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CAN TECHNICAL ANALYSIS STILL BEAT RANDOM SYSTEMS ?

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 www.whs-gmbh.de

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“Live (*markets*) can only understood backwards,

but it (*they*) must be lived (*traded*) forwards.”

SÖREN KIERKEGAARD, Danish Philosopher

Acknowledgements

This manual could not have been written without the assistance of the following software:

Omega Research

Trading Strategy Backtesting Software: TradeStation

www.omegaresearch.com

RINA Systems

Development of Performance Analysis Software: Portfolio Evaluator, Money Manager

www.rinasystems.com

AnalyCorp (Dr. Savage)

Business Analysis Software for Microsoft Excel: Insight.xla

www.analycorp.com

Tradeworks software

Random Number Generator by Dave de Luca

http://mechtrading.com/tradestation/random.html

Inside Edge Systems, Inc.

Portfolio Monte Carlo Simulation by Bill Brower

www.insideedgesystems.com

1. The Problem

“Progress in knowledge results more from efforts to find faults with our theories, rather than prove them.”

SIR KARL POPPER, Austrian Philosopher

Technical Analysts often find a system or technical method that seems extremely profitable and convenient to follow - one that they think has been overlooked by the professionals. Sometimes they are right, but most often that method doesn't work in practical trading or for a longer time.

Technical analysis uses price and related data to decide when to buy and sell. The methods used can be interpretive as chart patterns and astrology, or as specific as mathematical formulas and spectral analysis. All factors that influence the markets are assumed to be netted out as the current price.

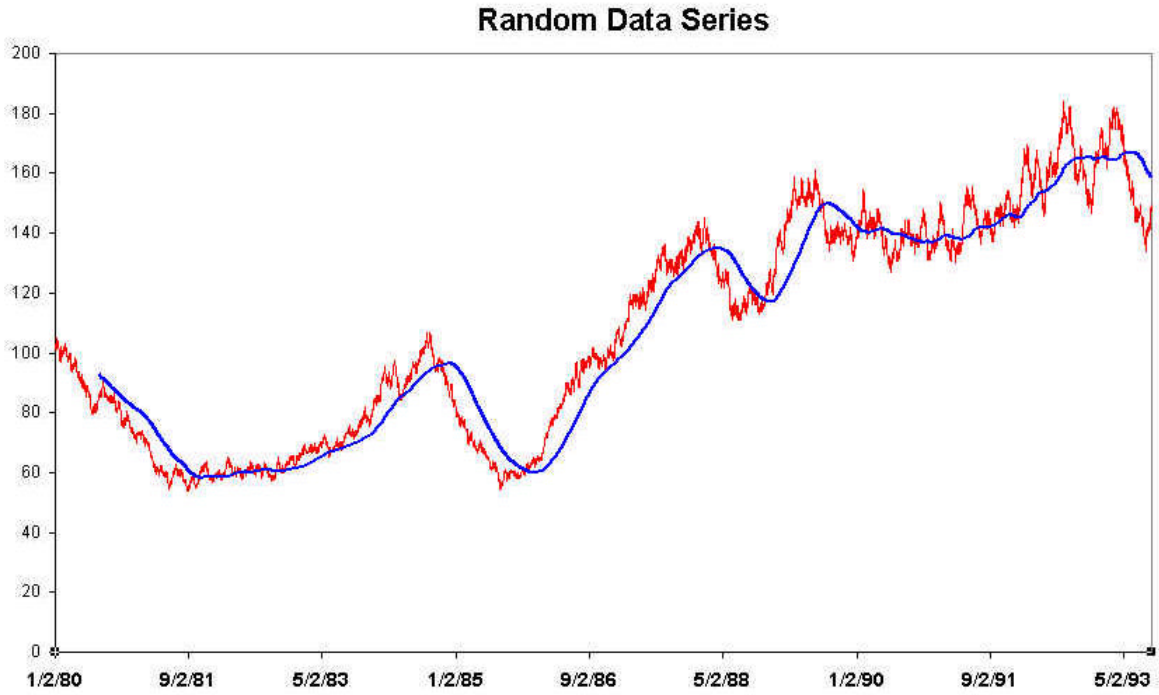


Figure 1: Random generated data with 200-Moving Average

On the other side it has been the position of many fundamental and economic analysis advocates that there is no sequential correlation between the direction of price movement from one day to the next.

Even if the markets were random, people fail to understand randomness. When a long trend does occur in a random sequence, people assume that it is not random.

They develop theories to suggest that it is something other than a long series in a random sequence. This tendency comes from our natural inclination to treat the world as if everything were predictable and understandable. As a result, people seek patterns where none exist and assume the existence of unjustified relationships.

The following parts will show the results of some investigations done by the author regarding the random behaviour of price data and system results. There were three main topics:

a. The fundamental issue of technical trading systems evaluation is to answer the questions: How much did the result of the trading system differ from a randomly selected set of trading signals and how much did the results differ from an available benchmark?
b. Many technical based systems fail to meet expectations when used in trading even though they performed very well on historical data or in practical trading before. This can happen because of changing market conditions or - in the case of backtesting only - because of insufficient testing.
c. Measuring the risk /reward - profile of a system may sound somewhat trivial. At a closer inspection, however, various issues arise, affecting the comparison between different systems or the probability for the future outcomes of a system.

2. The Solution

"I like the Japanese philosophie where you ask questions rather than look for answers. The more questions you come up with the better. The answers will happen."

SUNNY HARRIS, Trader

There are some different ways to get reliable numbers on the stability and the mathematical expectation of a system:

- Finding a profitable strategy in a historic backtest does not guarantee any measure of success in the future but at least there is a better chance that the strategy will make money going forward than the strategy which has consistently demonstrated a propensity to fail. Still the profitable strategy must be assessed to see if it meets the investors risk/reward - profile. We can compute probability risk/reward - profiles using a statistical method called Monte Carlo Simulation (MCS).

- One way to evaluate a system on a market is to test it on simulated or synthetic data. Using synthetic data, a trader can test systems on price files that have been simulated from any underlying market. The need for extensive system testing on simulated (other names are synthetic, scrambled) data is widely discussed in several books.

- A given system can be compared with a system that was generated on the basis of a random number generator. That means that the entry signals were generated by chance only.

3. Key System Performance Numbers

“It is not only fine feathers that make fine birds.”

AESOP

A mechanical system should teach you proper principles of trading. In the case of trendfollowing systems it teaches you to go in the direction of momentum. In Figure 2 you can see the equity-curves (in points) for a trendfollwing system on the DAX in comparison with the underlying Cash-DAX. The system was implemented on the historical database over the last ten years.

In Figure 3 you can see the same system implemented on the S&P 500 (again the Cashindex is used for the study).

While the system on the DAX shows a high correlation with the underlying, the same trading logic failed on the S&P 500 nearly all the time.

Figure 2: DAX – Index vs. System (in points)

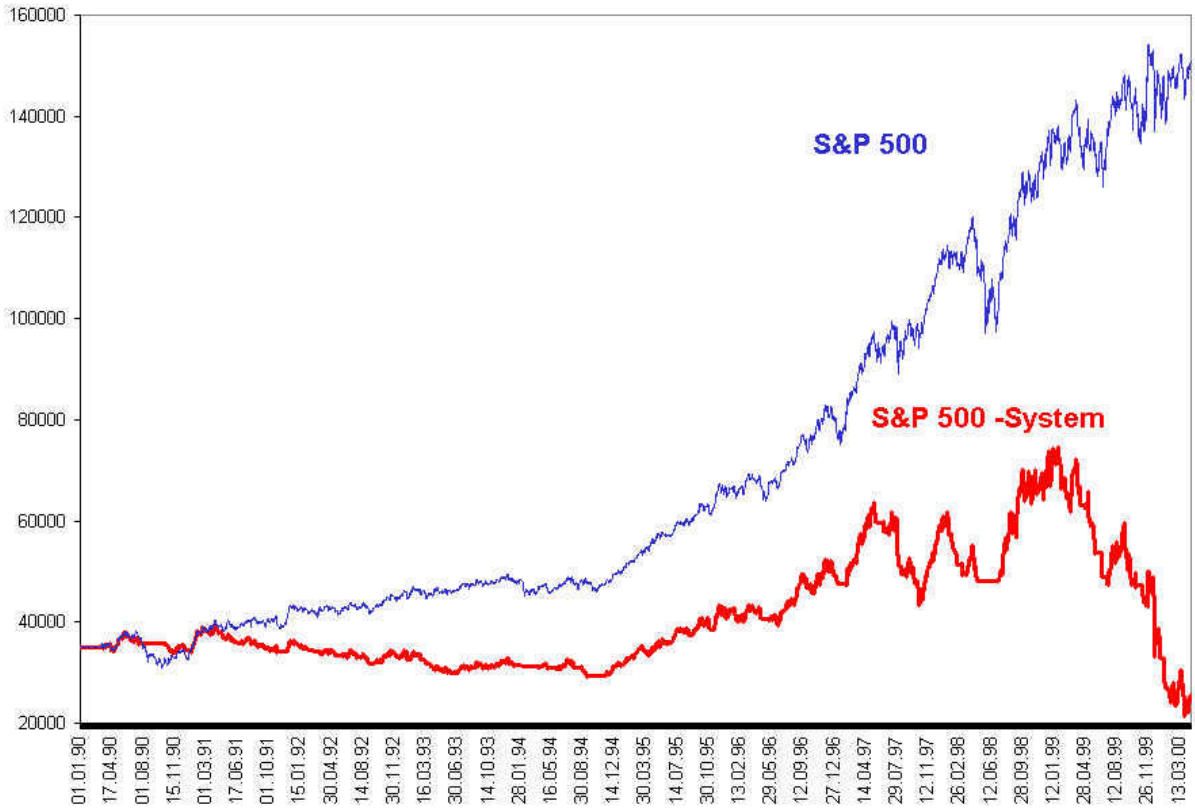


Figure 3: S&P 500 – Index vs. System (in points)

Some performance numbers are shown in table 1, statistical numbers are shown in table 2.

	DAX		S&P 500	
	Buy and Hold	System	Buy and Hold	System
Total Net Profit (points)	5,386	3,161	1,155	-126
Return on Initial Capital	291.77%	170.87%	329.96%	-36.00%
Annual Rate of Return	13.95%	10.07%	15.00%	-4.19%
Max Drawdown	-35.00%	-22.00%	-23.00%	-69.54%
Net Profit / Max Drawdown	10.29	10.45	27.89	-1.17
Profit Factor	-	1.86	-	0.88

Table 1: Performance Summary Report

	DAX		S&P 500	
	Buy and Hold	System	Buy and Hold	System
Arithmetic Mean (% per day)	0.06%	0.04%	0.06%	0.00%
Standard Deviation	1.23%	0.90%	0.90%	1.47%
Skewness	-0.32	-0.37	-0.25	-1.38
Kurtosis	4.98	7.43	5.10	26.84
Maximum	7.54%	5.06%	5.04%	13.37%
Minimum	-8.36%	-8.36%	-6.77%	-20.13%

Table 2: Statistical Numbers

Notice:

The underlyings and both systems are negativ skewed. This menas that we would expect more high negative daily yields than the normal distribution would suggest.

No one of the systems were able to beat the “Buy and Hold” – strategy.

Daily Yield Distribution

Figure 4 shows the daily yield distributions.

Result:

The S&P 500 and the DAX has “fat tails” and lower peaks than the corresponding systems, which means that they are more volatile.

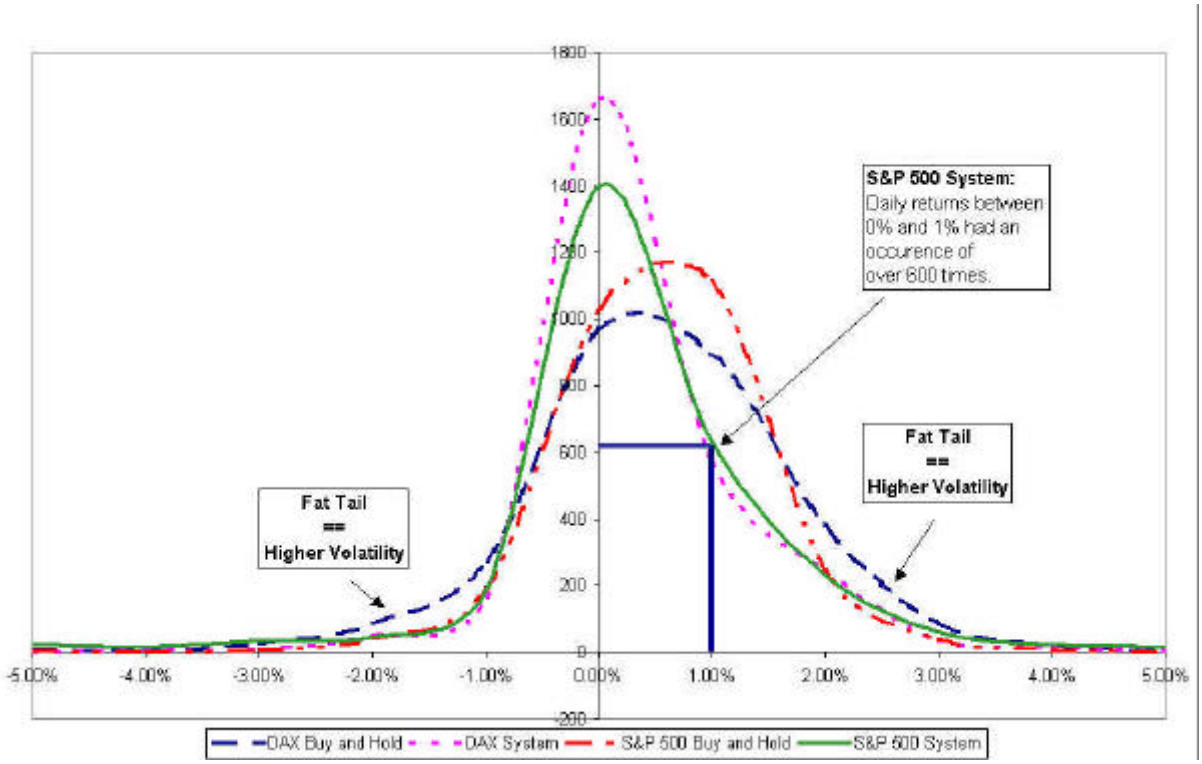


Figure 4: Daily Yield Distribution

Problem:

The above data shows the result of only one dataset. This shouldn’t give us reliable numbers for results in the future. To solve this problem we could use Monte Carlo Simulation (MCS).

4. Monte Carlo Simulation (MCS)

“If a man will begin with certainties, he shall end in doubts, but if he will be content to begin with doubts, he shall end in certainties.”

FRANCIS BACON, English Philosopher

The idea of MCS is simple. One generates a large number (5.000 – 20.000) of market scenarios that follow the same underlying distribution. For each scenario the value of the parameter (e.g. Daily Yield, Max Drawdown, Profit-/Risk – Ratio etc.) is calculated and recorded. The calculated value form the probability distribution of the parameter value, from which the probability for occurrence can be derived.

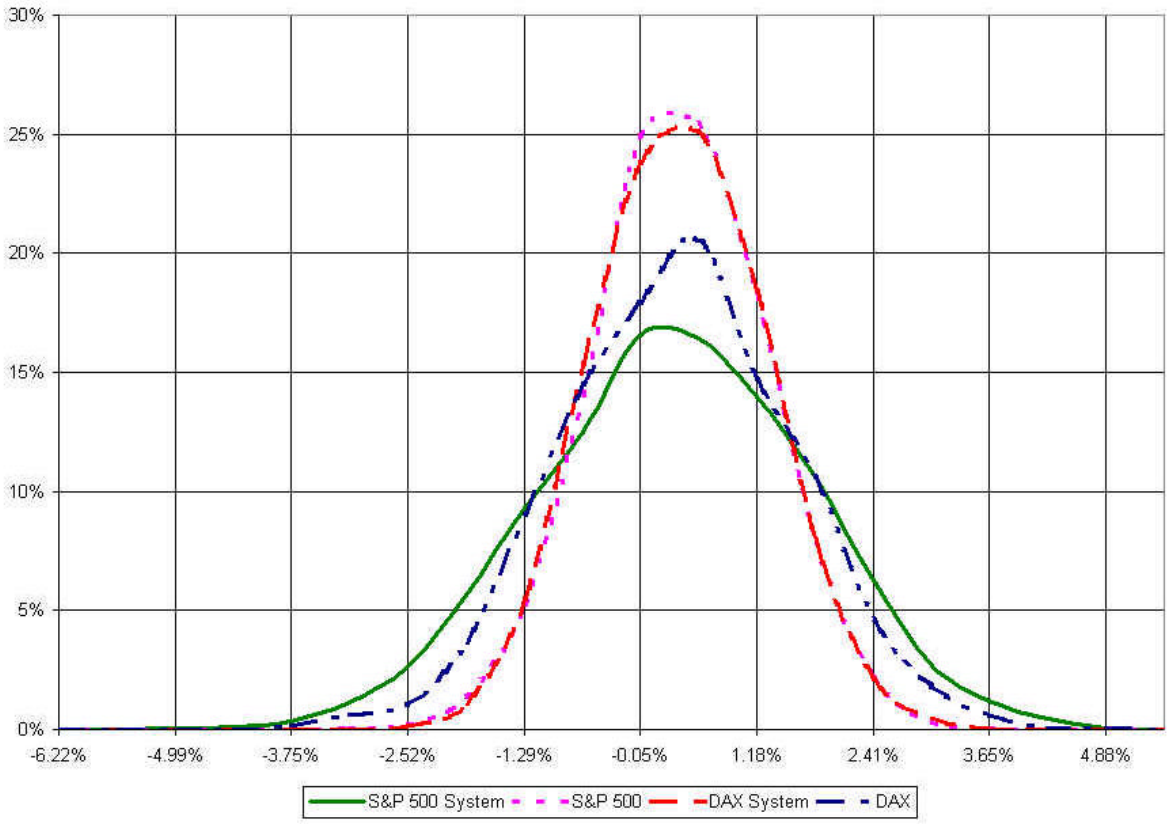


Figure 5: Daily Yield Distribution using MCS

The curves in Figure 5 shows two things:

1. The system on the S&P 500 Future has the worst statistical values to make a good performance.
2. It is evident that the curve on the S&P 500 and the curve on the DAX system are nearly kongruent. This means that we were able to rebuild the statistical characteristics of the S&P 500 with a system on the DAX. This system has the same technical logic as the (poor) system on the S&P 500.

Conclusion:

The poor performance depends on the (random) curve of the S&P on the past. Imagine that this curve was arbitrarly chosen by a random generator. The only things we can say is the fact, that the statistical numbers didn't change over the last 40 years.

5. Synthetic Data

"I can't believe that God plays dice with the universe."

ALBERT EINSTEIN

RINA Systems, Inc. has developed a model to generate synthetic data. The data – which can be downloaded in the case for the S&P 500 for free from their website www.rinasystems.com – has the same statistical characteristics as the original file. This was accomplished through statistical analysis of the original price file distribution.

Four synthetic data set were used as basis to implement the same trendfollowing system as on the original data. The results are shown on Table 3 for the S&P500. At this time there were only four synthetic data sets available. It is obvious that the more files trader uses for testing the closer results will be to the expected performance.

	Synthetic Data Testing			
	Set 1	Set 2	Set 3	Set 4
Total Net Profit (points)	92.37	17.03	379.10	296.77
Return on Initial Capital	26.39%	4.87%	108.31%	84.79%
Annual Rate of Return	3.07%	0.63%	9.89%	8.21%
Max Drawdown	-47.34%	-32.79%	-10.83%	-16.75%
Net Profit / Max Drawdown	1.21	0.57	13.14	3.10
Profit Factor	1.19	1.04	3.61	2.43

Table 3: System Results on the synthetic data basis

Result:

In comparison with the original system we get some respectable performnace numbers on the synthetic data sets. Yet the "Buy and Hold" – strategy couldn't be beaten.

In a next step we run a MCS with 5.000 iterations on the average equity of the four systems on the synthetic data. The result is shown in Figure 6.

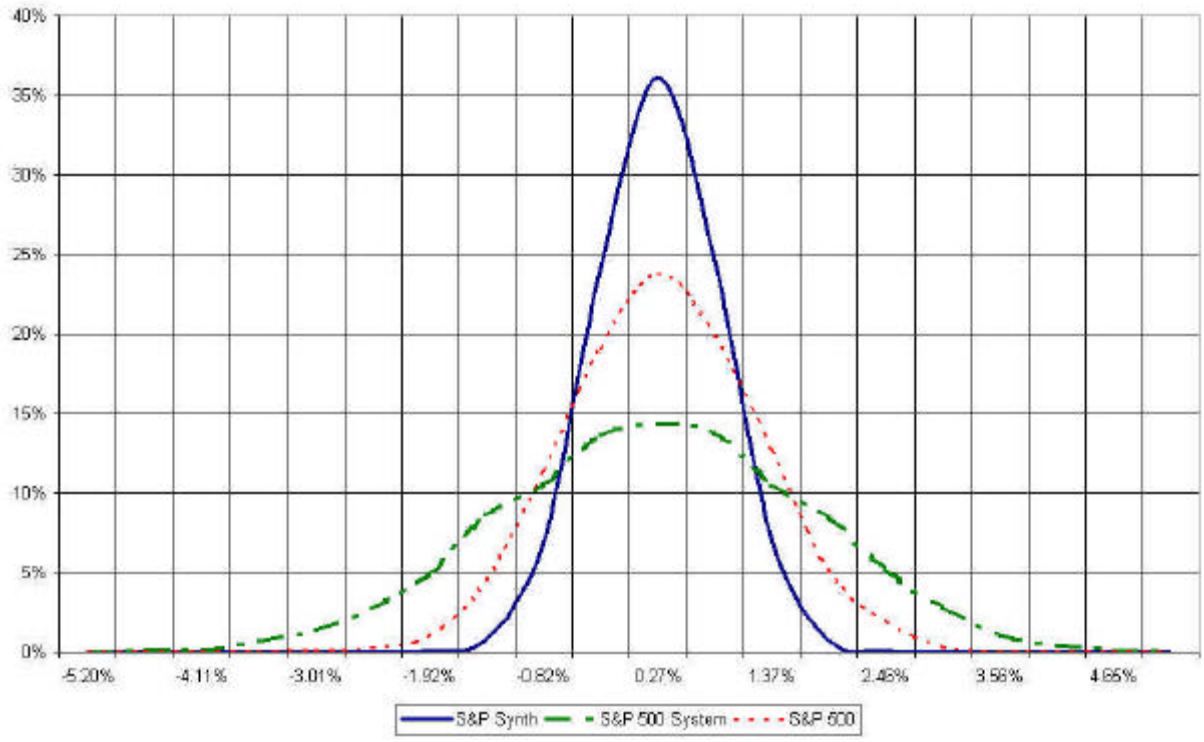


Figure 6: S&P 500 Daily Yield Distribution using MCS

The curves in Figure 6 shows that the systems on the synthetic data are less volatile than the S&P 500 Index or the trading system on the original data.

To compare the perfomance numbers we run another MCS using the Portfolio MCS by Inside Edge systems, Inc.

Figure 7 to 9 shows the computed probability of the “Maximum Dradown Ratio”.This ratio is computed by dividing the MaxDrawdown by the sum of the starting equity and the net profit. On the ordinate we can see the number of ocurrences for a specific bins. We run 20.000 iterations for every data set.

The result of the simulation confirmed the best performance characteristics for the synthetic data sets.

The extreme right data points on the graphs represents cases where the expected drawdown within the next year will reach its maximum.

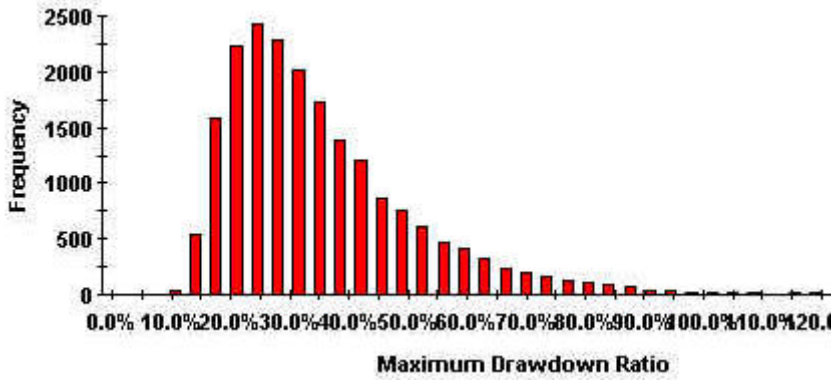


Figure 7: MCS on S&P 500 Buy and Hold

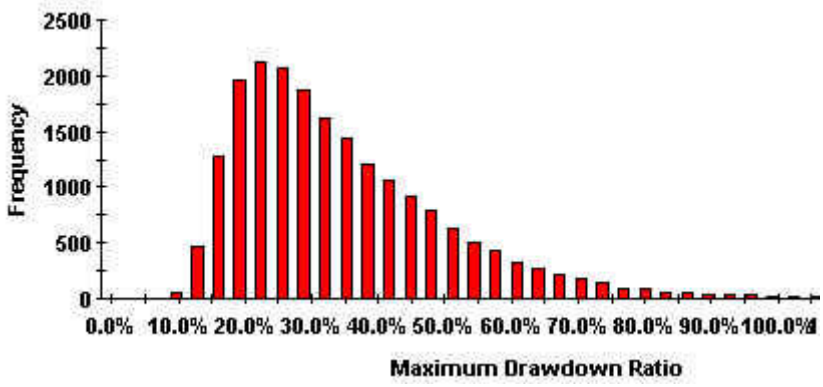


Figure 8: MCS on S&P 500 trendfollowing system

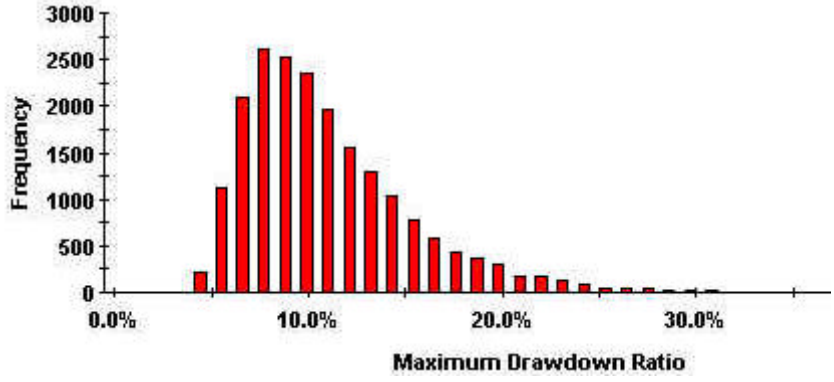


Figure 9: MCS on S&P 500 synthetic data trendfollowing system

6. Random Systems

"The biggest value is probably understanding the markets are highly irrational. They're so full of random activity…"

LARRY WILLIAMS, Trader

The following studies were inspired by the work of Charles LeBeau and David Lucas. In their book "Technical Traders Guide to Computer Analyses of the Futures Market" they published the results of their studies on random entries. They used various types of entry signals to enter the market when doing historical testing. The only exit they used was at the close of business 5, 10, 15 and 20 days later. Their primary interest in using this approach was to determine what percentage of their trades made money and if the percentage exceeded what one would expect from entering the market at random. The result was that most of the indicators failed to perform any better than random.

We tried to reproduce these results with our own investigations. Our aim was not only to look at the percentage of winning trades but also at the mathematical expectations.

The results are shown in Table 4 and Table 5.

	DAX		
Stop Technique	3 * ATR(10)	Parabolic	5-Bar Exit
Total Net Profit	8,966 €	-8,216 €	-14,815
Return on Initial Capital	17.57%	-17.11%	-29.84%
% Profitable	33.76%	41.47%	46.61%
Max Drawdown	-52,432 €	-50,021 €	-$51,297
Net Profit / Max Drawdown	0.17	-	-
Profit Factor	1.13	0.95	0.92

Table 4: System Results for the random systems on the DAX

Stop Technique	S&P 500		
	3 * ATR(10)	Parabolic	5-Bar Exit
Total Net Profit	-72,751	-38,464	-15,845
Return on Initial Capital	-145.47%	-76.93%	-31.69%
% Profitable	33.26%	40.03%	48.10%
Max Drawdown	-$118,130	-$93,157	-$86,633
Net Profit / Max Drawdown	-	-	-
Profit Factor	0.77	0.86	0.97

Table 5: System Results for the random systems on the S&P 500

Test procedure:

- The random signals on a ten year data basis were created on the TradeStation by Omega Research with the Random Generator by Tradeworks Software (Dave DeLuca). One can download this software for free on http://mechtrading.com/tradestation/random.html.
- The results on 2.000 systems per exit-technique were recorded and averaged. The averaged values for some performance numbers are listed in Table 4 for the DAX and in Table 5 for the S&P 500.

Conclusion:

Though for some exit-techniques there are some respectable values for the percentage of winning trades, the mathematical expectation on average is negative.

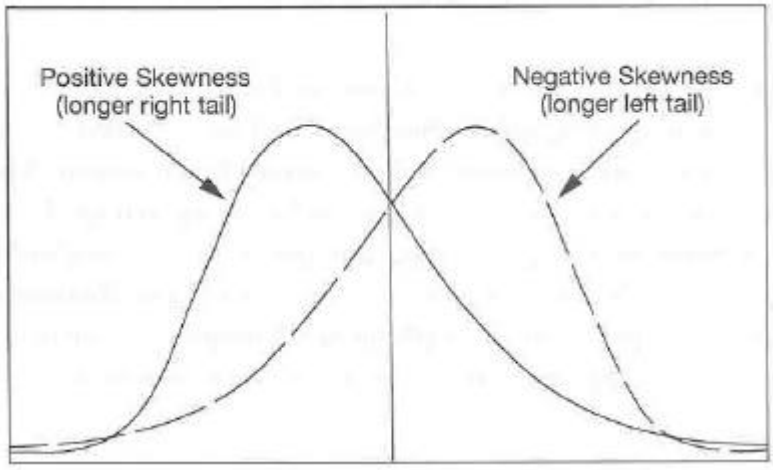
7. Conclusion

- Technical Analysis produce better results than random signals.
- Using Technical Analysis has the advantage of consistent decision making.
- The performance of every trading system depends on the random price behaviour. This makes the usage of Technical Analysis as a stand alone method not advisable.
- To reduce the risk of your portfolio you should diversify not only over a broad spectrum of non correlated assets but also over time and systems.
- Further investigations should focus on the various yield distribution functions to get reliable numbers about market risk structures.

Appendix

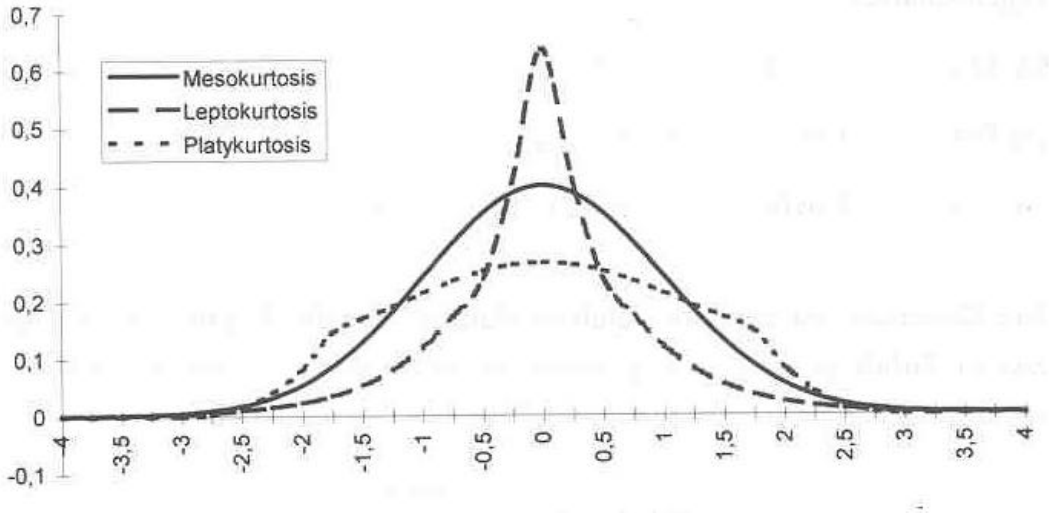
Skewness

…is the amount of distortion from a symmetric distribution shape.



Kurtosis

…is the "peakedness" of a distribution, the analysis of central tendency.



Central Limit Theorem

…If enough independent samples of almost any distribution are averaged together, the resulting distribution is normal.

Profitfactor

…broken down into three parts. The three segments of the equation are trading logic (when to buy and sell), money management (how much) and risk management (when to exit a position).