

# TRADING SYSTEM EVALUATION

By  
John Ehlers and Mike Barna<sup>1</sup>

## **INTRODUCTION**

There are basically two ways to trade using technical analysis – Discretionarily and Systematically. Discretionary traders can, and have, made spectacular amounts of money with their techniques. They integrate their life's experience, knowledge of the markets, and technical indicators to make their trading decisions. System traders, on the other hand, need know very little about the market or have much experience. Instead, they rely on the trading signals automatically produced by rules implemented by computer programs. They have the confidence to rely on the computerized systems because the performance statistics can be reproduced by backtesting. That is not to say that hypothetical performance is perfect. There can be sharp differences between hypothetical performance and real trading results. For example, hypothetical trading does not involve financial risk, and the ability to withstand losses or to adhere to a particular trading system in the face of these losses is not considered. Implementation issues, such as slippage and commission, can only be included as allowance factors. Further, the trading system can have performance in the future significantly different from its past performance due simply to the randomness of events. Since backtests are always done with the benefit of hindsight, there are all kinds of ways to cheat on reported performance. But this is an article about what you can realistically expect from your trading system rather than how to cheat the statistics.

Many people equate speculation in the market to gambling. Their beliefs are reinforced by popular books such as "A Random Walk Down Wall Street". This belief persists although patently false and intellectually dishonest. More serious investors look at fundamental considerations such as P/E ratios, Sales, Debt, etc., and give scant attention to technical analysis. The techniques described in this article uses some gaming concepts to not only show that there is merit to trading using technical analysis trading systems but also enable you to visualize what equity growth performance you can reasonably expect from your system. We also describe a rational way to evaluate the system's likely profit and drawdown.

## **SYSTEM STATISTICS**

There are a number of statistics that are important if you are putting your hard-earned money at risk. Maximum drawdown is important because that, plus required margin, is the absolute minimum amount of money you should have in your account to avoid a margin call with reasonable probability. The number of consecutive losers is a test of how strong your stomach must be to trade the system. The average profit per trade is important to know because you must cover your transaction costs, commission plus slippage, before you can start making money for yourself.

Taking away all the details of the particular system, there are two statistics that enable you to assess what performance you can expect. These are the percentage of profitable trades and the profit factor. It is desirable to have as high percentage winners

---

<sup>1</sup> MESA Software, P.O. Box 1801, Goleta, CA 93116, [www.mesa-systems.com](http://www.mesa-systems.com)

as possible, but need not be greater than 50% to be profitable if you make more on winning trades than you lose on losing trades. Profit Factor is the ratio of Gross Winnings to Gross Losses. In terms of gaming, it is the payout probability. By determining whether a trade is a winner or a loser using the percentage wins and a random number generator, applying the payout probability to each trade, and summing the randomly selected trades we can provide realistic expectations for the equity growth produced by the system. Only in this sense can randomization be introduced to establish performance. Simply winning or losing is not a random occurrence.

### **EQUITY GROWTH GENERATOR**

We can make an equity growth simulator and plot the results in an Excel spreadsheet. We need to first insert the two important statistics. In cell A1 type “% Winners” and in cell A2 type 45. In cell B1 type “Profit Factor” and in cell B2 type 1.6. The values of 45 and 1.6 are only initial values. The entries into cells A2 and B2 are system statistics that you can change to visualize their impact on equity growth.

In cell A3 input =RAND(). This creates a random number having a uniform probability density in the range between 0 and 1. We compare this random number to the probability of a win by inserting =IF(A3<B\$1/100,\$B\$2,0) into cell B3. This conditional statement says that if the random number falls within the winning probability then assign the payout probability (the Profit Factor) to the trade, otherwise assign a value of -1 to the trade because it represents a loss. The result of this conditional statement is the outcome of the trade. In cell C3 input =B3. Copy all of row 3 into row 4. Then change cell C4 to be =C3+B4. Thus sums the trades in column C. Next copy all of row 4 and paste into rows 5 through 500. Column C now becomes the equity growth for the randomized set of trades using only the percent winners and Profit Factor. This equity growth changes every time you press the F9 key to recalculate the spreadsheet.

You can plot the equity curve for ease of interpretation. To do this, highlight cells C3 through C500. Then click on the chart wizard and input the data as requested. First, select a line type chart and click on the type shown in the upper left-hand corner of the thumbnail examples. Click Next. Then click Finish. Your chart is done! Now you are free to experiment with the kind of equity growth you can expect from your trading system. Just double click in cell A3 and press Enter. You will create a new randomized equity growth curve. Repeat as often as you desire to get a feeling you know what to expect. Figures 1 and 2 are just two examples we ran using the default statistics. Please note the equity curves are dramatically different although the input statistics are identical. We have attached a preformatted Excel Spreadsheet so you don't have to build it yourself.

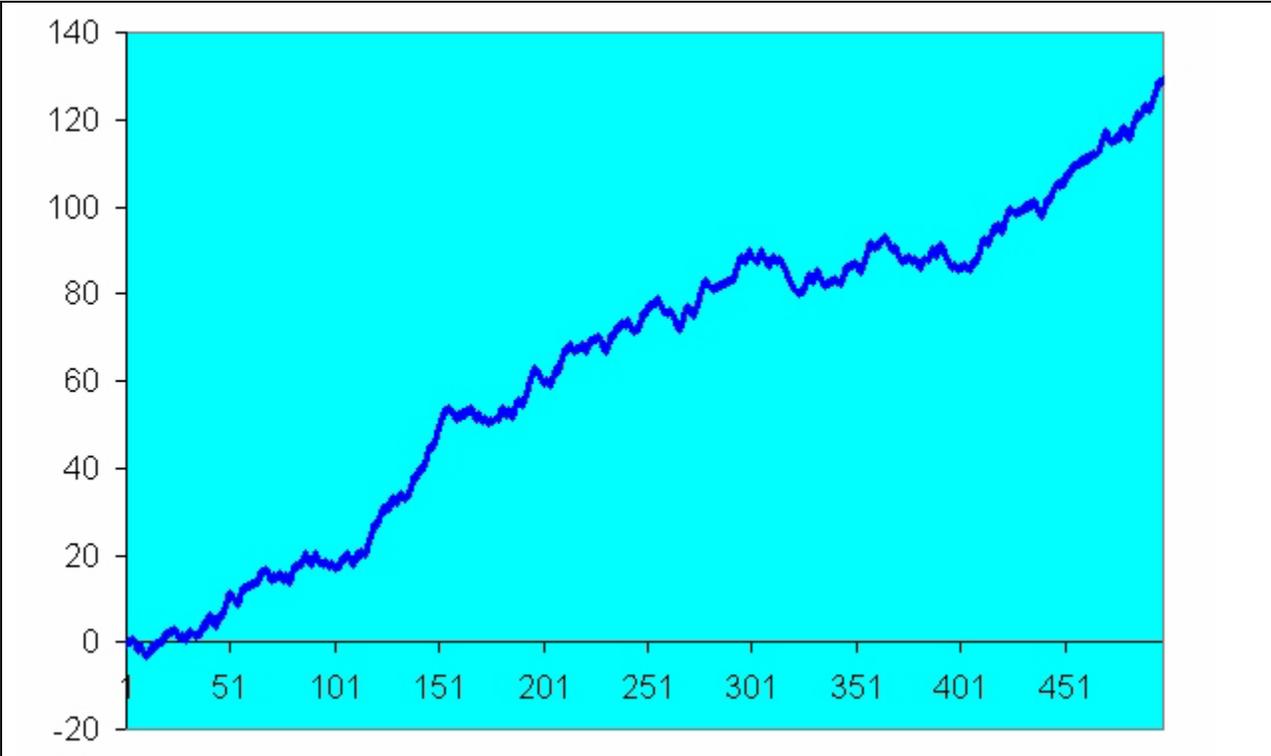


Figure 1. Hypothetical Equity Growth for %Profitable=45 and P.F.=1.50

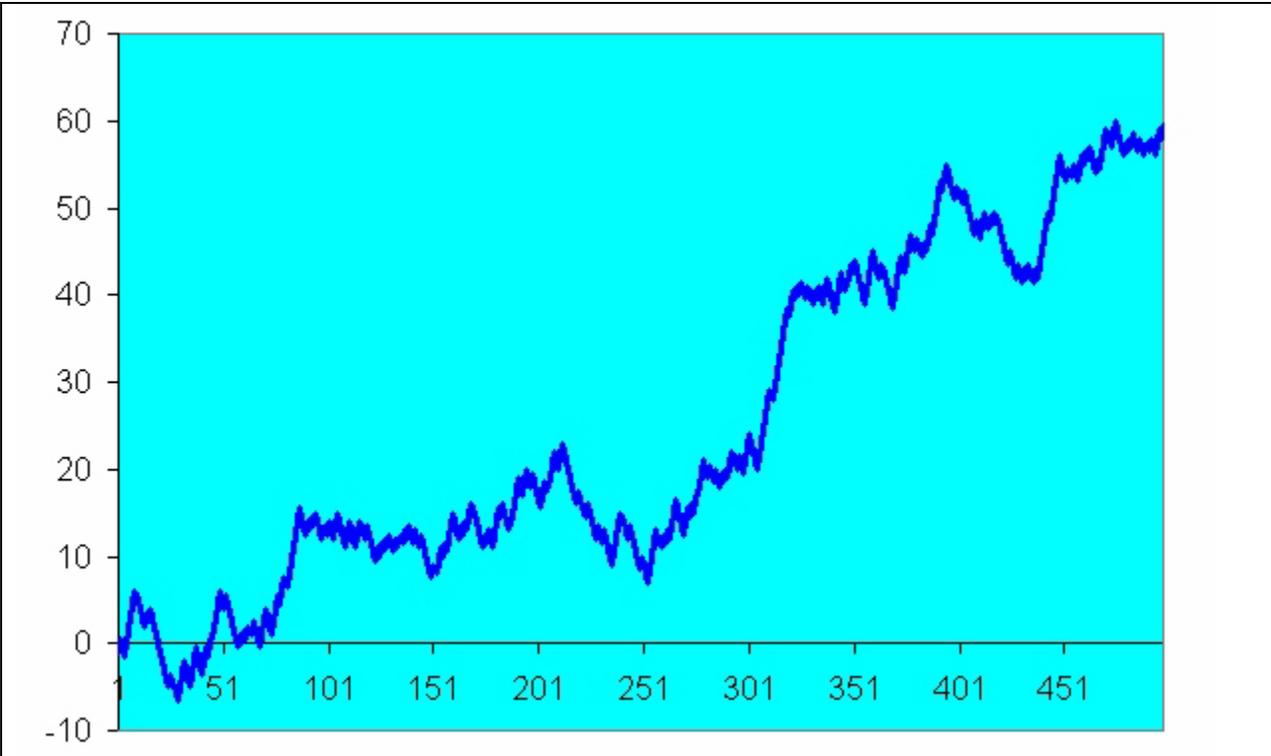


Figure 2. A Second Hypothetical Equity Growth for %Profitable=45 and P.F.=1.50

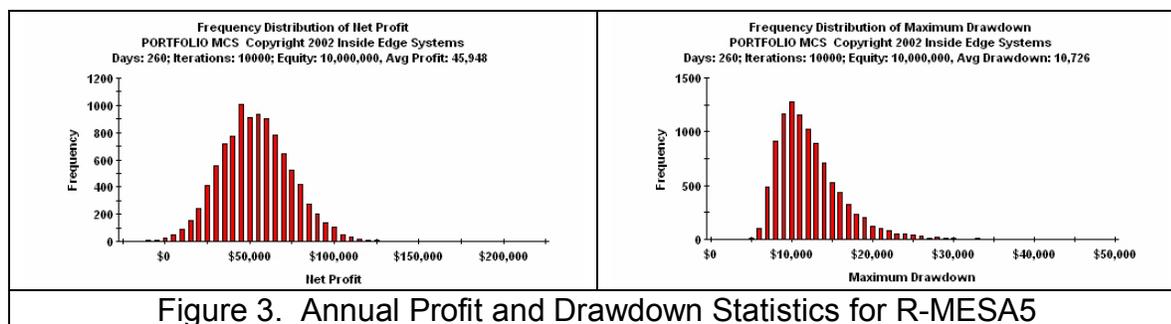
To see what a nice equity growth curve looks like, change cell A2 to 50 and cell B2 to 2.0. MESA Software is among the few systems developers that have systems with statistics such as these. You can see the backtested equity curves of some of our systems at [www.mesa-systems.com](http://www.mesa-systems.com). Next, let's explore what the lower limit statistics might be for a profitable trading system. Our experience is that the boundary is 42 in cell A2 (for percentage winners) and 1.5 (for Profit Factor) in cell B2. Explore for yourself.

### **MONTE CARLO SIMULATION**

The profit factor (ratio of gross winnings to gross losses) and percentage winning trades are serviceable descriptors to evaluate expected performance of a trading system. From these, one can calculate a range of standard deviations from the straight line equity growth. However, the process would have to be repeated a large number of times to gain meaningful statistics on the trading system.

Portfolio MCS is a software product by Inside Edge Systems<sup>2</sup> that enables a statistical estimate of trading system performance. Its process is to take the actual trades produced by a trading system and process these trades in a random sequence. This Monte Carlo approach enables a mean and variance to be computed for both the profit and maximum drawdown. Further, the statistics of the maximum drawdown enables you to assess your risk of ruin for a given amount of initial capitalization in your account, rather than in an oversimplified closed-form equation.

We ran Portfolio MCS on MESA Software's R-MESA5 trading the S&P Futures over the last two years. 10,000 Monte Carlo iterations were performed to compute annual results. We used \$100 slippage and commission because we assumed that five e-mini contracts would be used in lieu of a single large S&P Futures contract. The annualized statistical results are shown in Figure 3. The average profit per contract is \$45,948 and the average drawdown is \$10,726. Their ratio provides a statistical reward-to-risk ratio of 4.28:1. This is an outstanding result for a trading system. Also, it is apparent that the risk of ruin for an initial equity of \$30,000 is vanishingly small.



<sup>2</sup> Inside Edge Systems, 10 Fresenius Road, Westport, CT 06880, 1000mileman@mindspring.com

We also ran Portfolio MCS on MESA Software's MESA Bonds V7 trading the 30 Year Treasury Bond Futures over the last two years. We used \$25 slippage and commission for this system because it only uses limit entries and reversals. The annualized statistical results are shown in Figure 4. The average profit per contract is \$20,435 and the average drawdown is \$6,709. Their ratio provides a statistical reward-to-risk ratio of 3.05:1. This is also an outstanding result for a trading system.

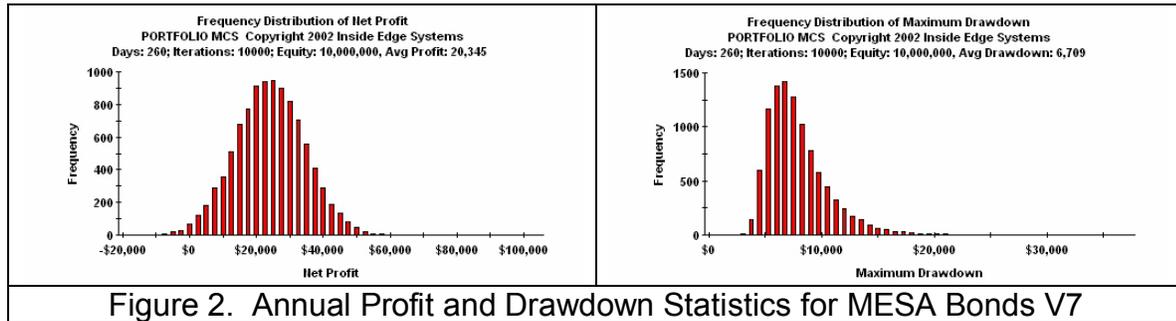


Figure 2. Annual Profit and Drawdown Statistics for MESA Bonds V7

## **CONCLUSIONS**

We hope this randomized generation of equity curves, given the global statistics of a trading system, and the Monte Carlo approach will help you evaluate a trading system you are considering purchasing. More importantly, we hope we have given you a tool to provide a realistic expectation of how your trading system will perform in the future and the confidence to adhere to the system strategy.