 246, 257, 279, 288, 291n3
Goldstein, M., 70
Gordon, R. J., 250n14, 271n22, 272
Group of Ten, 341–43
Group of Thirty, 189
- Hamilton, J. D., 29n29
Hatton, T. J., 12n7, 18n16, 29, 30, 31n32,
40
Hawtrey, R. G., 19
Henderson, D., 175, 176
Hernández, L., 287
Hirshleifer, D., 50
Hooper, P., 265
Horsewood, N., 12n7, 29, 32
Hsieh, C.-T., 15n12, 20n17, 241n1
Hume, L. J., 18
- International Abstract of Economic Statis-
tics (IAES)*, 40
International Monetary Fund (IMF), 9n3,
118, 122, 188nn7, 8, 280
Isard, P., 194
Ishii, S., 220n29
Issing, O., 222n33
- James, H., 12n10
Janeway, W. H., 17, 18
Jeanne, O., 9, 20n17, 21n18, 22n20, 24n26,
49, 60, 287
Juan-Ramón, V. H., 223n36, 224, 230
- Kalter, E., 185n1
Kaminsky, G., 70, 94, 287
Kehoe, T. J., 71, 86n17, 101
Kenen, P., 181, 241n2
Keynes, J. M., 11n6, 18, 19, 44
Kindleberger, C., 142–43, 145, 146
Kiyotaki, N., 100, 101
Klein, M. W., 308n12, 311n14
Knight, M. A., 297n7
Kochin, L., 30
Kraay, A., 287, 297
Kremer, M., 101
Krugman, P., 9, 22n20, 48–49, 75–76, 81,
105n1, 106, 107, 108, 188n7, 241n1,
248n13, 257, 286, 287, 288–89, 329n2
Kumhof, M., 76n6
Kunz, D., 20
Kydland, F., 44, 175n12
- Lall, S., 157n1
Lane, P., 287, 297
Leiderman, L., 81, 188n7, 287
Lindbeck, A., 279
Lizondo, S., 287
López-Salido, J. D., 242n5
Losada, F., 188n7

- Loser, C., 185n1
Lustig, N., 185n1, 188n7
- Malpass, David, 221
Mancera, Miguel, 189n9
Mann, C. L., 265
Marion, N. P., 9n3, 308n12, 311n14
Masson, P., 9, 22n20, 48, 50, 52, 60n13, 188n7, 190n13, 287
McKinnon, R., 3, 241n2
McLeod, R., 138n10
McMahon, P., 194, 198
Mélitz, J., 64
Mendoza, E. G., 71, 80, 85n15, 188n7, 287
Menon, J., 247, 265, 266
Mihov, I., 222n33
Milesi-Ferretti, G. M., 187n4, 287, 302n8, 323
Miller, M., 11n5
Mishkin, F. S., 154
Moersch, M., 243n7
Moggridge, D., 16n14
Montiel, P., 287
Moore, J., 100, 101
Morton, W. A., 19
Mundell, R., 246–47, 269
- Naim, M., 188n7
National Monetary Commission, Great Britain, 17n15
Neimeyer, Otto, 17
Nickell, S. J., 12n7, 32, 242n4, 244
- Obstfeld, M., 3, 9n3, 24n26, 48, 67, 71, 164, 165, 172–75, 179, 180, 188n7, 241nn1, 2, 244n8, 246, 286, 288
O'Dogherty, P., 223
Organization for Economic Cooperation and Development (OECD), 242n3, 264t, 280
Ortiz, G., 187
Ozkan, F. G., 49
- Palyi, M., 20
Park, Y.-C., 105n1, 118
Pelagidis, T., 242
Perotti, R., 278, 287
Pesenti, P., 104
Pill, H., 3
Pollard, S., 20
Portes, R., 341
- Prescott, E., 175n12
Price, R., 31
- Radelet, S., 107, 138n9
Ramey, V., 91
Razin, A., 187n4, 287, 302n8, 323
Recueil International de Statistiques Economiques (RISE), 40
Redmond, J., 12n8
Reinhart, C. M., 68, 70, 78n9, 81, 94, 287
Reisen, H., 187n4
Reynoso, A., 188n7, 189
Rigobon, R., 100n4
Robinson, S., 188n7
Rogoff, K., 71, 86n16, 175, 176, 188n7, 194
Romer, C., 221n32
Romer, D., 221n32
Romer, P., 108
Rose, A., 2, 47n1, 51, 68, 71, 194, 209, 213–18, 232, 241n1, 243, 246, 287, 291n3, 292, 294, 303, 311, 328n1
Roubini, N., 104
- Sachs, J., 107, 109, 128n7, 188nn7, 8, 287, 341
Santaella, J. A., 185n2, 297n7
Sargan, J. D., 30
Sargent, T. J., 176
Savastano, M., 215n25, 222, 230, 231, 233
Sayers, R. S., 16, 18, 19, 40, 44–45
Schmukler, S., 68
Schwartz, A. J., 84n14, 105
Smets, F., 47n1, 51
Smith, R., 31
Spaventa, L., 164
Steiner, R., 188n7
Summers, B., 168
Sutherland, A., 11n5, 49
Svensson, L. E. O., 14, 241n1, 257
- Tavares, J., 278
Taylor, C., 241n2
Taylor, J., 221
Thorne, A., 188n7
Tornell, A., 128n7, 188nn7, 8, 287, 297
- Valdés, R. O., 9, 70, 83n12, 188n7, 241n1, 242, 246, 257, 279, 288, 291n3
Végh, C. A., 78n9
Vela, A., 185n2
Velasco, A., 4, 24n26, 83n12, 128n7, 188nn7, 8, 287, 288

Ventura, J., 287, 290, 297
von Hagen, J., 241n2

Wallace, N. N., 176
Warburton, P., 29
Warner, A., 188n7
Watson, M. W., 108

Welch, I., 50
Werner, A., 188n7, 190, 209n21
Willman, A., 8n2
World Bank, 83
Wyplosz, C., 2, 47n1, 50n3, 51, 52, 64–65,
68, 71, 241nn1, 2, 243, 246, 287, 290,
292, 294

Subject Index

- Adverse selection: with currency devaluation, 156; as problem of asymmetric information, 154
- Asian Development Bank: provider of public funds, 332
- Balance of payments: current accounts in East Asia (1985–96), 124–25; Thailand's deficit (1997), 328. *See also* Capital flows; Current account; Current account deficits
- Balance-of-payments crises: in absence of current account deficits, 98–100; with balanced current account and full neutrality, 73–76; with balanced current account and nontradable goods, 77–79; conditions for occurrences of, 75–76; self-fulfilling, 85–87
- Balassa-Samuelson theory, 335
- Banking systems: bank runs in Indonesia, Thailand, and Korea, 4, 116; East Asian economies (1995–97), 111–16, 128–37, 140–45, 154–57; effect of deterioration in, 155–56; effect of devaluation in emerging market countries, 157–58; emerging market countries, 88–95, 100–103; foreign bank lending to East Asian countries (1995–97), 111–16. *See also* Credit markets
- Bank of Mexico (BOM): expansion of domestic credit (1994), 81–82; monetary policy, 222–25; peso devaluation (1994), 219; peso-dollar rate (1995–97), 226–32; postcrisis monetary policy (1995–97), 5, 219–33. *See also* Cetes (peso-denominated debt); Tesobonos (dollar-linked instruments)
- Bank of Thailand, 135
- Basle capital adequacy standard, 343
- Brady plan, Mexico, 186
- Budget deficit, United Kingdom: as factor in sterling crisis (1931), 45
- Capital flows: composition of, 328; controls on outflows, 83; dangers of large inflows, 81–85; into East Asian countries, 116–19, 124–26; inflows of foreign capital, 155; into Mexico (1990s), 186–88; negative inflows, 85–87; outflows of foreign capital in East Asia (1994–98), 111–16; policies to manage, 87–88, 116–18; slowdown of inflows, 87; subsidized investment and inflows, 83. *See also* Balance of payments; Cetes (peso-denominated debt); Current account; Tesobonos (dollar-linked instruments)
- Central banks: Bank of England role (1931), 15–20, 45; day-to-day operations, 224; in ESCB, 166; as lenders of last resort, 159. *See also* Bank of Mexico (BOM); Bank of Thailand; European Central Bank (ECB); European System of Central Banks (ESCB)

- Cetes (peso-denominated debt), 190–91, 220–21, 228–30
- Contagion: definitions of, 4, 49–50; effects in East Asia, 135–36; effects in Indonesia, 137–40; in Europe (1931), 15–20; information cascade model, 50–51, 62; multiple equilibria model, 52, 62; political, 52–54, 62, 67; spill-over model, 51–52, 62
- Contagion, membership: defined, 54; in European Monetary System (EMS) crisis (1992–93), 62–66; government's choices in model of, 56–58; model of, 54–62; reverse, 61; value of club membership in model of, 59–61
- Corporate governance, Asian style, 329
- Credit markets: East Asian economies (1995–97), 111–16, 119–23, 128–32, 154–57; in emerging market countries, 88–95, 100–102, 156; lending booms with financial liberalization, 155; Mexico (1994), 81–82; related to speculator behavior, 55–56; sovereign ceiling doctrine, 116; United Kingdom (1931), 16–20
- Currencies: appreciation in Mexico (1988–92), 186–87; behavior of Mexican peso (1995–97), 192–219; conversion to the euro, 163; devaluation expectations in Great Britain (1925–31), 14–15; effect of weakness of one club member's, 63–65; Mexico (1995–97), 219–31; modeling EMU conversion restrictions, 172–75; replacement under EMU of national, 166; speculators' borrowing domestic to buy foreign, 55–56; sterling's fall against other currencies (1930), 15. *See also* Depreciations; Devaluation; Euro, the; Speculative attacks; Sterling
- Currency boards, 335–36
- Currency crashes: defined, 306f; indicators of, 303–13; Thailand, 328
- Currency crises: causing financial crisis, 156–57; compared to current account reversals, 5–6, 313, 316–17; conditions in emerging markets for, 155; contagious, 4, 47, 49–54, 67; description of, 1; effects, 5–6; European Monetary System (EMS) (1992–93), 339; output performance after, 312–15; unemployment-based model, 20–25. *See also* Contagion; Currency crashes; European Monetary System (EMS); International Monetary Fund (IMF); Mexico; Speculative attacks
- Currency crisis models: counterfactual simulations, 33–37; early, 2–3; empirical tests of, 287; estimation, 26–33; first- and second-generation, 2–5, 8–9, 15, 52, 286; possible third-generation, 3–4; with unemployment variable, 20–26
- Current account: crisis related to deteriorating, 52; currency crises different from reversals in, 5–6; East Asian countries (1985–96), 124–26; intertemporal aspects, 287; output growth in countries with imbalances in, 301–3; post-1925 weakness in United Kingdom, 45; predictors of imbalances, 297; United Kingdom (1931), 16–20, 45. *See also* Capital flows
- Current account deficits: analysis using reversals as events, 291–301, 325; balance-of-payments crises in absence of, 98–100; without capital inflows, 85; conditions for reversals in, 286, 324; financing of, 328; as indicator of currency crash, 311; indicators of reversals, 291–300, 323–24; Mexico's financing of (1992–94), 186; reversals compared to currency crises, 313, 316–17; Thailand (1997), 327–28; theoretical determinants of reversals of, 288–90
- Data sources: analysis of current account reversals, 290–91, 319–21; analysis of ERM stayer and leaver countries, 251, 264–65, 279–80; comparison of Mexican exchange rate with other currencies, 194; currency crisis model, 26–27, 40
- Debt: long-term ratings in East Asia (1996–97), 119–20; Mexico's peso-denominated Cetes, 190–91
- Debt service, foreign currency: of East Asian countries, 340–41; proposed short-term suspension of payments, 341–44
- Depreciations: in currency crash, 306f; in East Asia (1994–97), 115; peso-dollar rate (1995–97), 226–32
- Devaluation: adverse selection with, 156; conditions for, 2; effect in emerging market countries, 156; effect in industri-

- alized countries, 156; in ERM leaver and stayer countries, 265–70; European Monetary System (EMS), 47, 62–66; factors in EMS decision, 47; in membership contagion model, 56–58; of Mexican peso (1994), 219; Mexico (1988–94), 185–87; as necessity, 68; as political decision, 47–49, 67–68; probability in currency crisis model, 22–26, 32–33, 38–39; speculator behavior related to, 49. *See also* Depreciations
- East Asian countries: composition of capital inflows (1997), 328; currency crisis (1997–98), 1; exchange rate policy, 335–37; export growth (1996–97), 128; flawed financial system, 328; foreign currency debt, 340; growing risk (1996–97), 124–32; macroeconomic policy, 336; money and credit (1990–96), 128–30. *See also* Contagion; Indonesia; Korea, South; Malaysia; Philippines; Thailand
- ECB. *See* European Central Bank (ECB)
- Economic and Monetary Union (EMU): conditions for viability of, 180–81; convergence criteria for membership, 63–64; endgame of Stage II, 164; as explicit currency area, 53; function of, 166; modeling Stage II and III conversion restrictions, 172–75; potential for contagion among members, 59–65, 68; stages of transition to, 163; Stage III conversions to the euro, 4–5, 163; Stage III currency exchange rate policy, 4–5, 164
- Economic performance: ERM leaver and stayer countries (1987–96), 255f, 256f, 258, 262–65, 278; output after currency crisis, 312–15; output in countries with reductions in current account imbalances, 301–3; slow growth as indicator of currency crash, 308–10
- Economic policy: political objectives, 53–54; reform in Mexico (1985–89), 185
- Emerging market countries: causes of financial crises in, 155; contagious crises, 68–70; effect of devaluation in, 157–58; government role in managing capital inflows, 81–85; weak regulatory regimes, 155, 158. *See also* Contagion, membership
- EMU. *See* Economic and Monetary Union (EMU)
- ERM. *See* Exchange Rate Mechanism (ERM)
- ERM leaver and stayer countries: before and after 1992 ERM breakup, 251–65; differences from stayer countries, 257–59, 278; IS-LM analysis, 248–49, 258; pass-through of exchange rate devaluation, 265–70; Phillips curve analysis, 249–51
- ESCB. *See* European System of Central Banks (ESCB)
- Euro, the: cross-border payments through TARGET, 167–70; as replacement for national currencies, 166; TARGET cross-border payments system for, 167–71
- Euromoney Country Risk Assessment: for East Asian countries (1993–97), 120–21
- European Central Bank (ECB): function of, 166; in Stage III of EMU operation, 4–5, 164–65
- European Monetary Institute (EMI): description of TARGET payments system, 178–79
- European Monetary System (EMS): currency crisis (1992–93), 1, 47, 59, 339; currency fluctuation bands, 63; membership contagion in crisis (1992–93), 62–66
- European System of Central Banks (ESCB): intended bilateral rates, 165; structure and function, 166
- European Union member countries. *See* ERM leaver and stayer countries
- Exchange Rate Mechanism (ERM): contagion vehicle in crisis (1992–93), 52; German reunification as cause of 1992 breakup, 248; political factors in crisis (1992–93), 68; speculative attack crippling (1992), 166. *See also* ERM leaver and stayer countries
- Exchange rate regime: in first years of EMU, 177–78; Mexican modification of (1988–94), 185–86; Mexico (1988–94), 191–92, 195–98; Mexico (1995–97), 192–219
- Exchange rates: appreciation in East Asia (1988–97), 126–28; depreciation in currency crash, 306f; depreciation in East Asia (1994–97), 115; effective, 283;

Exchange rates (*cont.*)

- EMU currencies with locked, 166;
 - ERM stayer and leaver countries (1987–96), 252f, 257, 259–60, 262–64;
 - ERM stayer and leaver country pass-through of devaluation, 265–70; maintenance of British, 16–20; policy in currency crisis model, 21; post-1995 peso-dollar stability, 232; real exchange rate in United Kingdom (1925–36), 12. *See also* Balance of payments; Current account; Real exchange rate
- Financial crises: asymmetric information view, 154; bubble collapse, 108–9; currency crisis as cause of, 156–57; defined, 44; diagnosis and treatment, 109–11; disorderly workout, or debt overhang, 109; distinct from currency crises, 339; factors in resolution of, 159; financial panic, 108–9; induced by macroeconomic policy, 107–8; moral hazard crisis, 108–9; predicting, 329; role of sovereign governments, 79–81; use of public money in response to East Asian, 333–35. *See also* Contagion; International Monetary Fund (IMF); Mexico; Speculative attacks
- Financial crisis, East Asia: asymmetric information view, 154–59; events triggering, 133, 135–37; financial panic, 136–37; in Indonesia, 137–40; macroeconomic and financial processes in, 111–16; microeconomic policy mistakes, 154–61. *See also* Contagion; East Asian countries; International Monetary Fund (IMF)
- Financial markets: Anglo-American model, 328; efficiency of, 332–33; flawed structure of East Asian, 328–30; Japanese, 328–29; markets with asymmetric information, 154
- Fiscal policy: of IMF in East Asian financial crisis, 149; United Kingdom (1931), 16–20
- Foreign exchange reserves: with current account in equilibrium, 73–79; East Asian countries, 124; as indicator of currency crash, 308–10; speculator buying of, 55–56; Thailand (1997), 328, 342; United Kingdom (1931), 15–20
- Germany: IS-LM analysis, 248–50, 258; Phillips curve analysis, 249–50. *See also* ERM leaver and stayer countries
- Gold reserves: Bank of England losses (1930), 15–17
- Gold standard: abandoned by United Kingdom (1931), 9–10, 43–44; as contingent rule, 44; interwar, 44; postwar return in United Kingdom, 11, 14, 44
- Government: behavior in currency crisis models, 4–5; choice of exchange rate policy, 56–58, 61–62; choices in model of membership contagion, 56–58; intervention in East Asian economies, 330; probability of devaluation in membership contagion model, 61–62; role in sterling crisis (1931), 10–20. *See also* Central banks; East Asian countries; Economic and Monetary Union (EMU); Mexico
- Harrison, George, 16
- Harvey, Ernest, 17, 19
- Indonesia: contagion, panic, and crisis in, 137–40; current account (1985–96), 125–26, 133; external debt, 124, 133; IMF analysis (1997), 122–23; IMF Board discussion, 151; money and credit (1990–96), 129–30; risk assessment (1993–97), 121; signs IMF program, 138–39; sovereign ceiling doctrine, 116; stock market and bank lending (1997), 123; syndicated loan spreads, 119
- Industrial policy, Asian, 330
- Inflation: with devaluation in emerging market countries, 157; ERM stayer and leaver countries (1987–96), 253f, 254f, 255f, 257–60, 262; Mexican stabilization program (1987–88), 185; Mexico (1988–94), 186–88; Mexico (1995–97), 192; triangle model of, 271–72; wage-price inflation in ERM leaver and stayer countries, 270–76
- Information: about Mexico available to foreign markets, 189–90; of speculators in decision to attack, 55
- Information, asymmetric: in membership contagion model, 56–58; in view of East Asian financial crisis, 154–59
- Information cascade model, 50–51

- Interest rates: in Asian financial crisis, 115; Bank of England failure to raise (1931), 16–20, 45; in currency crisis model, 21–26; real interest rate in United Kingdom (1925–36), 12–14; relation of currency crash to high U.S., 308–10
- International Monetary Fund (IMF): advice to Thailand (1997), 328; assessment of East Asian economic performance (1996–97), 121–22; Indonesian program, 138–39; Korean program, 139; as lender of last resort, 159; programs for East Asian economies, 336–37; proposed lending into arrears, 341; provider of public funds, 332; recommendations at start of Asian financial crisis, 136; role in Asian financial crisis, 115, 140–49; Special Data Dissemination Standard, 344; Thai program, 140
- Korea, South: capital inflows (1990s), 118; current account (1985–96), 124–26, 133; exchange rates, 117; external debt, 133; foreign bank lending (1997), 123; foreign exchange reserves, 124; IMF analysis (1997), 122–23; IMF Board discussion, 151–52; as member of OECD, 106; money and credit (1990–96), 128–29; risk assessment (1993–97), 121; signs IMF program, 139; sovereign ceiling doctrine, 116; stock market decline, 136; syndicated loan spreads, 119
- Labor force: costs in ERM stayer and leaver countries, 254f, 255f, 258, 260, 262, 270–76. *See also* Unemployment; Wages
- Lender of last resort, international: role in financial crises, 159–61
- Lending booms. *See* Credit markets
- Liquidity crises, 341
- Maastricht Treaty: currency conversion rates restrictions, 164–65, 177; effect of criteria on leaver countries, 249, 263t, 264t, 278–79
- MacDonald, Ramsay, 16
- Macmillan, H. P., 19
- Macmillan committee (Committee on Finance and Industry) report, 15, 17n15, 19
- Macroeconomic policy: East Asian countries, 336; management of foreign capital inflows, 87–88, 116–18; Mexican Pacto (1988), 185–88, 191–92; structure in currency crisis model, 20–26. *See also* Exchange rates; Fiscal policy; Monetary policy
- Madrid Council, 164–65
- Malaysia: current account (1985–96), 124–26, 133; exchange rates, 117; FDI inflows (1990s), 117; money and credit (1990–96), 128–29; risk assessment (1993–97), 121; stock market performance (1997), 123; syndicated loan spreads, 119
- May committee (1931), 16, 45
- Mexico: behavior of peso (1995–97), 192–219; currency crisis (1994–95), 1; economic reform (1985–89), 185; exchange rate appreciation (1988–93), 128, 186–87; IMF-U.S. support package (1995), 219; inflation (1995), 157; as member of OECD, 106; response to crisis (1994–95), 341; role in Latin American debt crisis, 185. *See also* Bank of Mexico (BOM)
- Monetary policy: exchange rate models of, 163–64, 174–75; of IMF in East Asian financial crisis, 145–49; to manage capital flows, 87–88; United Kingdom (1931), 15–20
- Moral hazard: avoidance of future, 84; incentives in emerging market countries, 156; limits in emerging markets, 160; as problem of asymmetric information, 154–55
- Norman, Montagu, 16, 19
- North American Free Trade Agreement (NAFTA), 185
- Philippines: banking system regulation, 118; capital market liberalization, 117; current account (1985–96), 125–26; exchange rates, 117; external debt, 124; money and credit (1990–96), 128–30; risk assessment (1997), 119–21; syndicated loan spreads, 119
- Phillips curve: as generic term, 270; triangle model of inflation, 270–71

- Prices: in currency crisis model, 21–26, 32; wage-price inflation in ERM leaver and stayer countries, 270–76
- Purchasing power parity (PPP): long-run validity, 246–48
- Real exchange rate: overvaluation as indicator of currency crash, 308–10; in United Kingdom (1925–36), 12
- Regulation: of financial sector in emerging market countries, 155, 158–60; Philippine banking system, 118
- Risk: in East Asian countries (1993–97), 121, 124–32; Euromoney Country Risk Assessment for East Asia, 121; pooling in emerging markets, 82–83
- Risk taking: in currency crisis, 156–57; after financial liberalization, 154–55. *See also* Adverse selection; Moral hazard
- Salinas de Gortari, Carlos, 185
- Shocks: in currency crisis model, 25–26, 33; information used by speculators in, 55
- Snowden, Philip, 16
- Speculative attacks: conditions for, 7–9, 286; emerging market countries' defense against, 155–56; during Great Depression, 9; models of, 48–49; political contagion concept in, 53–54; role in financial crisis, 158–59; on sterling (1931), 9–10. *See also* Contagion
- Sterling: crises (1927, 1929, 1931), 9, 45; effect of external shocks on, 25, 33–37; post-1925 overvaluation, 45
- Sugisaki, Shigemitsu, 146
- TARGET payments system: of EMU, 165–70, 177–81; as settlement system, 167–71
- Terms of trade: as indicator of currency crash, 308–10
- Tesobonos (dollar-linked instruments): doubling (1994), 192; replace peso-denominated debt, 190–91; threat of default on (1994), 231
- Thailand: banking system, 18; budget balances, 123–24; capital inflows (1990s), 117; current account (1985–96), 125–26, 133; exchange rates, 117; external debt, 133; factors igniting East Asian crisis, 339–40; foreign currency debt, 339; foreign exchange reserves, 124; IMF analysis (1997), 122–23; IMF Board discussion, 152; macroeconomic policy, 327–28, 339–40; money and credit (1990–96), 128–30; risk assessment (1993–97), 121; sovereign ceiling doctrine, 116; syndicated loan spreads, 119
- Unemployment: as cause of sterling crisis, 33; driven by external shocks of Great Depression, 43; during Great Depression, 9; United Kingdom (1925–36), 10–20, 43; as variable in currency crisis model, 20–31, 37
- United States: effect of high interest rates in, 308–10; IMF-U.S. support package for Mexico, 219; as lender of last resort, 159
- Wages: in currency crisis model, 21–26, 29–31; real wage in Great Britain (1925–36), 12–14
- World Bank: provider of public funds, 332
- Zedillo, Ernesto, 192

This Page Intentionally Left Blank

Capital Flows and the Emerging Economies: Theory, Evidence, and Controversies

Edited by Sebastian Edwards

This timely volume from the NBER examines the correlation between volatile capital mobility, currency instability, and the threat of regional contagion, focusing particular attention on the emergent economies of Latin America, Southeast Asia, and Eastern Europe.

An NBER Conference Report

International Capital Flows

Edited by Martin Feldstein

International Capital Flows contains nontechnical background papers by eminent scholars and short essays by practitioners who have played key roles in the policy process and the private sector on the experience of capital flows to Latin America, Asia, and Eastern Europe. These papers discuss the role of banks, equity markets, and foreign direct investment in international capital flows, and the risks that investors and others face with these transactions.

An NBER Conference Report

Deregulation and Interdependence in the Asia-Pacific Region

Edited by Takatoshi Ito and Anne O. Krueger

These essays explore the broadly similar experiences of certain economies in the Asia-Pacific region—China, Hong Kong, Japan, Korea—in dealing with the potentially volatile process of deregulation and examine the East Asian response to a rapidly transforming economic environment.

NBER—East Asia Seminar on Economics, Volume 8

THE UNIVERSITY OF CHICAGO PRESS

ISBN 0-226-45462-2



9 780226 454627



90000