Money Management Strategies for Serious Traders

PRESENTED BY DAVID C. STENDAHL

The Importance of Money Management

Traders can typically describe the methods they use to initiate and liquidate trades. However, when forced to describe a methodology for the amount of capital to risk when trading, few traders have a concrete answer. Some make vague references to experts that recommended risking one or two percent of portfolio equity on any trade. Others rely on intuition to determine when to increase position size on a particular trade, always risking different amounts. Experienced traders learn that as important as it is to have an effective method to determine when to trade, it is equally important to develop a methodology to determine how much to risk. A trader that risks too much; increases the chance that they will not survive long enough to realize the long run benefits of a valid trading strategy. However, risking to little creates the possibility that a trading methodology may not realize its' full potential. Therefore, while a positive expectation may be a minimal requirement to trade successfully, the way in which you exploit that positive expectation will in large part determine your success as a trader. This is, in fact, one of the greatest challenges for traders.

At RINA Systems, we have had the fortune of working with many experienced traders, and in that process we became increasingly aware of the need for sound methods for applying money management strategies. In fact, it seems that as traders reach a certain level of comfort with a system they begin to realize that a sound money management approach is missing from their trading strategy. Our work in this area has led us to research several strategies for determining position size and ways in which to add to, decrease, and stop out positions. Many of these strategies are well known and readily available in the public domain and others are hybrids that we have built from improving concepts already available. Once you understand the importance of money management, the opportunity to modify many of the well-known strategies to meet your needs is endless.

It is our belief that there is really no "black box" formula for money management. That is, different trading strategies and systems require different approaches to money management. In

addition, we must always consider the trader's ability to implement a money management strategy given their tolerance for risk and other psychological factors. For example, several strategies that emphasize optimizing the amount of capital to invest often deliver substantial drawdowns. Few traders are comfortable suffering through a drawdown of fifty, sixty, or seventy percent, which is not unheard of for some aggressive strategies. Therefore, it is essential to match the theoretical drawdown with the traders risk tolerance.

Finally, and not insignificant, is that a trader's capitalization may effect their ability to execute a strategy. Even in cases where it might be preferable for a system to utilize a money management strategy, an undercapitalized trader may be unable to implement the strategy due to lack of funds. In this situation the trader would be unable to derive the potential benefits of the strategy. Therefore, apart from the effectiveness of a particular strategy on a given trading methodology, there are two important variables: the psychological preferences of the trader and their level of capitalization. If either of these two factors do not support the money management strategy employed, then it is unlikely the trader will be able to use the strategy effectively. Though seemingly insignificant, this point cannot be overemphasized because as many strategies are developed over large histories of data (in many cases 10 or 20 years of data). The trader needs to have the confidence to remain with the strategy even if positive results do not come immediately.

We believe that you will benefit from the strategies presented in this workshop. In addition, we hope we will create a greater awareness to evaluate what type of money management system you are using. Hopefully, we will spur your imagination when thinking about ways in which to use money management. We find that many traders focus too much of their creativity on their trading logic. They would be well advised to devote some attention to determine position size if they are going to take full advantage of their trading methodology.

It should be noted that all traders are using some form of money management. Some, though, are not conscious of what type of strategy or method they are using and simply trade by the seat of their pants. Other traders use thoroughly tested strategies to determine position size as well as when to add or liquidate positions which are consistent with their risk tolerance. It is our hope that you will find yourself among the latter group.

Workshop Goal

The goal of this workshop is to explain the process by which traders can develop, evaluate and ultimately improve the performance of trading systems based on money management strategies. These improvements must be based on an individuals risk tolerance and trading psychology. At RINA Systems we have developed an evaluation and improvement process to address these issues.

We believe that money management does not exist in a vacuum. This means that it is essential that your money management strategy be integrated into an overall approach to system design and development. Therefore, before we move directly into the application of various money management strategies we will focus on some elementary issues concerning system design and testing. We believe this is an essential component in our approach to money management. To provide you with an adequate foundation to apply money management we will take you through the necessary evaluation stages that **MUST** precede the application of any money management strategy. It is a requirement that the trader sufficiently understand a methodology before attempting to improve its performance.

The trading systems used in this presentation were provided by Advanced Research and Training. For more information concerning these systems contact them at 888 278 0037 or visit them on the web at www.advancedrtllc.com . To assist in the evaluation process we will use **Portfolio Evaluator** developed by RINA Systems. Contact RINA Systems at 513 469 7462 or on the web at www.rinasystems.com for more information concerning our products and services.

Workshop Overview

- Evaluate our Yen trading system in an effort to determine the level of risk associated with trading this system.
- Determine the stability of the system to apply a variety of money management strategies in an effort to improve trading performance.
- Perform the same evaluation and money management analysis on our Corn trading system.
- Combine our two trading systems into a portfolio for further analysis.

Each step in the evaluation and money management stage will be fully disclosed to ensure that every trader has the ability critique and improve trading performance.

Breakout Trading on Yen

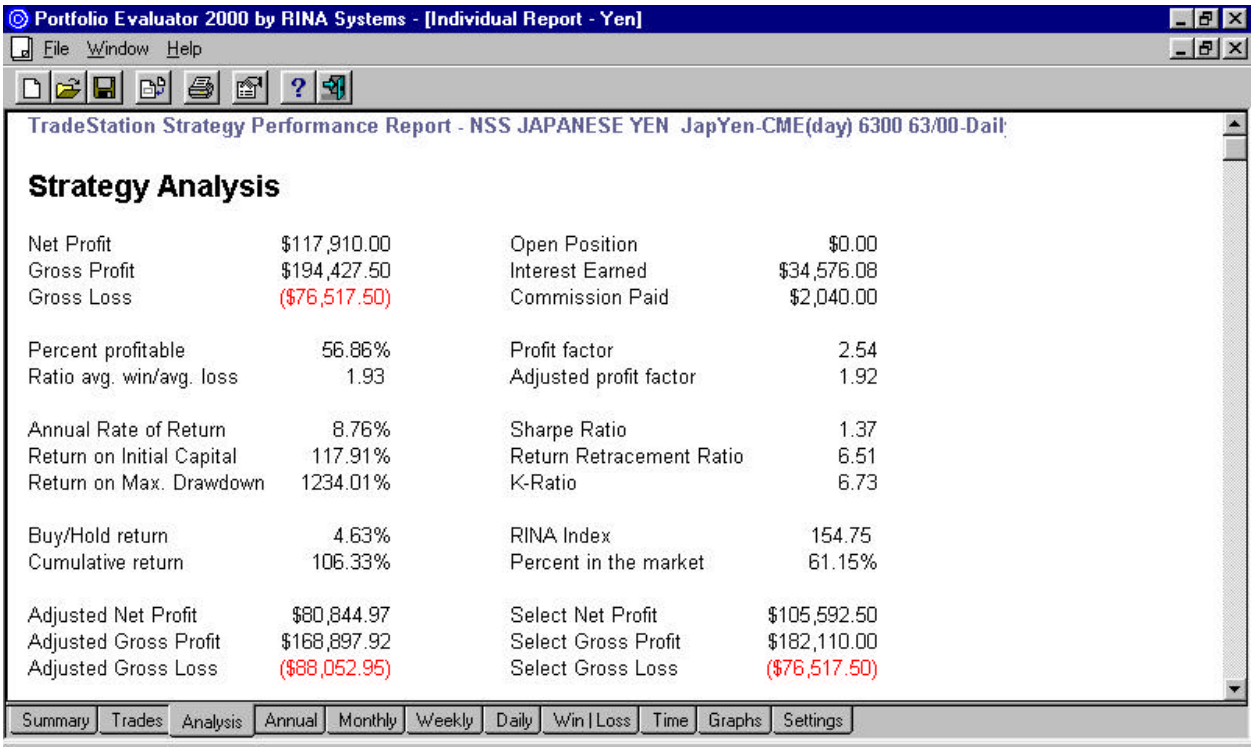
System Description: This system buys or sells the Yen based on market breakouts. If the close breaks above a set look back period the system buys the market. If however the system experiences a close below a set look back periods the system generates a sell signal. The system looks for other market conditions, not described, which go beyond the scope of this presentation. This trend oriented system trades on a frequent basis generating trading signals that are highly profitable and efficient.

Yen System

System Analysis Section

This section centers on the overall performance of the trading system. This is more of a general snap shot of the total system and should be used to gauge the system's total performance. It should however ***not*** be used exclusively to determine the true worth of a system.

System Analysis Exhibit



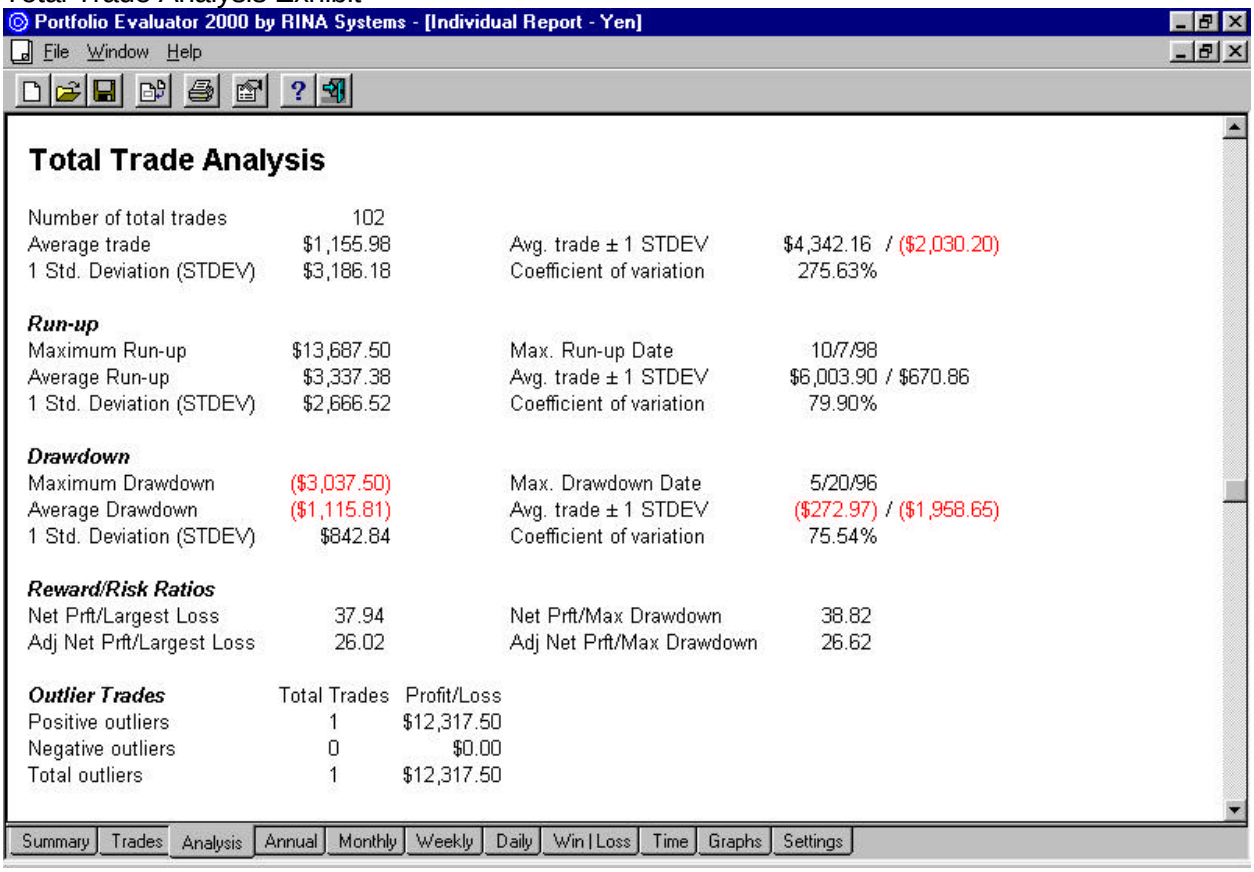
This system is very profitable and extremely efficient given a number risk reward calculations. Pay close attention to Net Profit, Percent Profitable, Profit Factor, Return Retracement Ratio, Sharpe Ratio, K-Ratio, RINA Index and Select Net Profit, these calculations in particular describe the system overall true worth.

Total Trade Analysis

The goal of this section is to evaluate the overall performance of the system by critiquing each trade in general as well as from an optimistic (run-up) and pessimistic (drawdown) perspective. Run-up is defined as the system's maximum profit potential during the course of a trade. Basically it's the opposite of drawdown. The greater the run-up the better the performance, assuming the system captures the majority of the move. Drawdown, on the other hand, is defined as the system's maximum loss potential during the course of a trade. The greater the drawdown the more pain experienced by the trader

By measuring these risk reward tools an individual trader can value a system's profitability in relation to risk. The experience of trading in real time is far different than watching from the sidelines. Unless a trader actually lives through an adverse trading experience, it's difficult to say how they may react. The best we can offer is an evaluation of both risk and reward to prepare for all possible situations.

Total Trade Analysis Exhibit



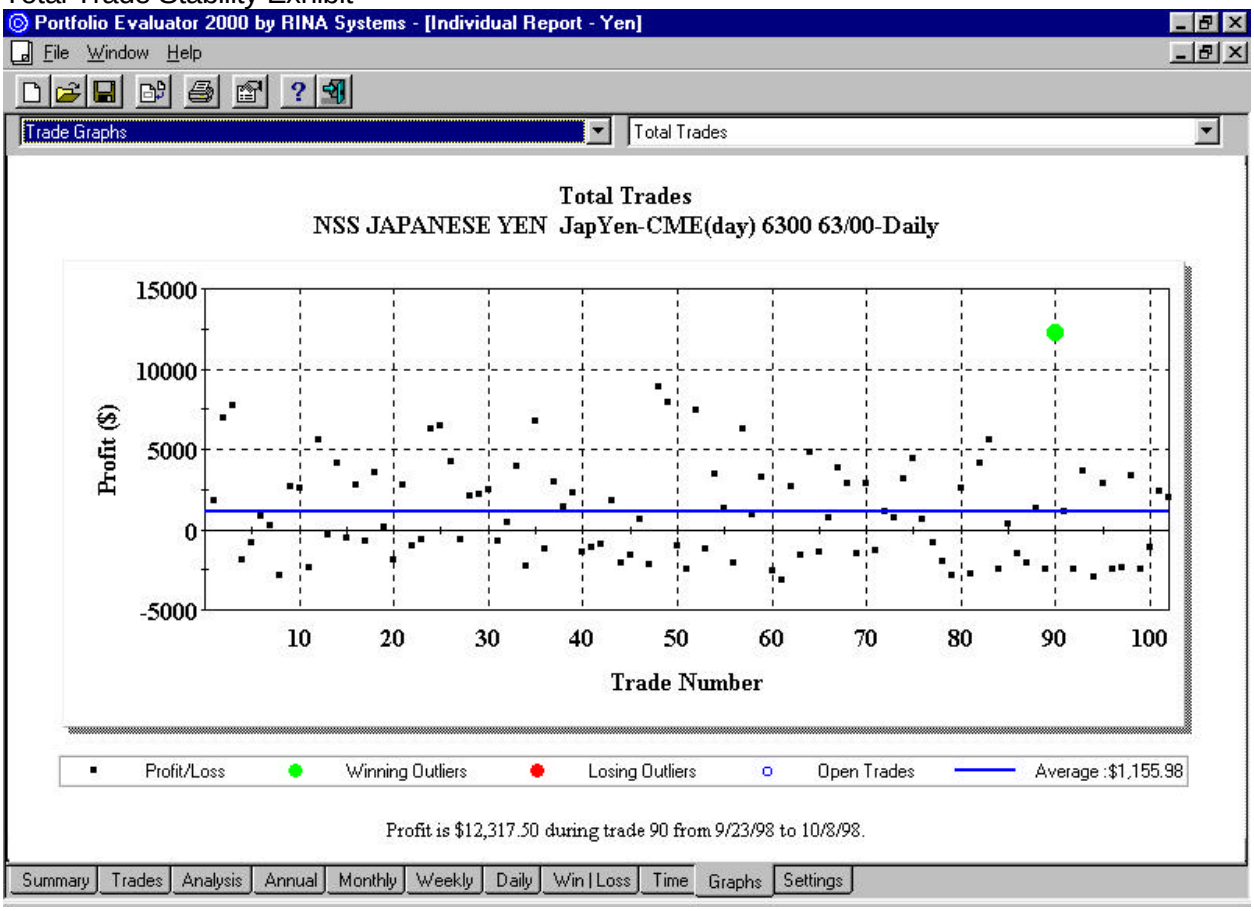
Pay close attention to the systems stable Average Trade, Run-up and Drawdown figures. These particlur calculations describe a very stable system suitable for a variety of different money managemnt strategies.

Total Trade Stability

Total Trades: Graphs the systems Profit in $ vs. Trade Number for all trades. Blue line stands for the average profit/loss. If applicable, large balls, green (positive) and/or red (negative) appear if the system has outlier trades. Trade 90 on this graphic is a positive outlier.

Notice how the trades cluster in and around the bold average trade line. The more clustered the trades the lower the Coefficient of Variation for the average trade. A low Coefficient of Variation signifies a sense of stability to the total trade number.

Total Trade Stability Exhibit

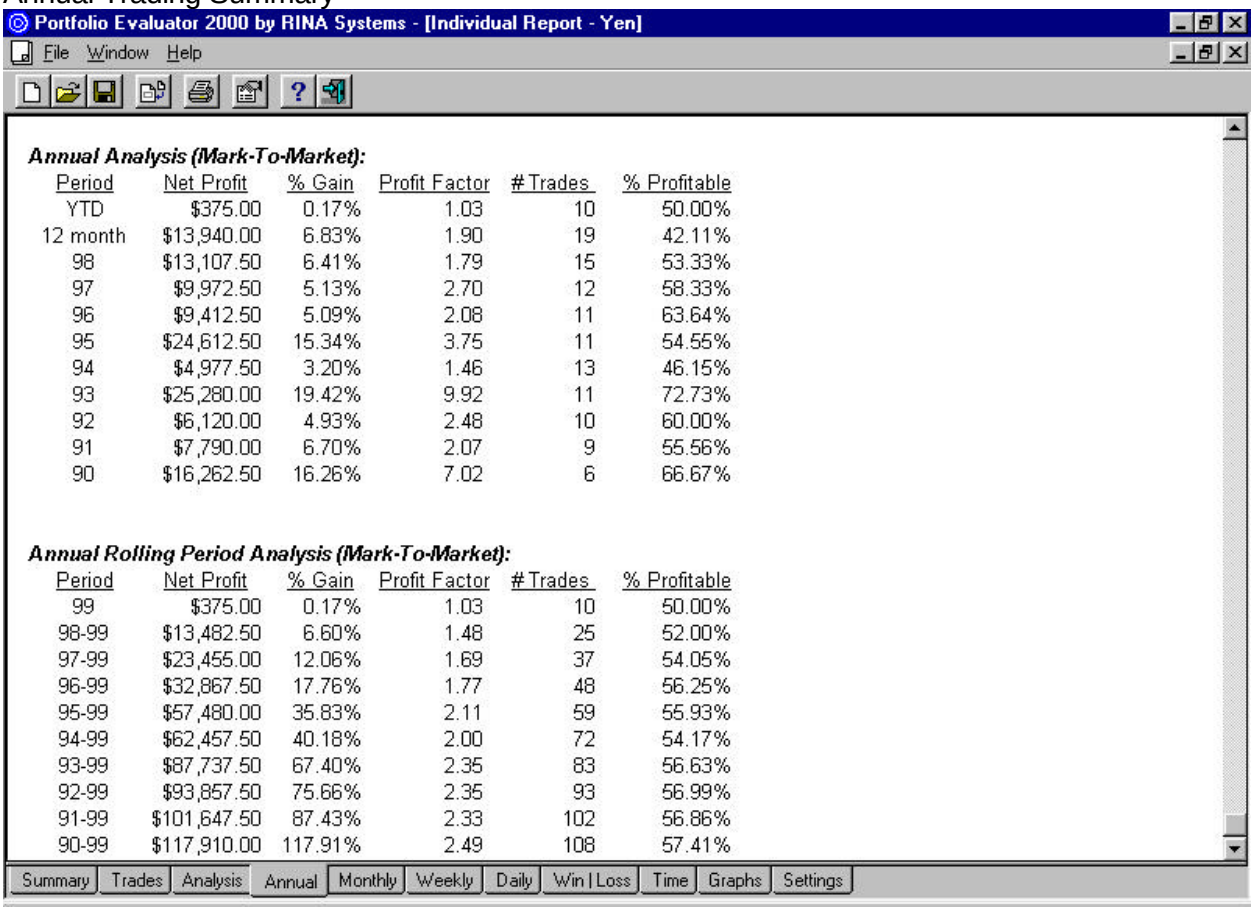


Notice that dispite the one outlier trade (Trade 90) the majority of the remaining trades are extremely stable. Stability is the key to improving performance through money management strategies.

Annual Trading Summary

This section expands upon the general overview of systems trading performance. In the previous sections the evaluation tools measured performance from the start to end during the test period. The next step is to examine the system over various time periods to ensure consistent performance. After all, what good is a winning system if a trader fails to follow it after its first loss? Remember consistency breeds confidence. A mark-to-market is performed at the end of each test period resulting in a complete and through performance evaluation.

Annual Trading Summary



Annual Analysis (Mark-To-Market):

Period	Net Profit	% Gain	Profit Factor	# Trades	% Profitable
YTD	$375.00	0.17%	1.03	10	50.00%
12 month	$13,940.00	6.83%	1.90	19	42.11%
98	$13,107.50	6.41%	1.79	15	53.33%
97	$9,972.50	5.13%	2.70	12	58.33%
96	$9,412.50	5.09%	2.08	11	63.64%
95	$24,612.50	15.34%	3.75	11	54.55%
94	$4,977.50	3.20%	1.46	13	46.15%
93	$25,280.00	19.42%	9.92	11	72.73%
92	$6,120.00	4.93%	2.48	10	60.00%
91	$7,790.00	6.70%	2.07	9	55.56%
90	$16,262.50	16.26%	7.02	6	66.67%

Annual Rolling Period Analysis (Mark-To-Market):

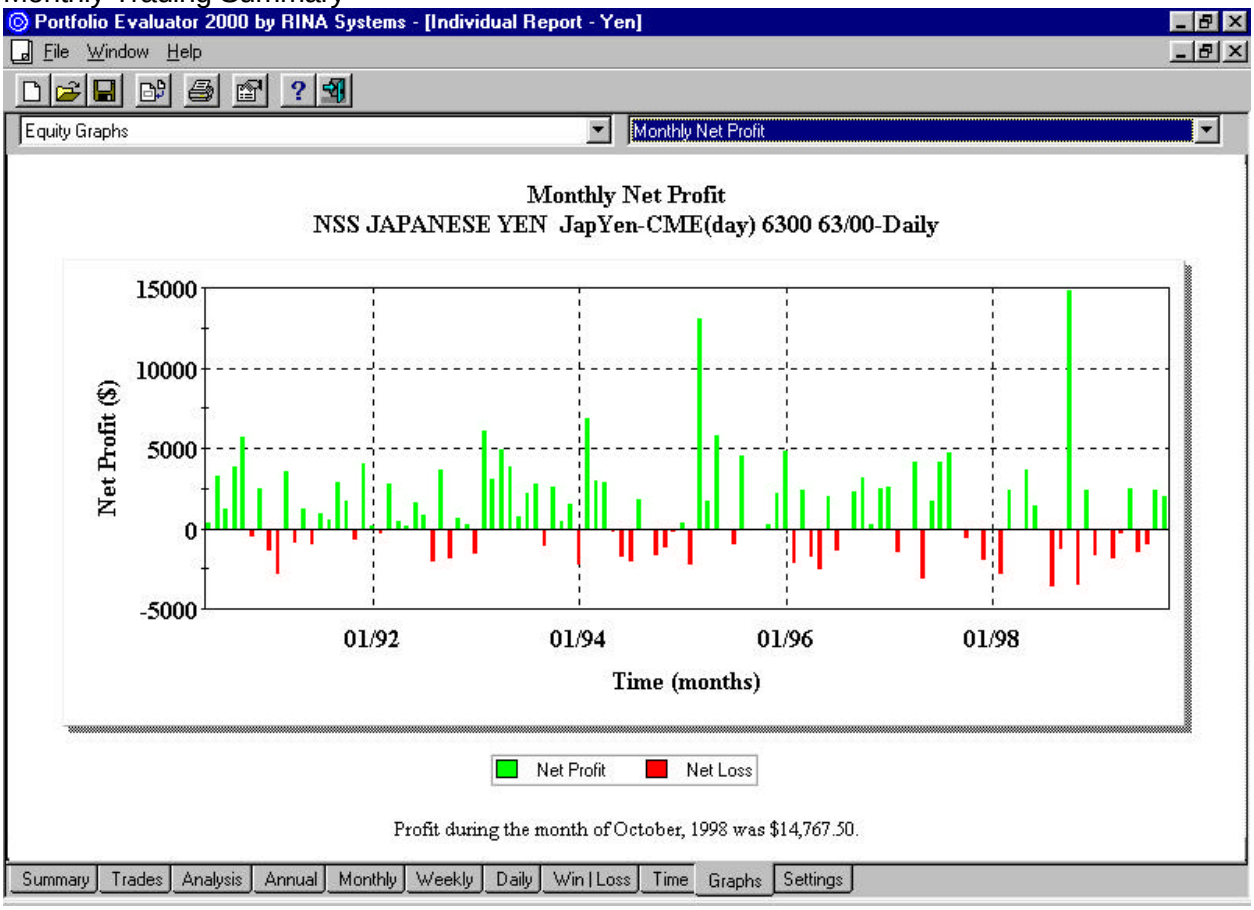
Period	Net Profit	% Gain	Profit Factor	# Trades	% Profitable
99	$375.00	0.17%	1.03	10	50.00%
98-99	$13,482.50	6.60%	1.48	25	52.00%
97-99	$23,455.00	12.06%	1.69	37	54.05%
96-99	$32,867.50	17.76%	1.77	48	56.25%
95-99	$57,480.00	35.83%	2.11	59	55.93%
94-99	$62,457.50	40.18%	2.00	72	54.17%
93-99	$87,737.50	67.40%	2.35	83	56.63%
92-99	$93,857.50	75.66%	2.35	93	56.99%
91-99	$101,647.50	87.43%	2.33	102	56.86%
90-99	$117,910.00	117.91%	2.49	108	57.41%

What does Mark-to-Market mean? Mark-to-Market is another term for closing the books at a certain time. If a Mark-to-Market is performed on a monthly basis, it means the account is officially closed at the end of each month. It is similar to receiving an account statement from your broker with a bottom line on all open and closed positions. This is important because without a Mark-to-Market it would be impossible to know where profit or losses are to be allocated. Take for example a trade that makes 30% and that begins November 1st and closes January 15th the next year. The Mark-to-Market allocates the proper percentages to each month as a posed to the entire amount at the end of the period. Without this simple accounting function it is impossible to have a thoroughly and complete evaluation.

Monthly Trading Summary

This section examines trading performance from a monthly perspective. The graphic below performs a monthly mark-to-market analysis, allowing traders to see their exact profit/loss statement on an on going basis.

Monthly Trading Summary



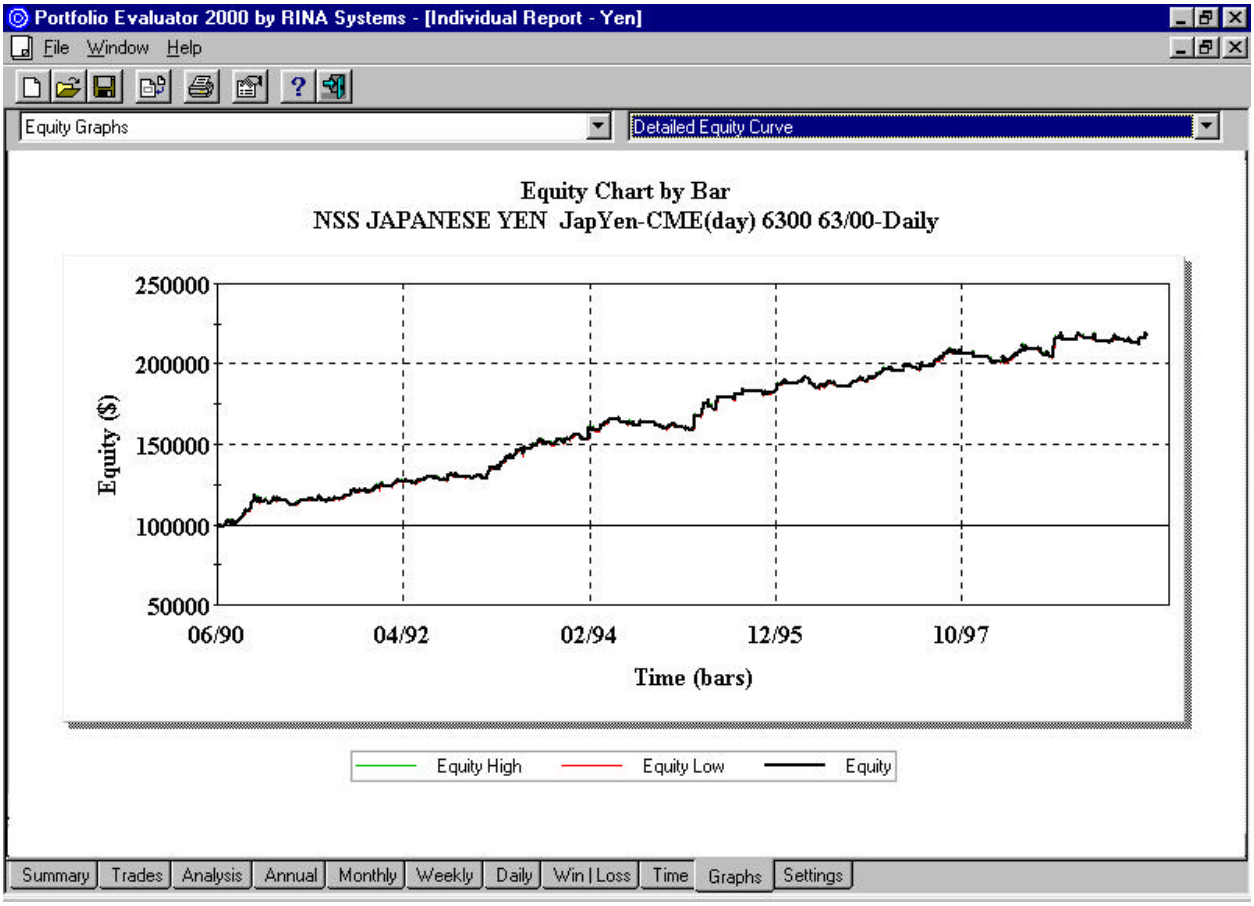
Notice that the system is able to link together a number of profitable months in a row while limiting the number of losing months. These periods of extended profitability give money management strategies greater flexibly to increase trading performance.

Equity Curve Analysis

Viewing a system's equity curve can also provide some additional insight into its performance. Equity curve charts tally a system's individual trades to present a time line of trade-by-trade results. The charts examine the same basic monthly, annual or rolling period information as in the Trading Summary, but in a graphic format. A quick review of an equity curve chart can provide the necessary mental security to trade a system. Until a trader sees a system's equity curve, he or she will never know what's really at stake.

Detailed: This graph offers greater insight into trading performance than a general equity curve graph. It displays net profit on a bar-by-bar basis revealing equity drawdowns and run-ups. Flat or non-trading periods are also shown to present a detailed overview of equity performance.

Detailed Equity Curve

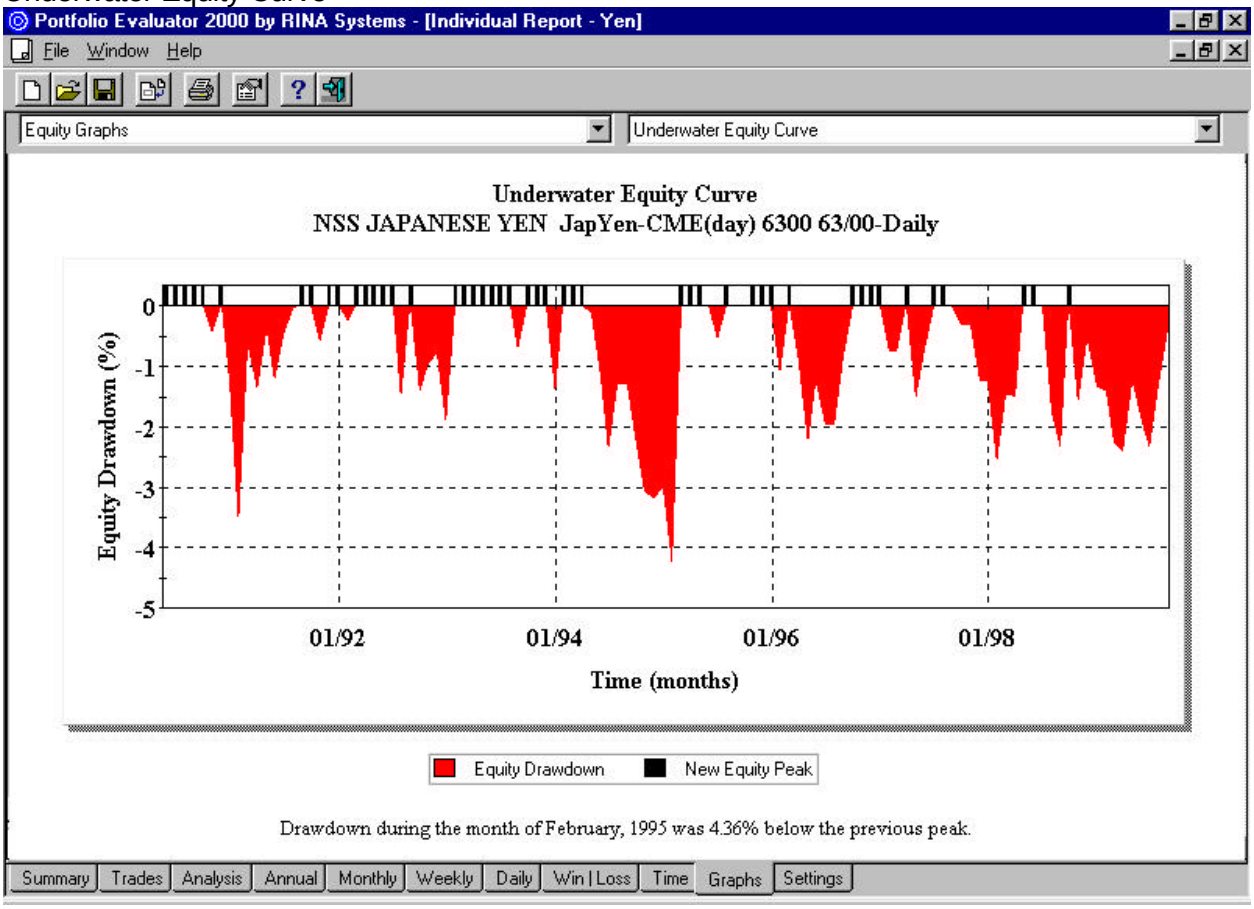


Notice how steady the equity curve is over the nine year period. Trading systems that exhibit this degree of performance are more accepting to aggressive money management strategies.

Equity Curve Analysis cont.

Underwater: This graph serves as a pessimistic review of equity performance over time. Each black vertical bar represents a new equity high based on monthly data. The negative curve between equity peaks represents the percent retracement from the previous high. In realistic terms this graph details the pain and suffering experienced by the system over time. The duration and magnitude of monthly drawdowns are graphically illustrated in a single equity graph. For additional information refer to **"Schwager on Futures: Technical Analysis"** by Jack Schwager.

Underwater Equity Curve



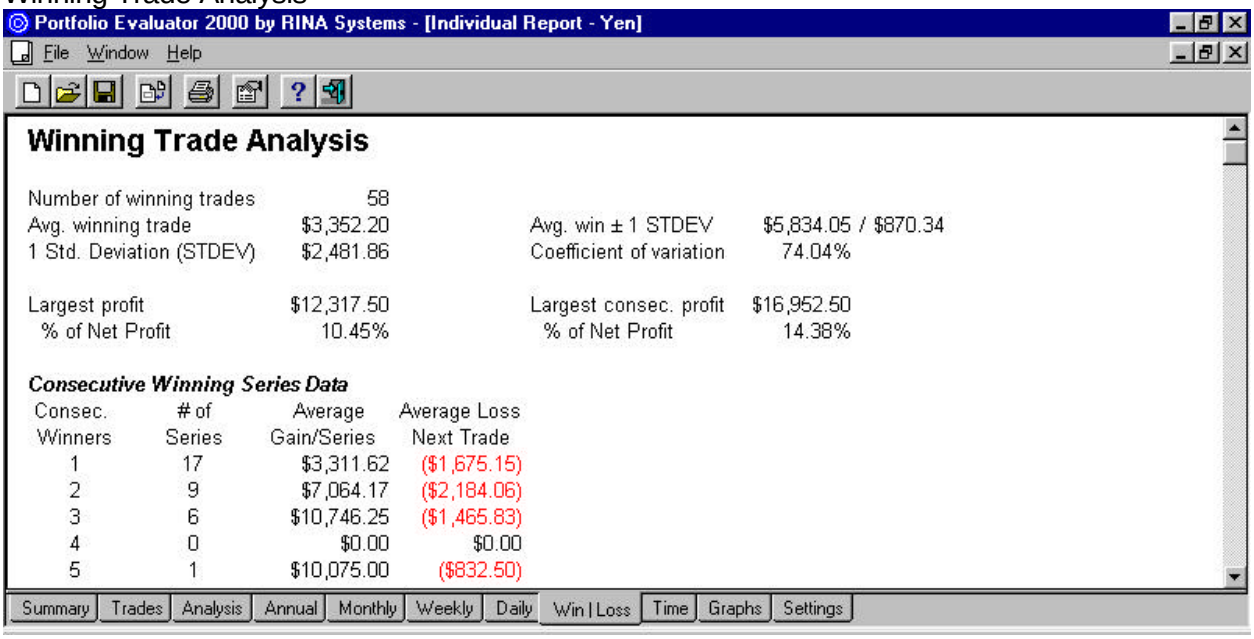
Every trading system expereinces some form of underwater equity curve loss. What is important to notice is the magnitude and duraction of the drawdown. We will use this graphic at the portfolio level to match trading system that off set periods of loss with gain to create well balanced trading portfolios.

For more information concerning the Underwater Equity Curve refer to the article **Staying Afloat** by David Stendahl in the Summer 1999 issue of Omega Magazine

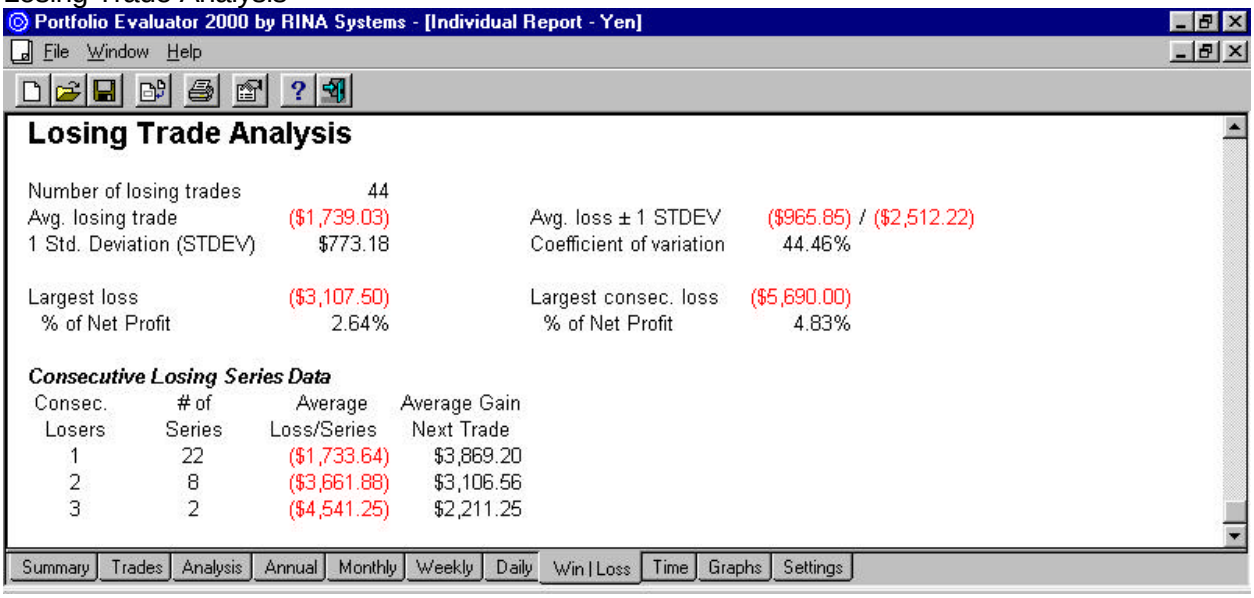
Winning (Losing) Trade Analysis

These two sections center on the systems winning and losing trades. The same statistical measures used for total trades are used again on winning and losing trades to fine tune the evaluation process. This section analyzes how a system performs during and after winning (losing) streaks. This information is best used to potential filter out trades or as a measure to add to positions. The goal is to try to add or liquidate positions as the system enters into a winning or losing streak.

Winning Trade Analysis



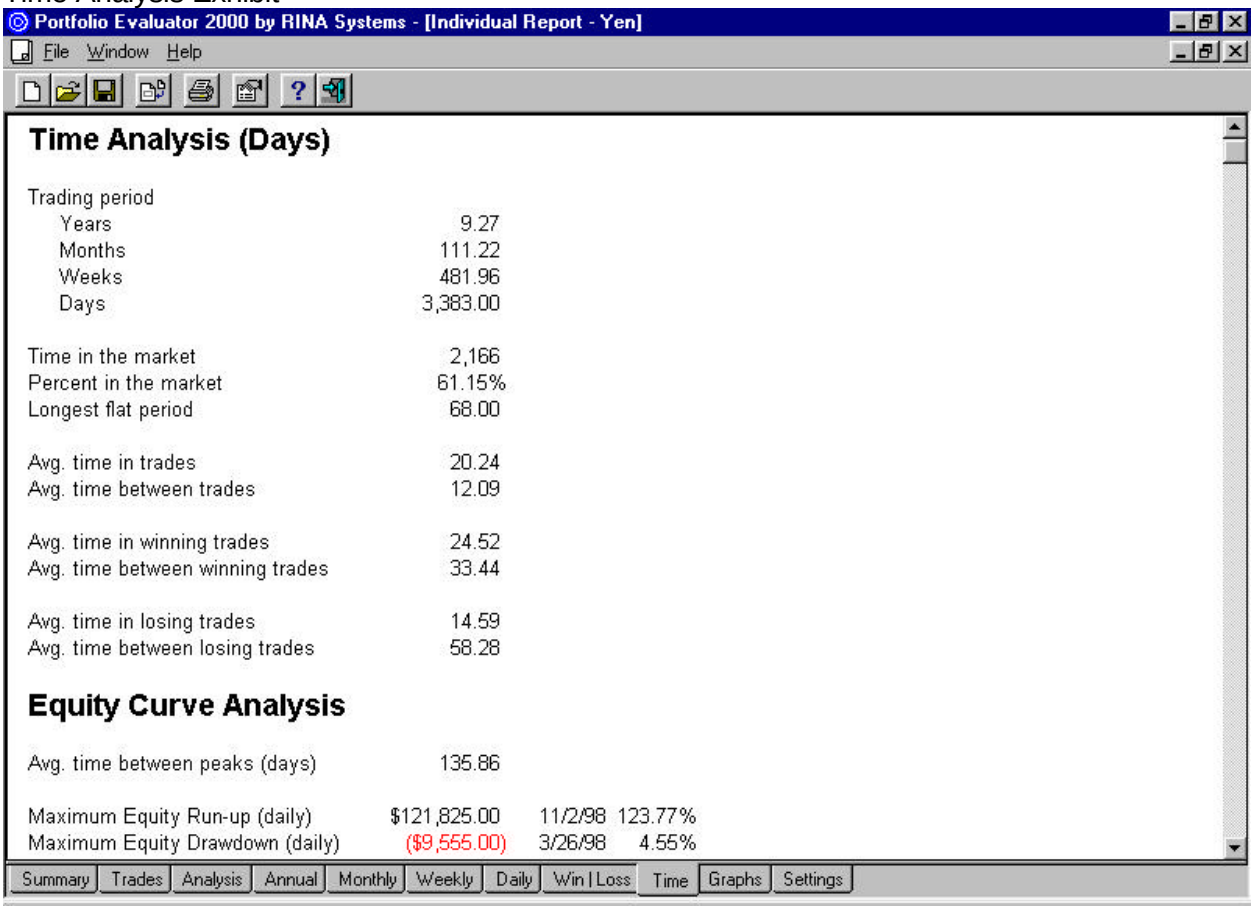
Losing Trade Analysis



Time Analysis

This section centers its evaluation strictly from the standpoint of time. The use of time is essential to properly evaluate a trading system. This form of analysis can be used on the entire system or on its individual trades. In either case, time-in-the-market is considered a measure of risk. The longer a position is exposed to the market, the more risk it assumes.

Time Analysis Exhibit



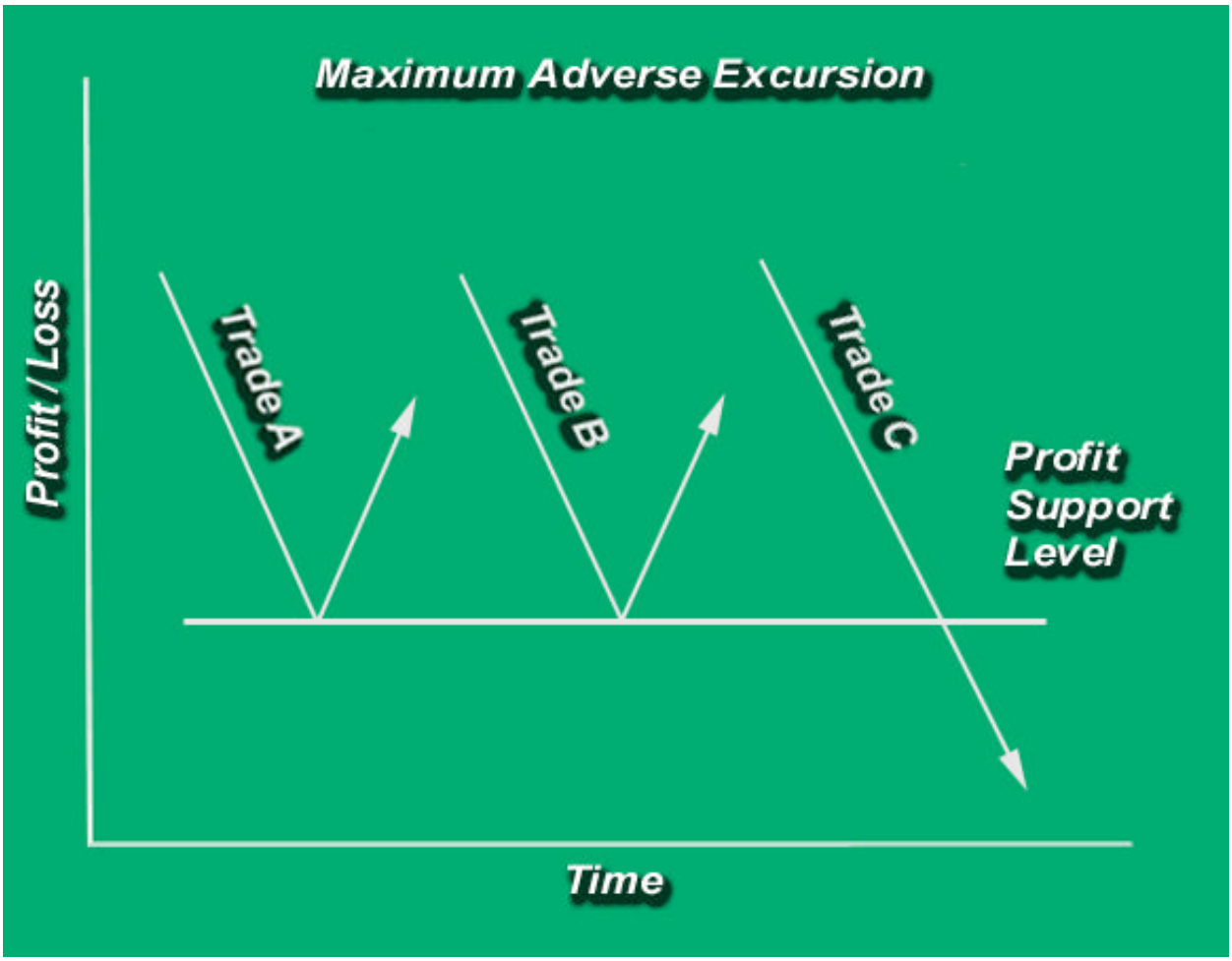
Maximum Adverse Excursion

The Maximum Adverse Excursion strategy allows traders to set a stop limit based on a set dollar drawdown level. Once a trade reaches the dollar stop, the strategy liquidates all contracts associated with the trade.

John Sweeney, Technical Editor of *Technical Analysis of Stocks and Commodities* magazine, introduced the concept of Maximum Adverse Excursion (MAE). The strategy was designed to help traders determine appropriate stop levels for trades based on historical testing. Essentially, the strategy evaluates each trade to determine a level of drawdown at which trades typically do not recover. Systems always have some form of drawdown; MAE attempts to differentiate between normal and abnormal drawdown levels.

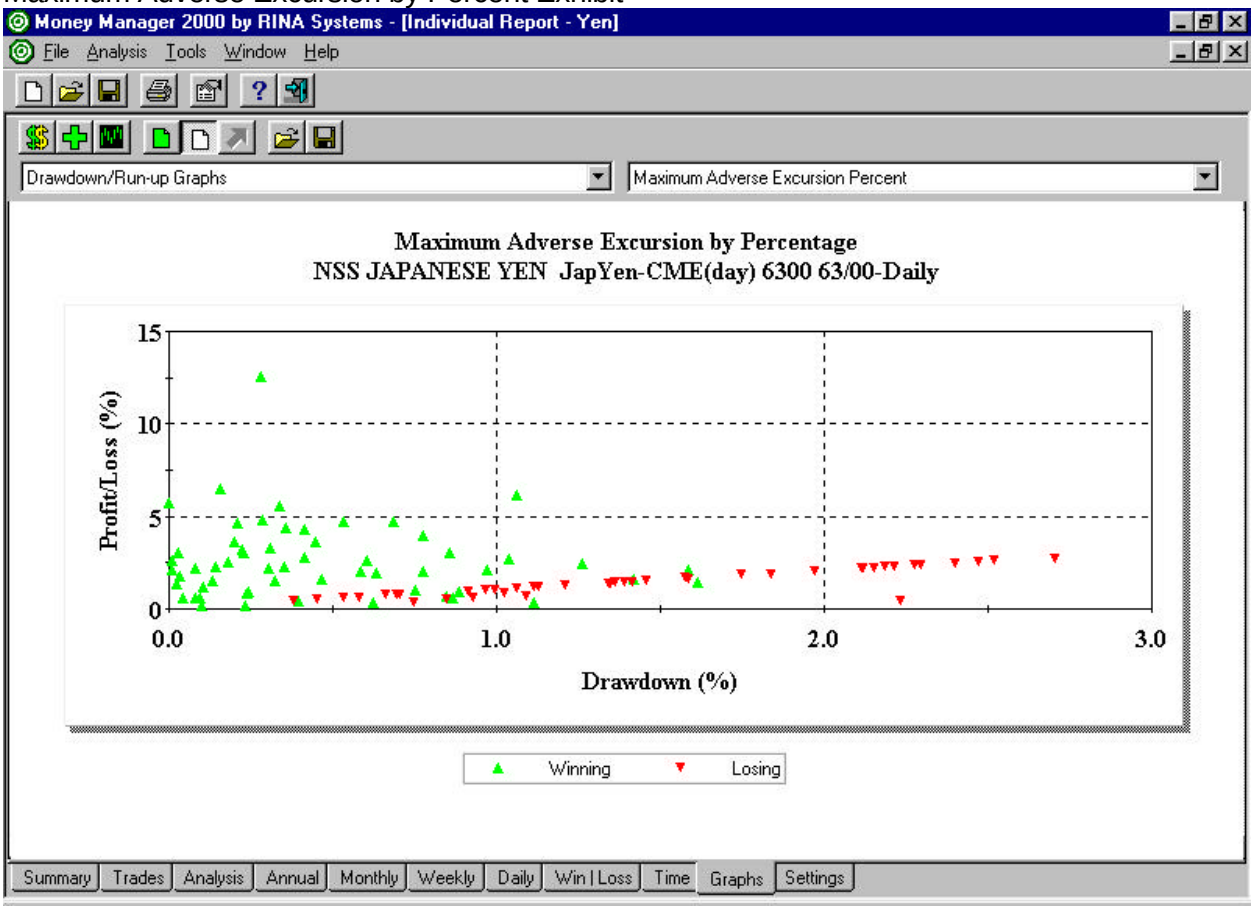
Like support and resistance lines in technical analysis, once the MAE drawdown level has been broken, the trade typically will not recover. Of course, it is possible for a trade to experience an abnormal drawdown only to recover to make a profit. These trades are rare at best and aren't worth the risk to continue with the trade. For more information on this strategy, refer to **Campaign Trading** and **Maximum Adverse Excursion**, both by John Sweeney.

MAE Exhibit



Maximum Adverse Excursion (MAE): This graph is best used to determine intelligent protective money management stops for a trading system. It graphs each trade's realized profit/loss vs. drawdown in a scatter graph format. The green up arrows represent winning trades and the red down arrows losing trades. Look to place a protective stop in an area that captures the majority of winning trades while simultaneously limiting the systems exposure to large drawdowns. For more complete information concerning MAE refer to the book **Campaign Trading** by John Sweeney.

Maximum Adverse Excursion by Percent Exhibit

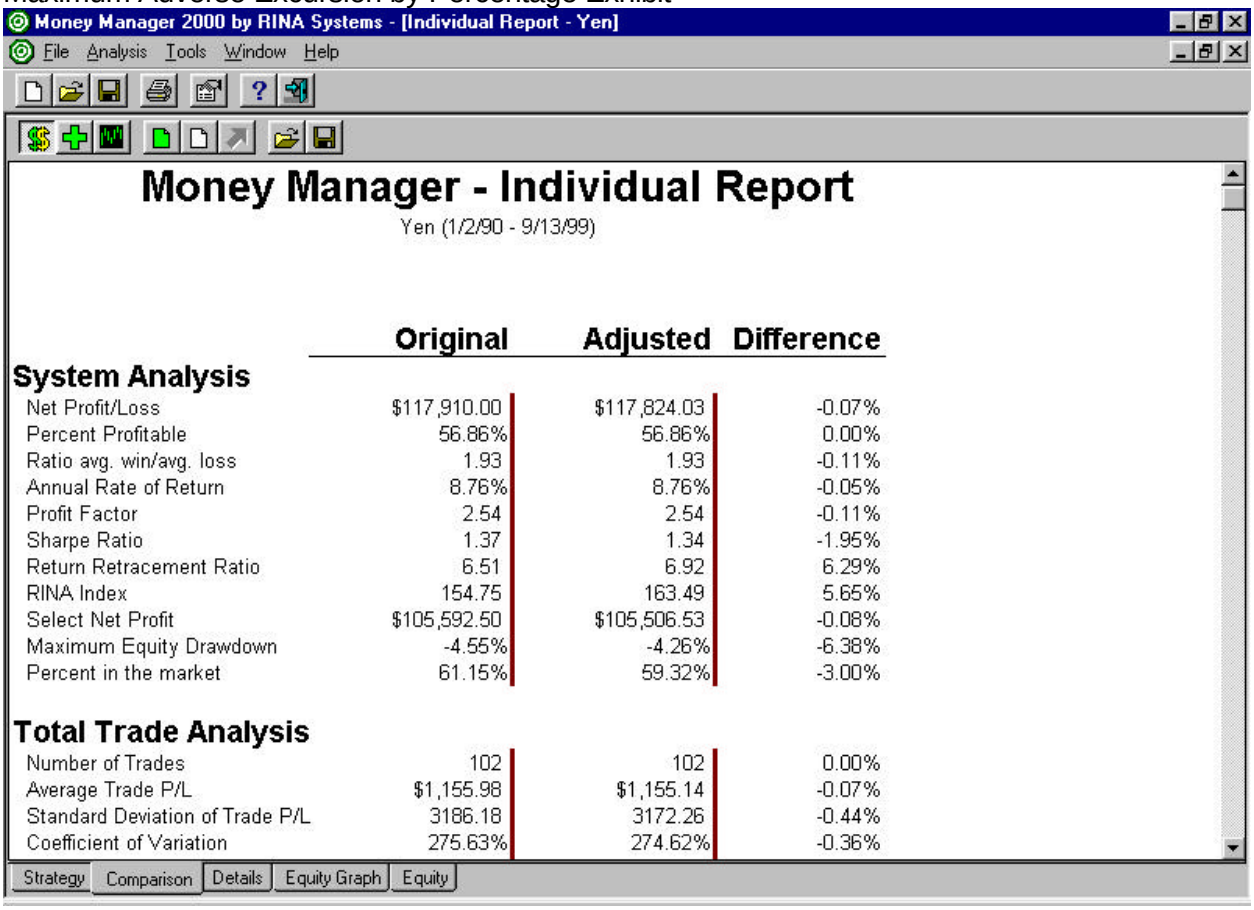


Money Management: Maximum Adverse Excursion

Let's review the results of our Yen trading system after we have applied the MAE money management strategy. Notice that our system makes less money but our risk measure Maximum Drawdown decreases making the system easier to trade with less capital.

Let's stop all the open trades if a 1.75% open unrealized loss is triggered.

Maximum Adverse Excursion by Percentage Exhibit



	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$117,910.00	$117,824.03	-0.07%
Percent Profitable	56.86%	56.86%	0.00%
Ratio avg. win/avg. loss	1.93	1.93	-0.11%
Annual Rate of Return	8.76%	8.76%	-0.05%
Profit Factor	2.54	2.54	-0.11%
Sharpe Ratio	1.37	1.34	-1.95%
Return Retracement Ratio	6.51	6.92	6.29%
RINA Index	154.75	163.49	5.65%
Select Net Profit	$105,592.50	$105,506.53	-0.08%
Maximum Equity Drawdown	-4.55%	-4.26%	-6.38%
Percent in the market	61.15%	59.32%	-3.00%
Total Trade Analysis			
Number of Trades	102	102	0.00%
Average Trade P/L	$1,155.98	$1,155.14	-0.07%
Standard Deviation of Trade P/L	3186.18	3172.26	-0.44%
Coefficient of Variation	275.63%	274.62%	-0.36%

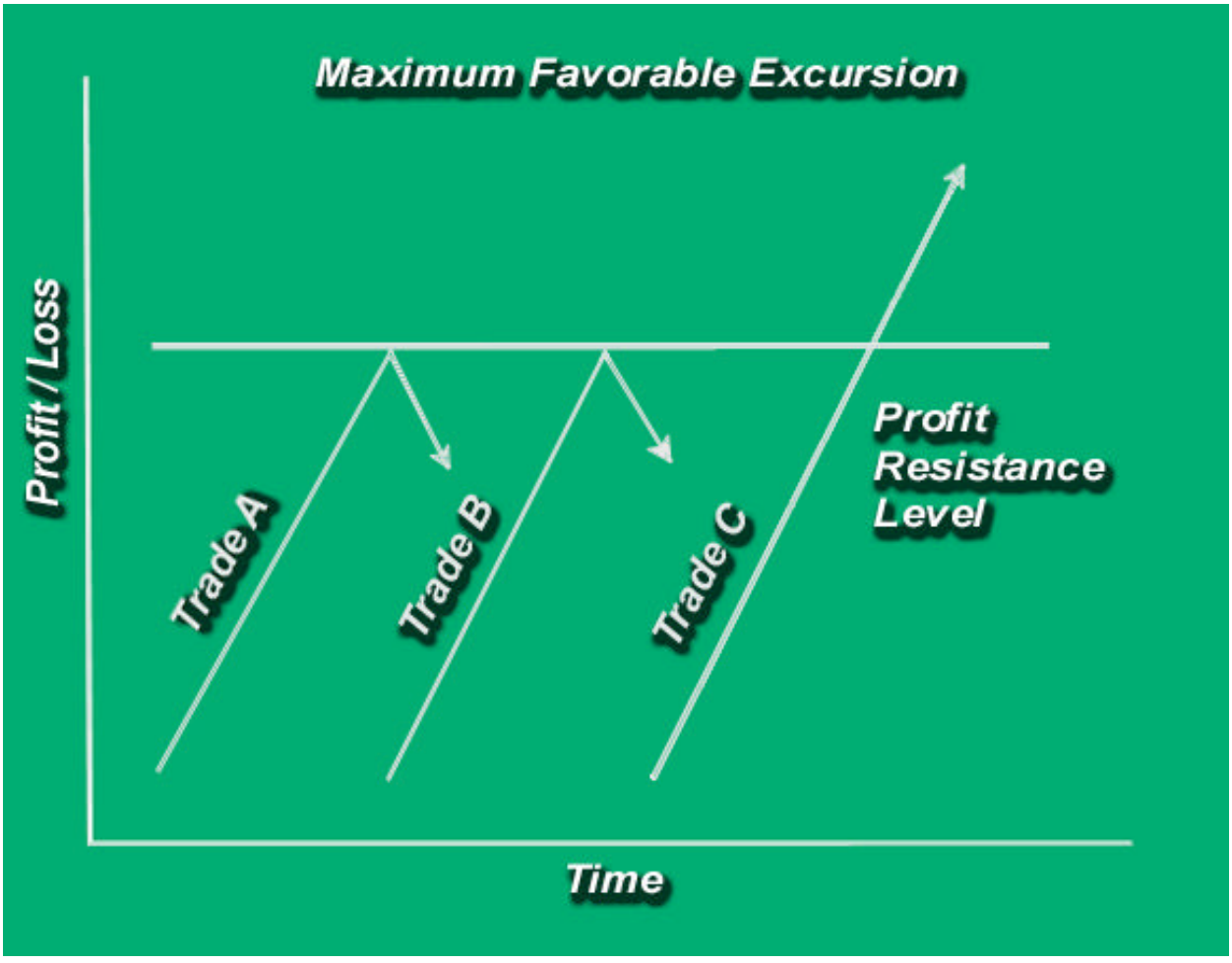
Workshop Tip: MAE can be calculated in either a dollar or percentage format. We have selected the percent format for this example, but both formats were tested to ensure that a complete analysis was performed.

Maximum Favorable Excursion

The Maximum Favorable Excursion strategy allows you to set entry limit orders based on a set dollar run-up level. Once a trade reaches the limit level, the strategy adds a predetermined number of contracts. This MFE strategy was designed to allow systems to add to position once an appropriate open profit level for a trade had been penetrated. Essentially the system evaluates each trade to determine a level of run-up at which trades typically never produce a loss and more importantly generate a larger closed profit. Systems always have some form of run-up, MFE attempts to differentiate between normal and abnormal run-up levels.

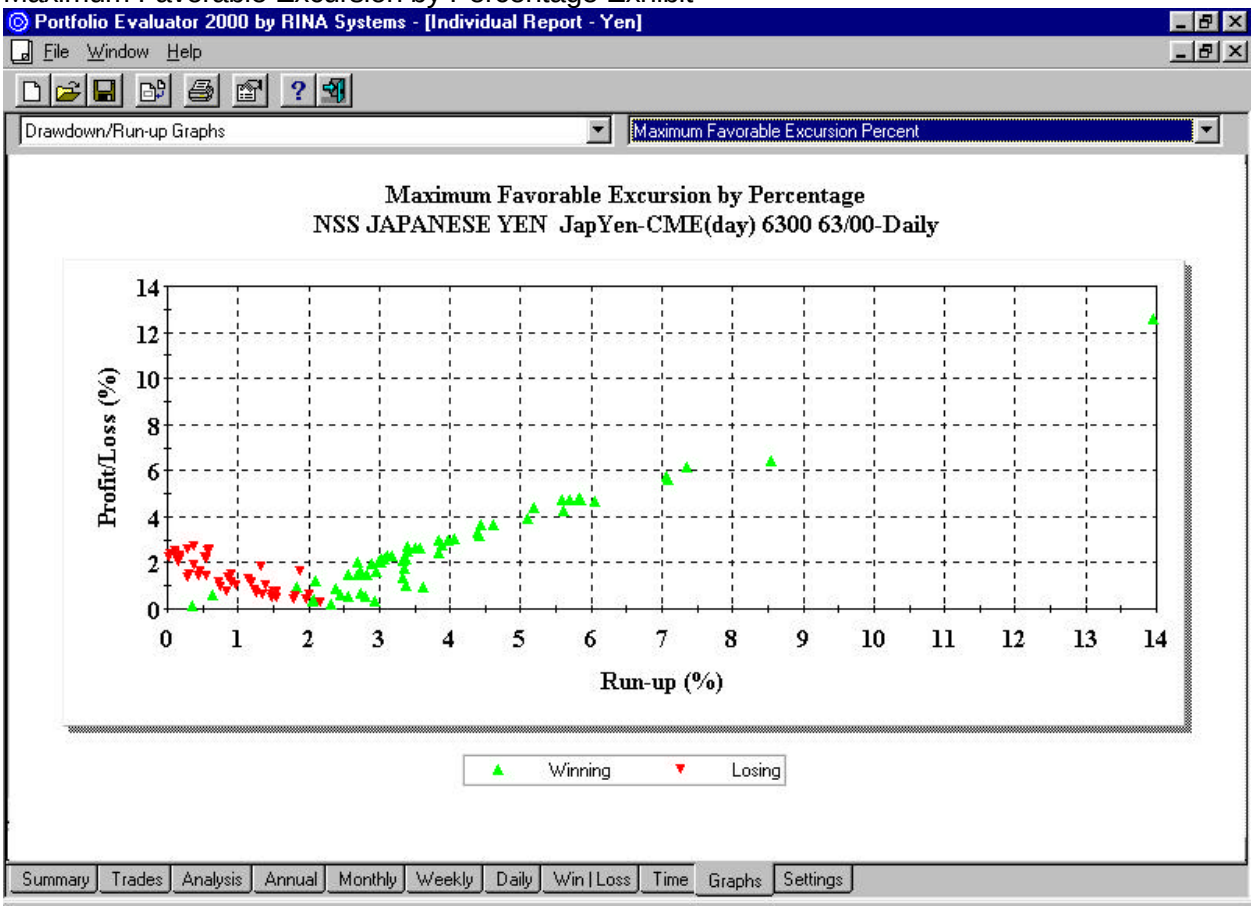
Like support and resistance lines in technical analysis, once the MFE run-up level has been broken, the trade most likely will generate an even larger profit. This strategy adds to positions based on open equity profits, which makes it a relatively low-risk trading strategy.

MFE Exhibit



Maximum Favorable Excursion (MFE): This graph is best used to determine opportunities to add to positions. It displays each trades run-up to realized profit in a scatter graph format. The green up arrows represent winning trades and the red down arrows losing trades. Look to add to positions in an area that captures the majority of winning trades while simultaneously limiting the systems expose to profit erosion. For more complete information concerning MFE refer to the book **Campaign Trading** by John Sweeney.

Maximum Favorable Excursion by Percentage Exhibit

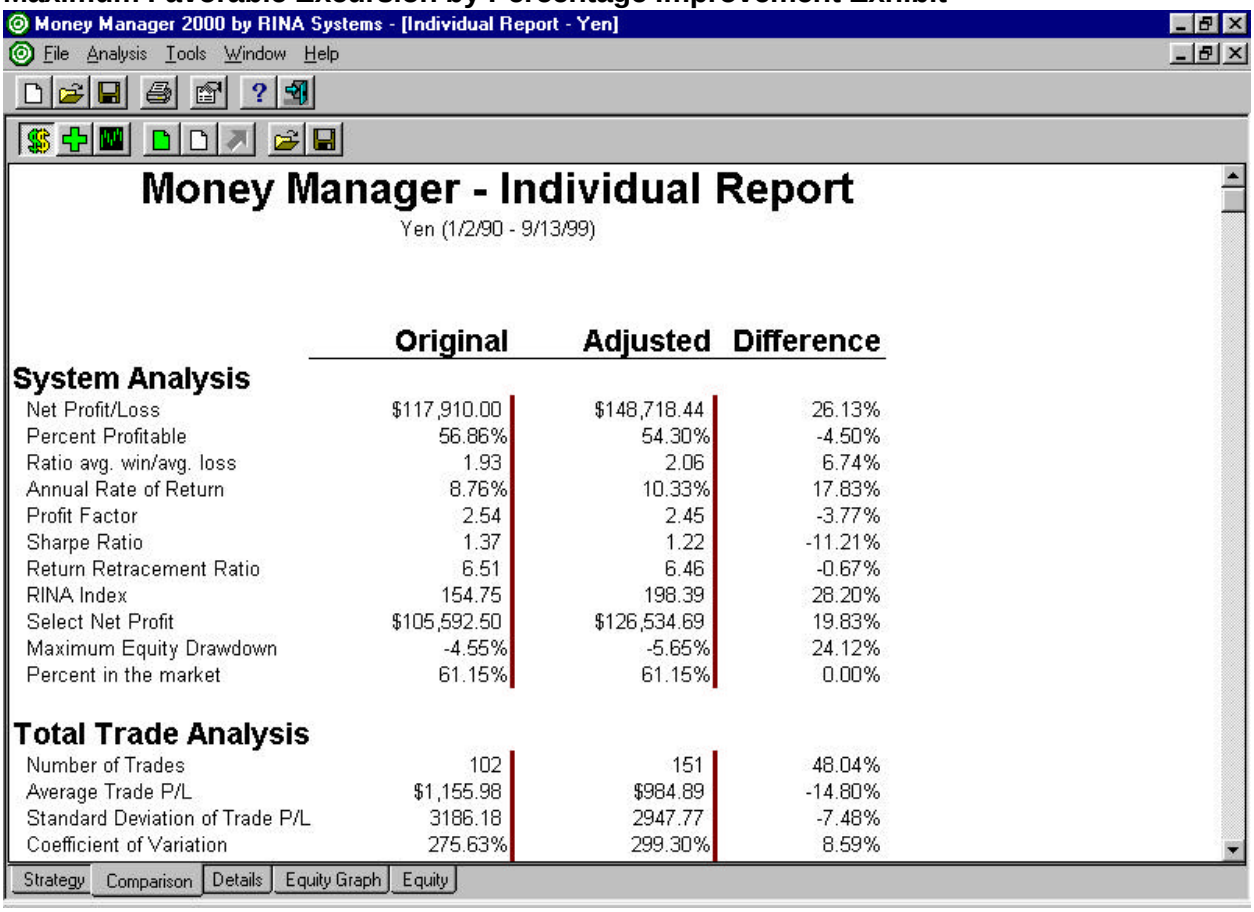


For more information concerning the use of MFE refer to the article **The Maximum Favorable Excursion Strategy** in the March 1999 issue of Technical Analysis of Stocks and Commodities.

Money Management: Maximum Favorable Excursion

Let's add one contract any time a trade generates an unrealized profit of 2.5% or more.

Maximum Favorable Excursion by Percentage Improvement Exhibit



Money Manager 2000 by RINA Systems - [Individual Report - Yen]

File Analysis Tools Window Help

Money Manager - Individual Report

Yen (1/2/90 - 9/13/99)

	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$117,910.00	$148,718.44	26.13%
Percent Profitable	56.86%	54.30%	-4.50%
Ratio avg. win/avg. loss	1.93	2.06	6.74%
Annual Rate of Return	8.76%	10.33%	17.83%
Profit Factor	2.54	2.45	-3.77%
Sharpe Ratio	1.37	1.22	-11.21%
Return Retracement Ratio	6.51	6.46	-0.67%
RINA Index	154.75	198.39	28.20%
Select Net Profit	$105,592.50	$126,534.69	19.83%
Maximum Equity Drawdown	-4.55%	-5.65%	24.12%
Percent in the market	61.15%	61.15%	0.00%
Total Trade Analysis			
Number of Trades	102	151	48.04%
Average Trade P/L	$1,155.98	$984.89	-14.80%
Standard Deviation of Trade P/L	3186.18	2947.77	-7.48%
Coefficient of Variation	275.63%	299.30%	8.59%

Strategy | Comparison | Details | Equity Graph | Equity

Money Management Tip: The MFE strategy is more effective if the trading system has an average Run-up coefficient of variation figure less than 150% and Exit Efficiency greater than 40%.

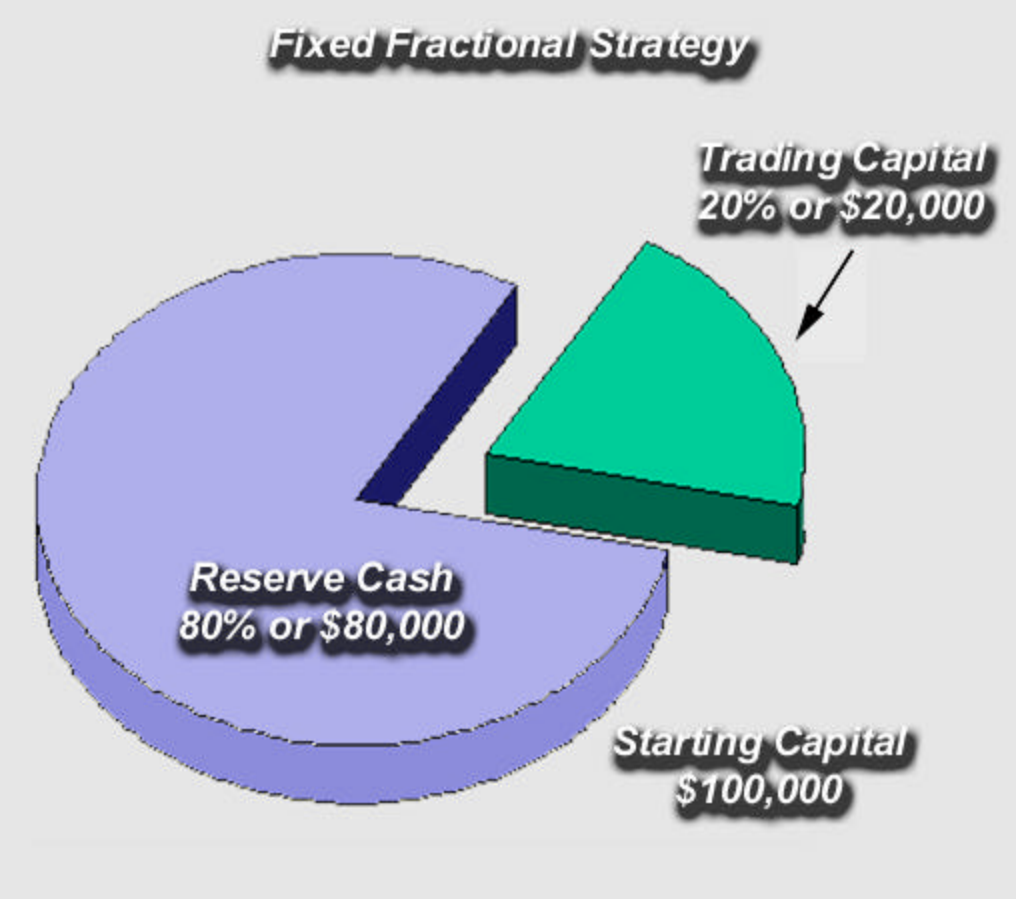
Fixed Fractional

The fixed fractional strategy enables you to manage your trades by setting aside a portion of your equity for trading. Not only does this strategy limit the amount of equity you are willing to risk, it also allows you to potentially increase your account dramatically. Basically, the higher your equity grows, the more funds you have available for trading and the more capital your system can earn. The strategy works as follows.

Suppose you start with $100,000 of initial capital and you are willing to risk 20% of it in your trading. You now have 20,000 available to purchase contracts. (Let's call this amount your "Trading Capital.") Suppose further that the cost of each contract is $15,000. Using only your initial investing pool, you are able to purchase one contract based on $20,000 available capital.

Let's say that your contracts are successful and over time you earn $75,000. These earnings increase your total equity to $175,000, thereby increasing your trading capital to $35,000 ($175,000 x 20%). Assuming that the cost of each contract is still $15,000, this strategy now allows you to purchase two contracts in your next trade ($35,000/$15,000 = 2 Contracts). As your total equity grows, your investing pool grows as well (since it is a fixed percentage of your equity), allowing you to purchase more and more contracts.

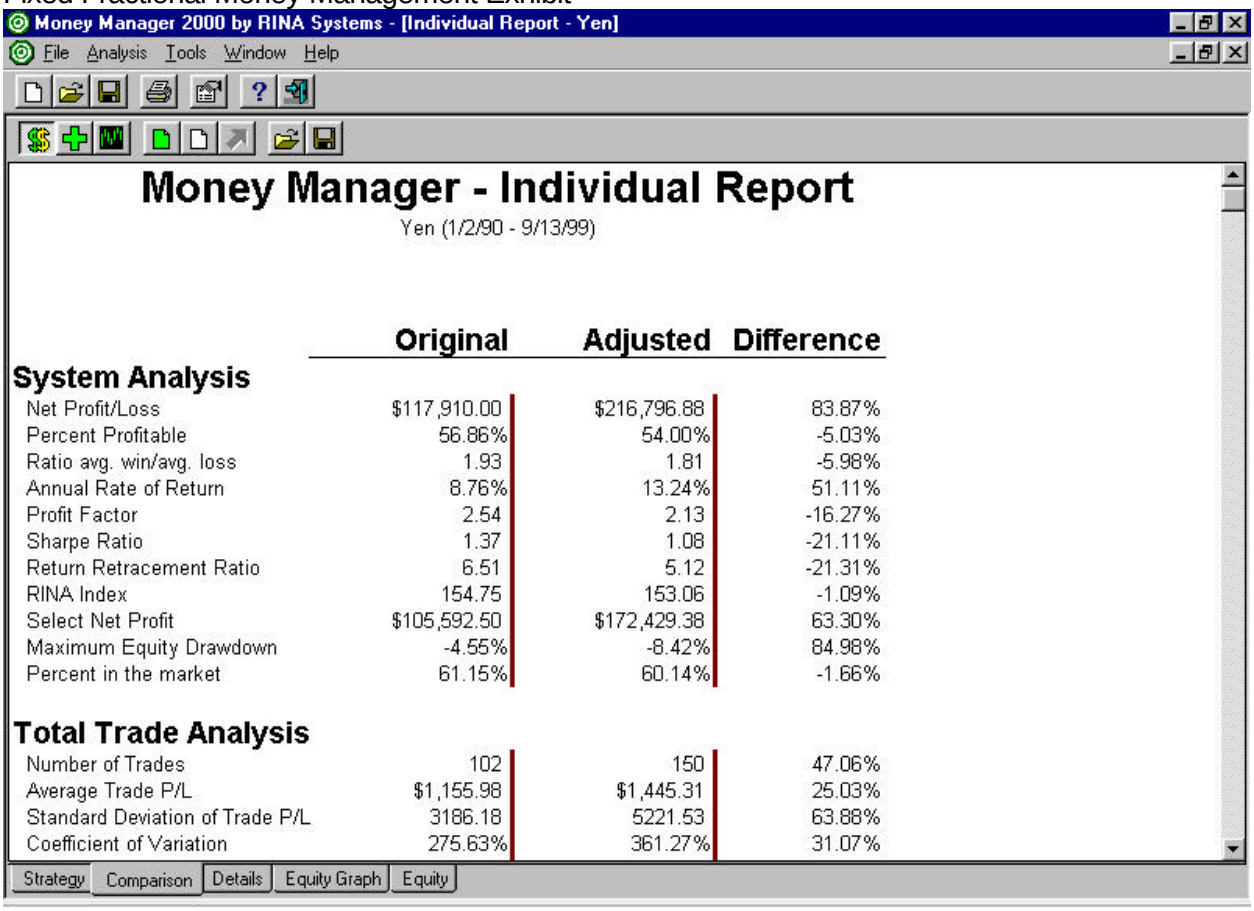
Fixed Fractional Exhibit



Money Management: Fixed Fractional

The fixed fractional strategy allows us to slowly increase the number of contracts traded as our account equity grows. As our trading capital grows so too does the number of contracts traded. In this example we have combined the Fixed Fractional strategy (20% risk with 20K margin) with Maximum Favorable Excursion to show how these two strategies can dramatically improve trading performance.

Fixed Fractional Money Management Exhibit

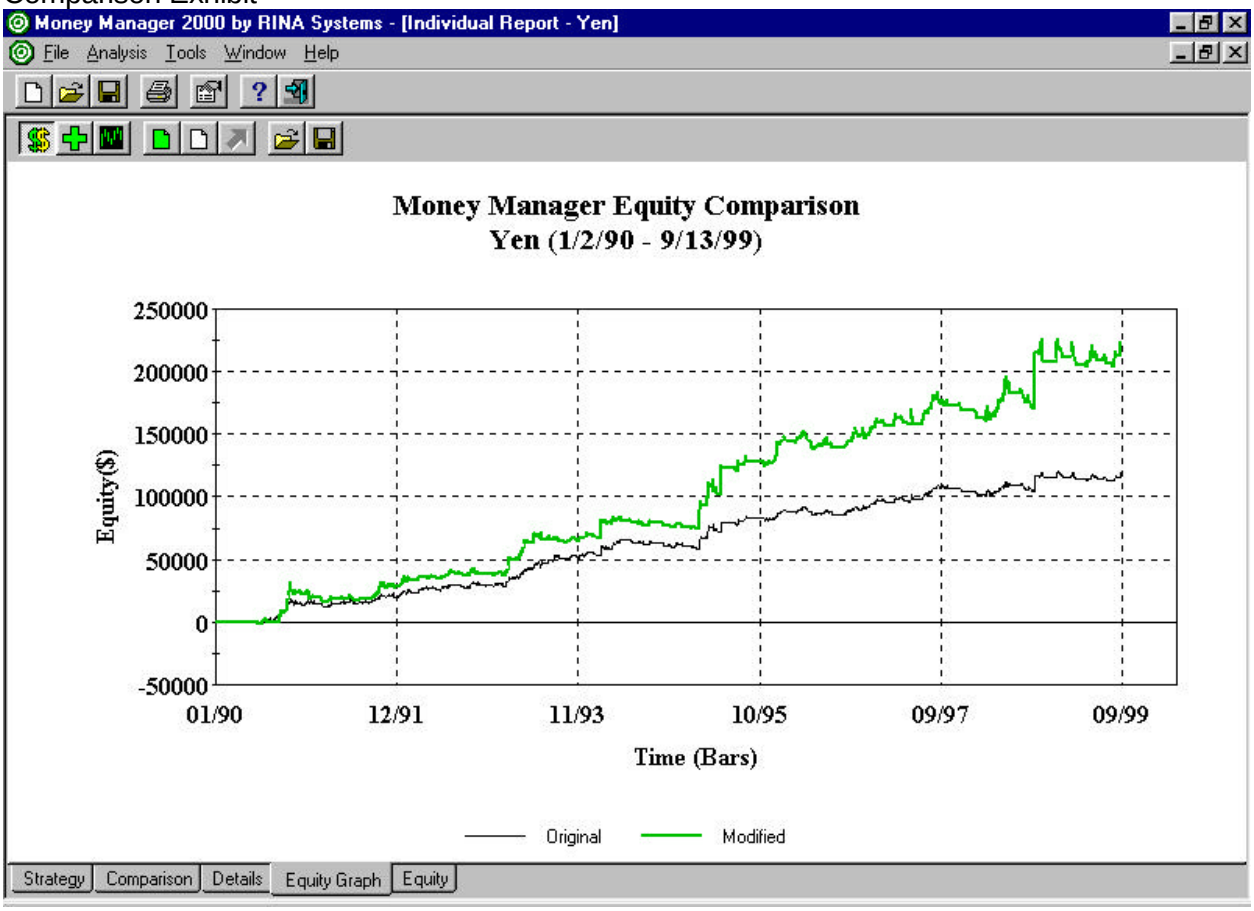


	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$117,910.00	$216,796.88	83.87%
Percent Profitable	56.86%	54.00%	-5.03%
Ratio avg. win/avg. loss	1.93	1.81	-5.98%
Annual Rate of Return	8.76%	13.24%	51.11%
Profit Factor	2.54	2.13	-16.27%
Sharpe Ratio	1.37	1.08	-21.11%
Return Retracement Ratio	6.51	5.12	-21.31%
RINA Index	154.75	153.06	-1.09%
Select Net Profit	$105,592.50	$172,429.38	63.30%
Maximum Equity Drawdown	-4.55%	-8.42%	84.98%
Percent in the market	61.15%	60.14%	-1.66%
Total Trade Analysis			
Number of Trades	102	150	47.06%
Average Trade P/L	$1,155.98	$1,445.31	25.03%
Standard Deviation of Trade P/L	3186.18	5221.53	63.88%
Coefficient of Variation	275.63%	361.27%	31.07%

Money Management: Fixed Fractional w/MFE

Comparison equity graphic: This graphic details the increase in profitability between the original and modified Yen trading system after applying the money management strategies.

Comparison Exhibit



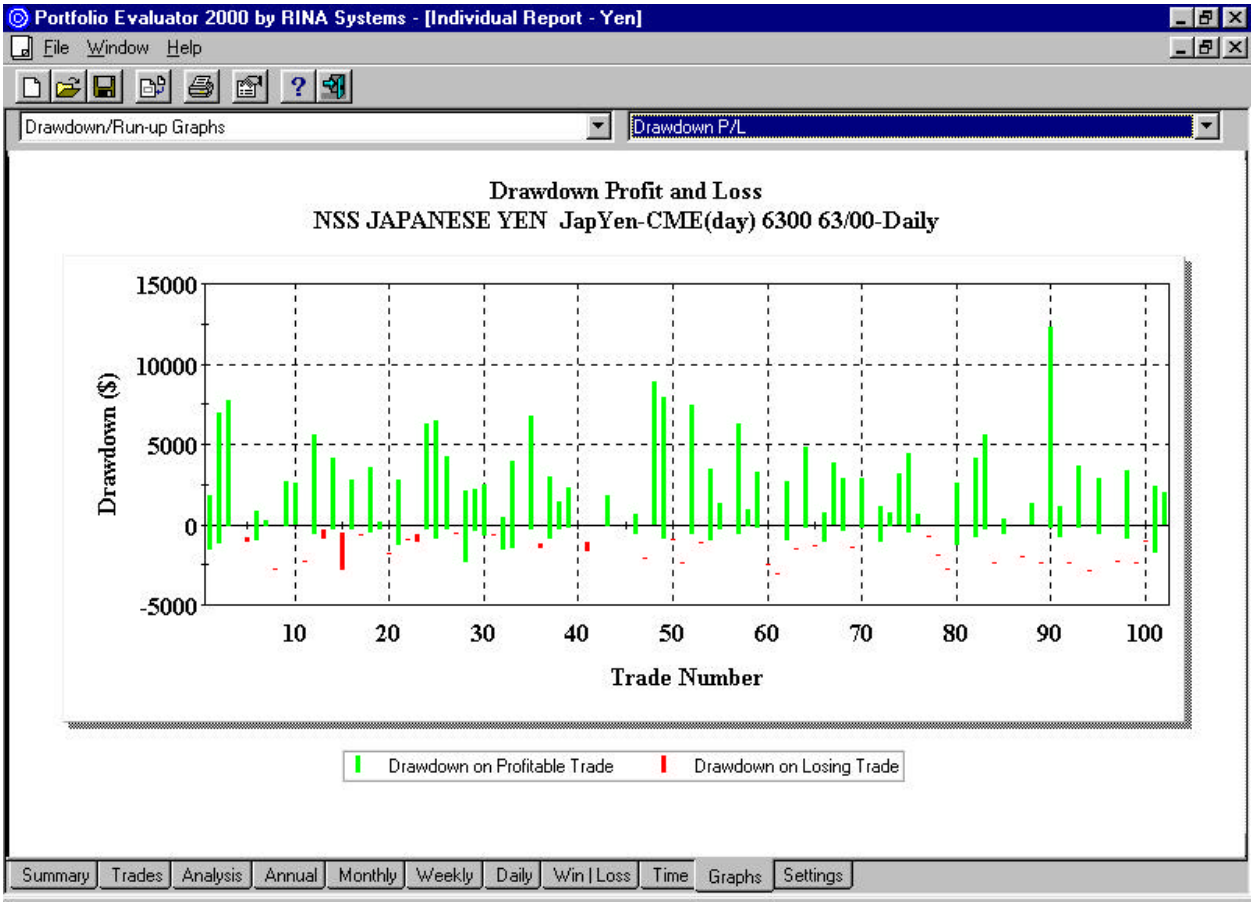
Drawdown Support

The Drawdown Support strategy adds contracts to an open position after a specified level of drawdown has been hit. To determine an appropriate level to add to positions let's look at a Drawdown Profit and Loss graph to evaluate the systems drawdown support level.

Drawdown P/L: Graphs each trade's drawdown together with realized profit/loss in $ vs. Trade Number in a bar graph format. The low to each bar represents the trades maximum drawdown while the high of the bar represents the trades close profit or loss. The smaller the bar the closer the trade was to its individual maximum drawdown.

If we were to add to a position when it was down $500 to $1000, knowing that this system typically reverses from that drawdown level then we would make a heck of a lot more money with little added risk. Psychologically however traders seem to have difficulty adding to positions when they aren't making money. That's why in looking at this graph we can see an area of support for our trading system. When a trade losses around $1000 dollars it has a tendency to recover.

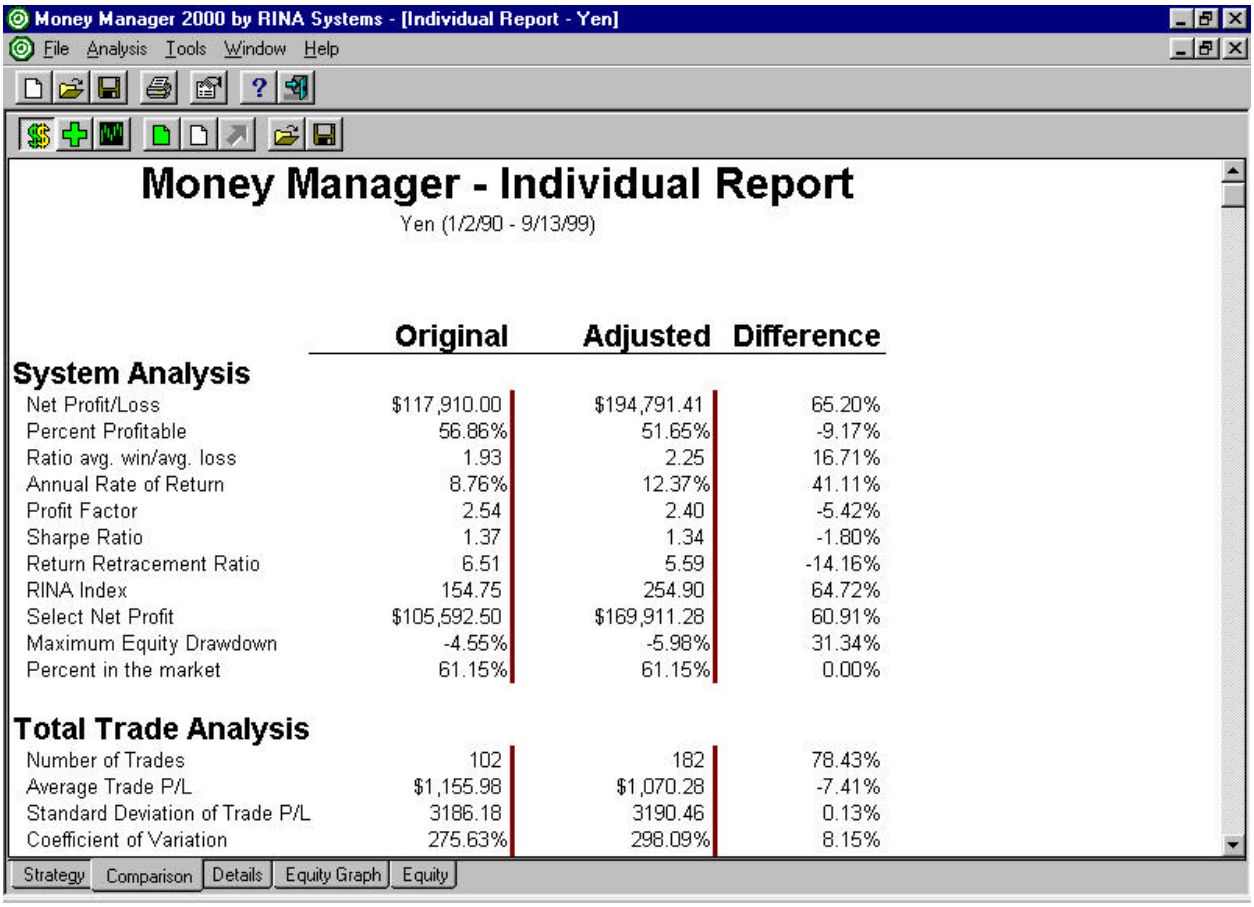
Drawdown Profit/Loss Exhibit



Money Management: Drawdown Support

The drawdown support strategy allows us to add to positions if the system should experience a specific level of unrealized loss. In this example we will add an additional contract once the system experiences a .25% drawdown.

Drawdown Support Money Management Exhibit

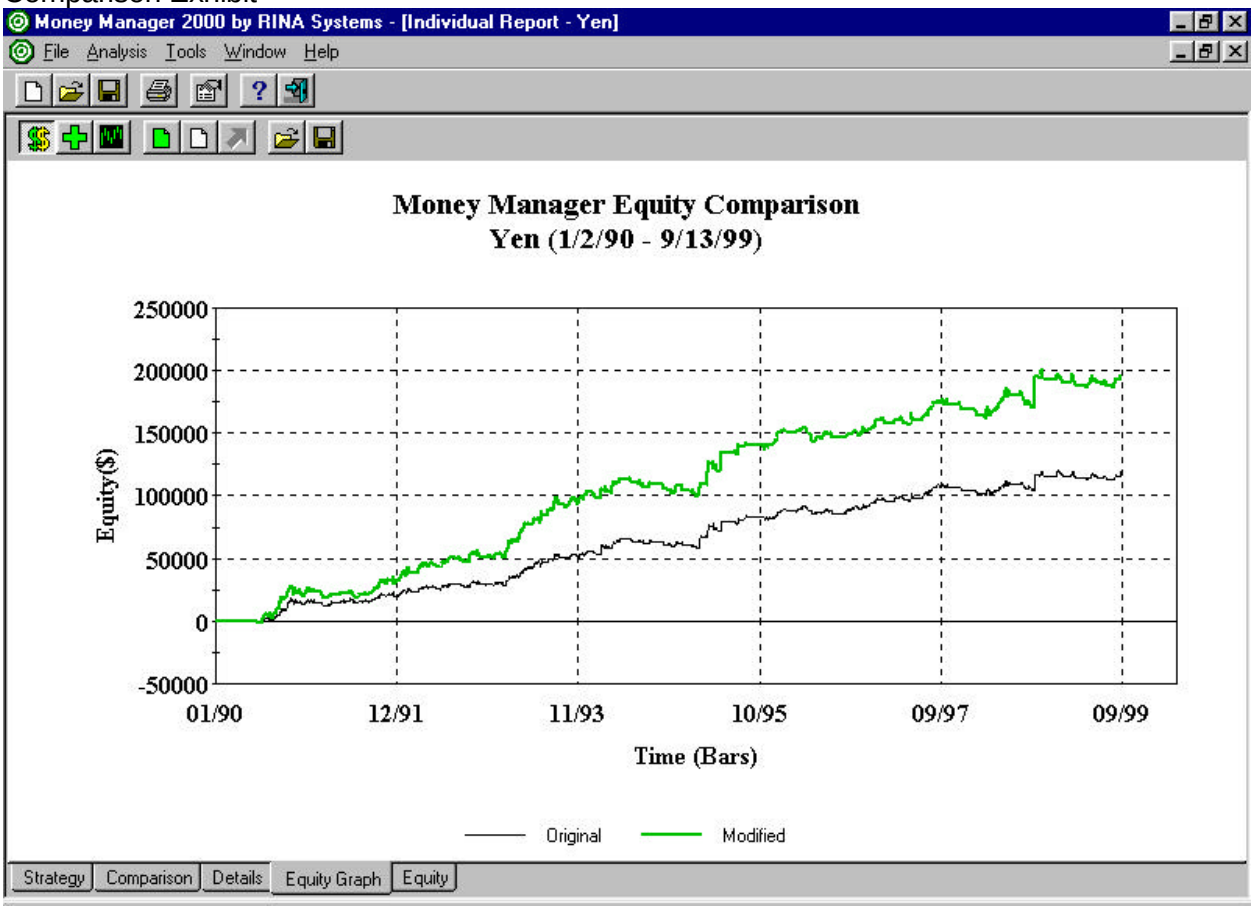


	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$117,910.00	$194,791.41	65.20%
Percent Profitable	56.86%	51.65%	-9.17%
Ratio avg. win/avg. loss	1.93	2.25	16.71%
Annual Rate of Return	8.76%	12.37%	41.11%
Profit Factor	2.54	2.40	-5.42%
Sharpe Ratio	1.37	1.34	-1.80%
Return Retracement Ratio	6.51	5.59	-14.16%
RINA Index	154.75	254.90	64.72%
Select Net Profit	$105,592.50	$169,911.28	60.91%
Maximum Equity Drawdown	-4.55%	-5.98%	31.34%
Percent in the market	61.15%	61.15%	0.00%
Total Trade Analysis			
Number of Trades	102	182	78.43%
Average Trade P/L	$1,155.98	$1,070.28	-7.41%
Standard Deviation of Trade P/L	3186.18	3190.46	0.13%
Coefficient of Variation	275.63%	298.09%	8.15%

Money Management: Drawdown Support

Comparison equity graphic: This graphic details the increase in profitability between the original and modified Yen trading system after applying the money management strategies.

Comparison Exhibit



Breakout Trading on Corn

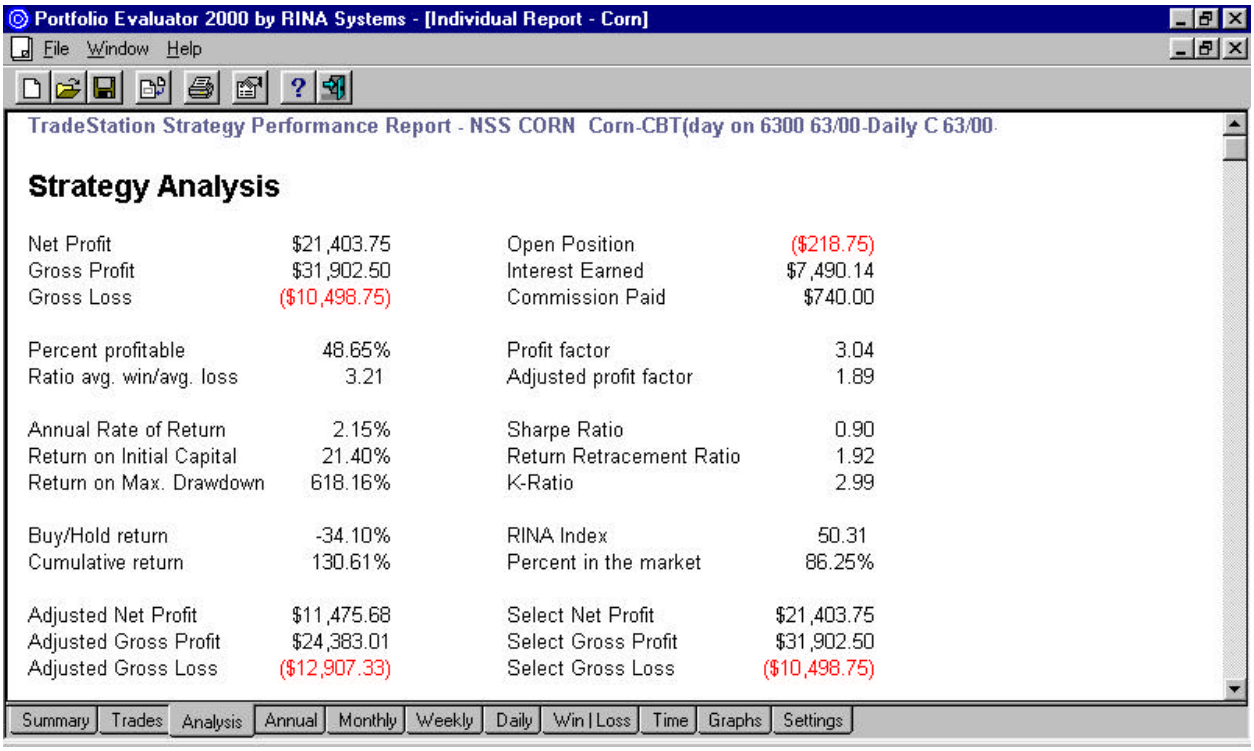
System Description: This system buys or sells the Corn based on market breakouts. If the close breaks above a set look back period the system buys the market. If however the system experiences a close below a set look back periods the system generates a sell signal. The system looks for other market conditions, not described, which go beyond the scope of this presentation. This trend oriented system trades on a frequent basis generating trading signals that are highly profitable and efficient.

Corn System

System Analysis Section

This section will evaluate the overall performance of our Corn trading system.

System Analysis Exhibit

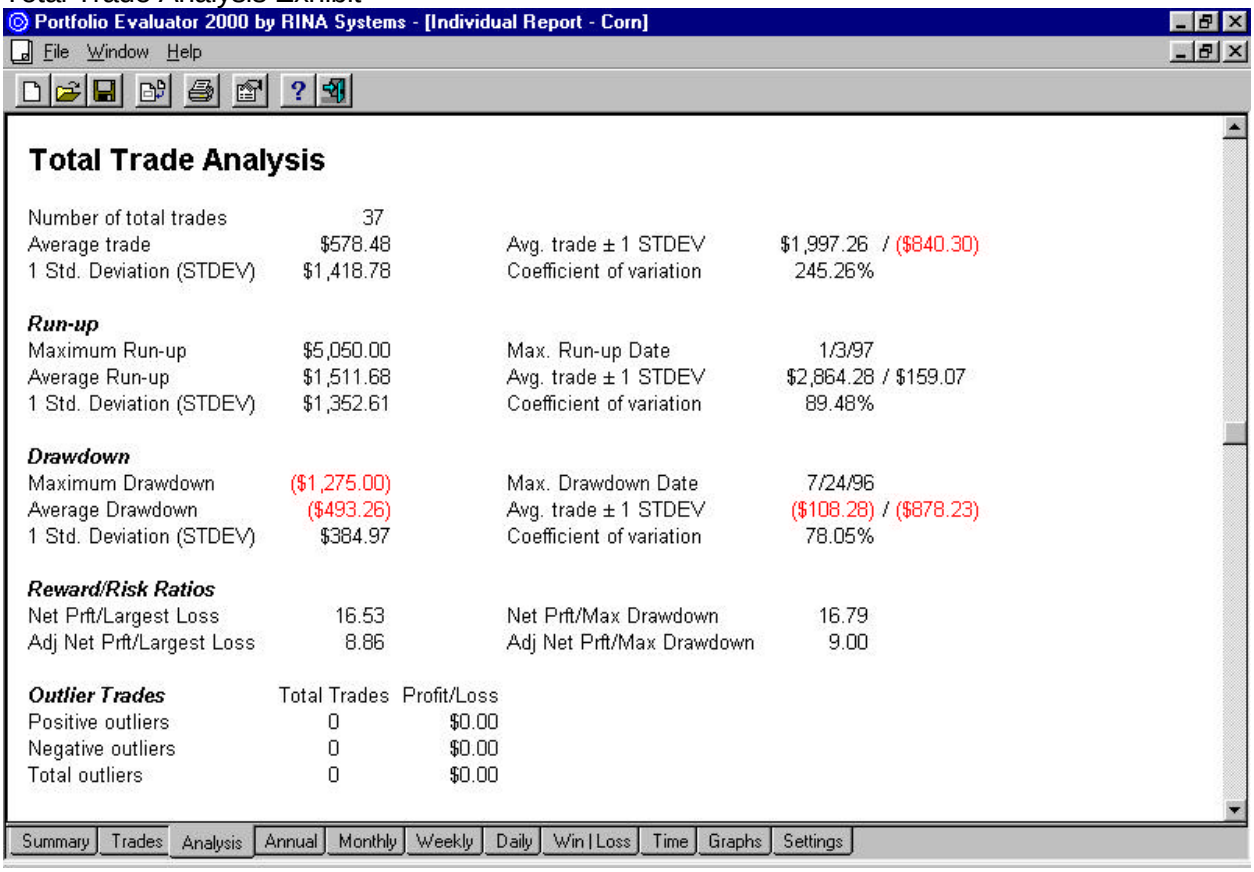


This system is very profitable and extremely efficient given a number risk reward calculations. Pay close attention to Net Profit, Percent Profitable, Profit Factor, Return Retracement Ratio, RINA Index and Select Net Profit, these calculations in particular describe the system overall true worth.

Total Trade Analysis

This section will help to evaluate a number of risk reward calculations as well determine the systems performance stability.

Total Trade Analysis Exhibit

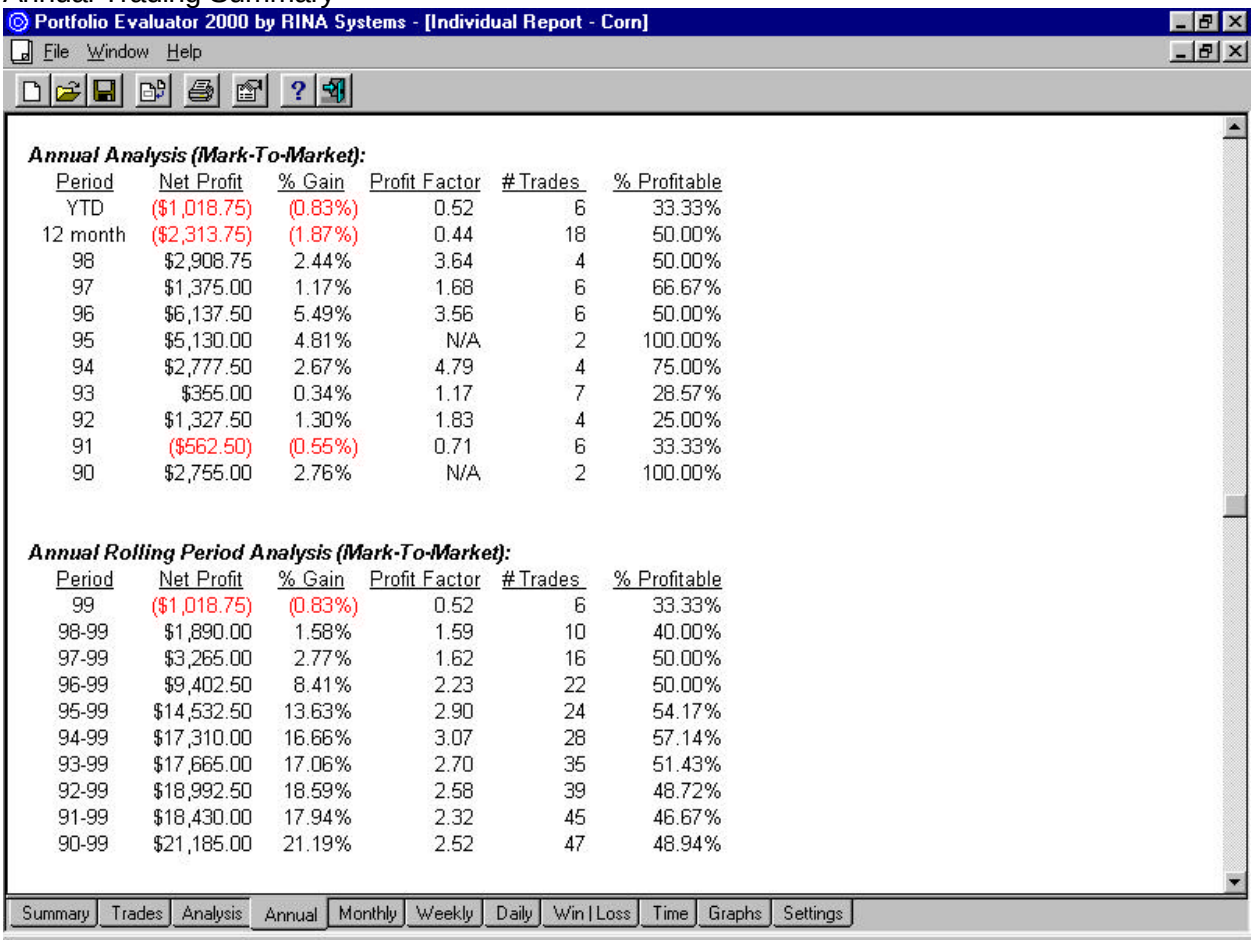


Pay close attention to the systems stable Average Trade, Run-up and Drawdown figures. These particlur calculations describe a very stable system suitable for a variety of different money management strategies.

Annual Trading Summary

This section breaks down the trading perfromance of our Corn system over time. Notice that the system % profitable and Profit Factor remain consistent no matter what date is used to begin trading.

Annual Trading Summary



Annual Analysis (Mark-To-Market):

Period	Net Profit	% Gain	Profit Factor	# Trades	% Profitable
YTD	($1,018.75)	(0.83%)	0.52	6	33.33%
12 month	($2,313.75)	(1.87%)	0.44	18	50.00%
98	$2,908.75	2.44%	3.64	4	50.00%
97	$1,375.00	1.17%	1.68	6	66.67%
96	$6,137.50	5.49%	3.56	6	50.00%
95	$5,130.00	4.81%	N/A	2	100.00%
94	$2,777.50	2.67%	4.79	4	75.00%
93	$355.00	0.34%	1.17	7	28.57%
92	$1,327.50	1.30%	1.83	4	25.00%
91	($562.50)	(0.55%)	0.71	6	33.33%
90	$2,755.00	2.76%	N/A	2	100.00%

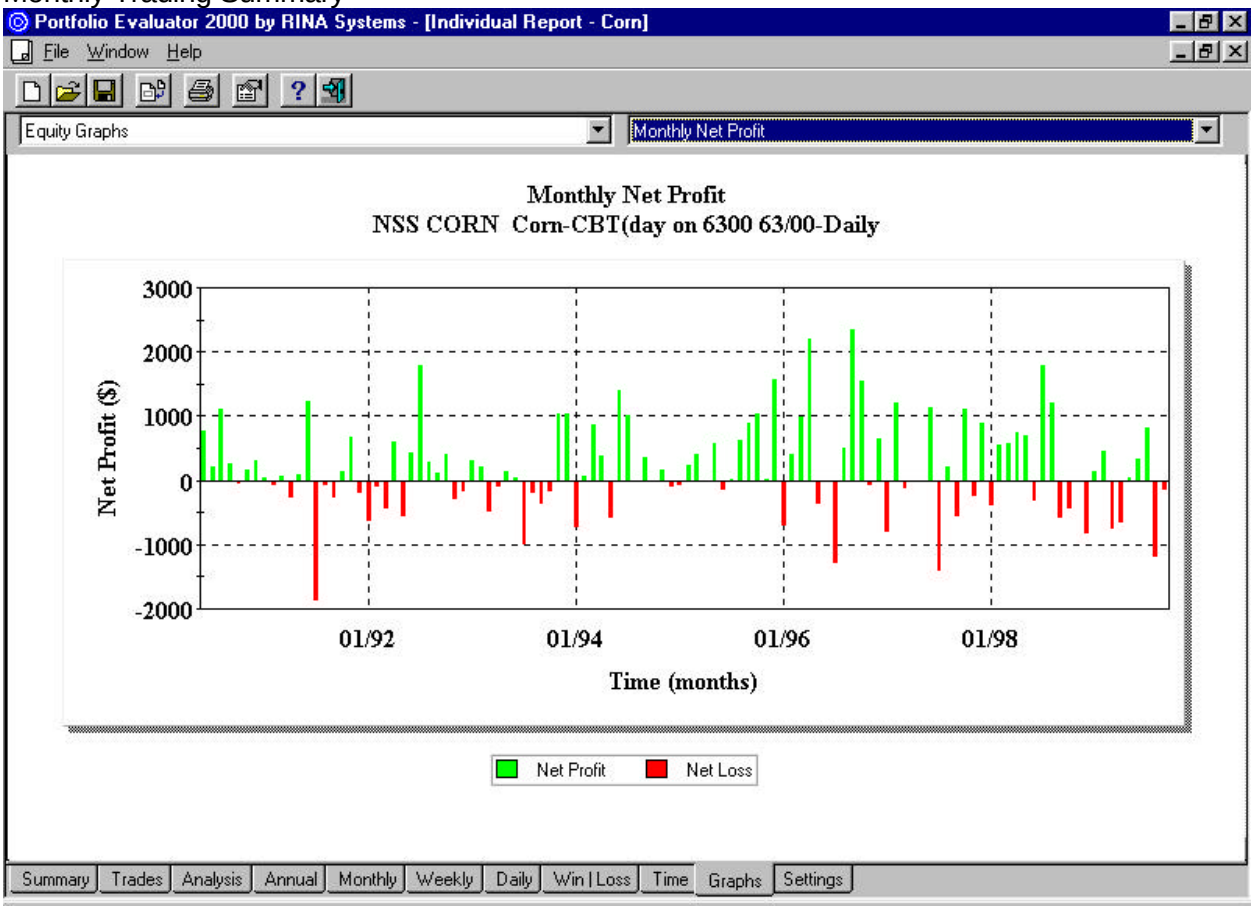
Annual Rolling Period Analysis (Mark-To-Market):

Period	Net Profit	% Gain	Profit Factor	# Trades	% Profitable
99	($1,018.75)	(0.83%)	0.52	6	33.33%
98-99	$1,890.00	1.58%	1.59	10	40.00%
97-99	$3,265.00	2.77%	1.62	16	50.00%
96-99	$9,402.50	8.41%	2.23	22	50.00%
95-99	$14,532.50	13.63%	2.90	24	54.17%
94-99	$17,310.00	16.66%	3.07	28	57.14%
93-99	$17,665.00	17.06%	2.70	35	51.43%
92-99	$18,992.50	18.59%	2.58	39	48.72%
91-99	$18,430.00	17.94%	2.32	45	46.67%
90-99	$21,185.00	21.19%	2.52	47	48.94%

Monthly Trading Summary

Our Corn syste is able to link together a number of profitable trading months. More importatly the system generates very few losing months with relativley small loses.

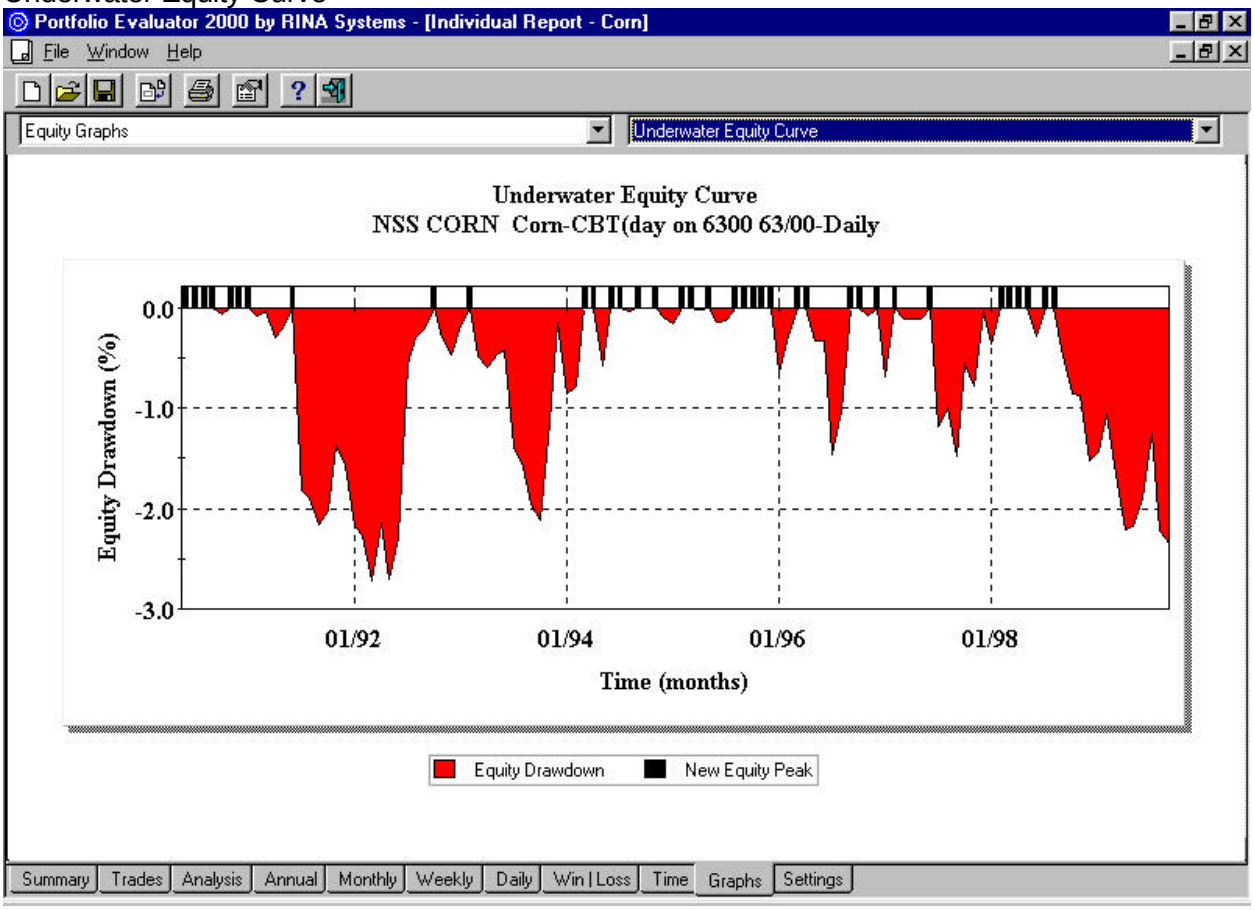
Monthly Trading Summary



Equity Curve Analysis

Although the Corn system experineces a few periods of underwater drawdown, the magnitude is relative minor. More importatly when this system is combines with our Yen system we will see that drawdwon occur a different times helping to off set periods of drawdown for the portfolio.

Underwater Equity Curve

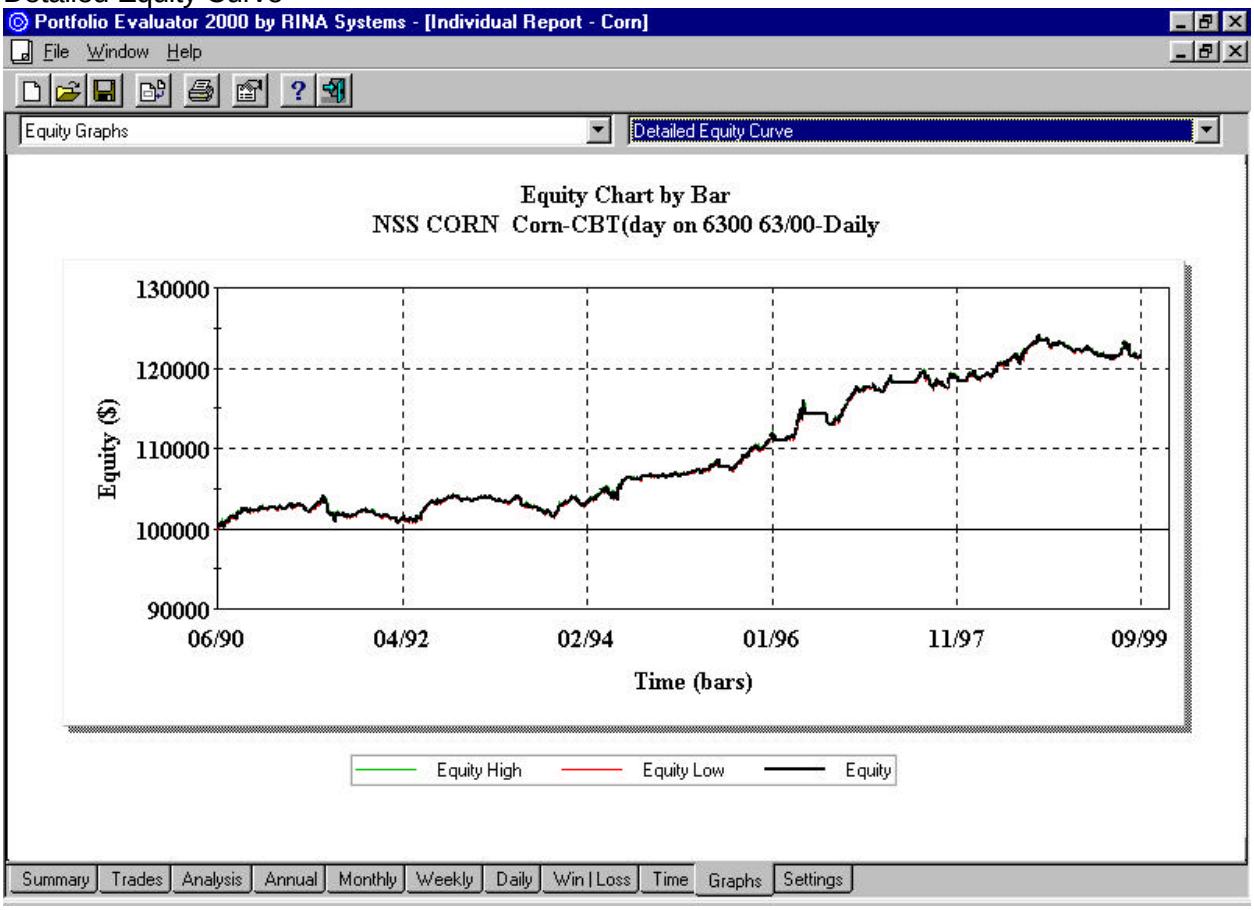


For more information concerning the Underwater Equity Curve refer to the article **Staying Afloat** by David Stendahl in the Summer 1999 issue of Omega Magazine

Equity Curve Analysis cont.

Notice that our system has a steady equity curve, perhaps not as consistent as the Yen system but none the less steady by itself.

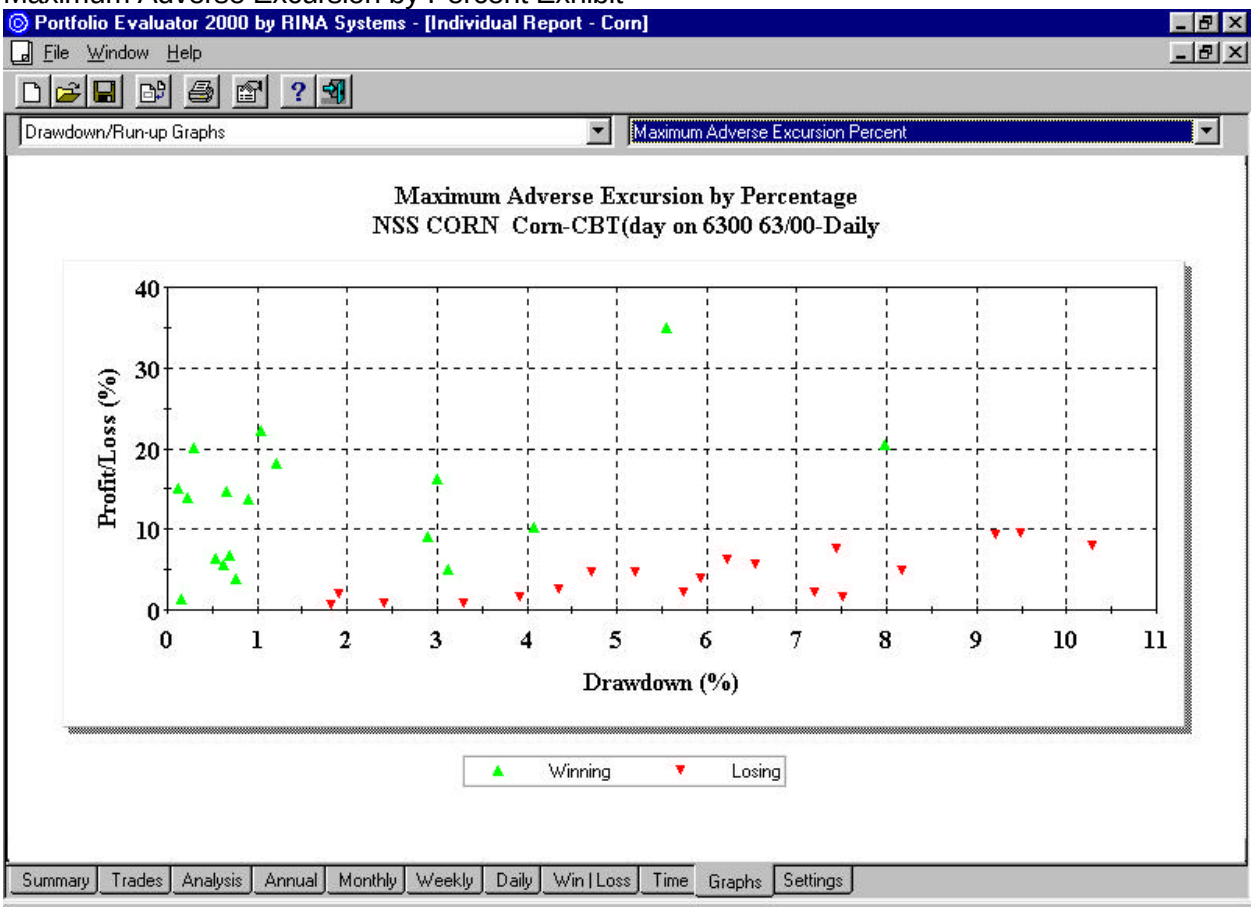
Detailed Equity Curve



Maximum Adverse Excursion

Maximum Adverse Excursion (MAE): This graph is best used to determine intelligent protective money management stops for a trading system. It graphs each trade's realized profit/loss vs. drawdown in a scatter graph format. The green up arrows represent winning trades and the red down arrows losing trades. Look to place a protective stop in an area that captures the majority of winning trades while simultaneously limiting the systems exposure to large drawdowns. For more complete information concerning MAE refer to the book **Campaign Trading** by John Sweeney.

Maximum Adverse Excursion by Percent Exhibit

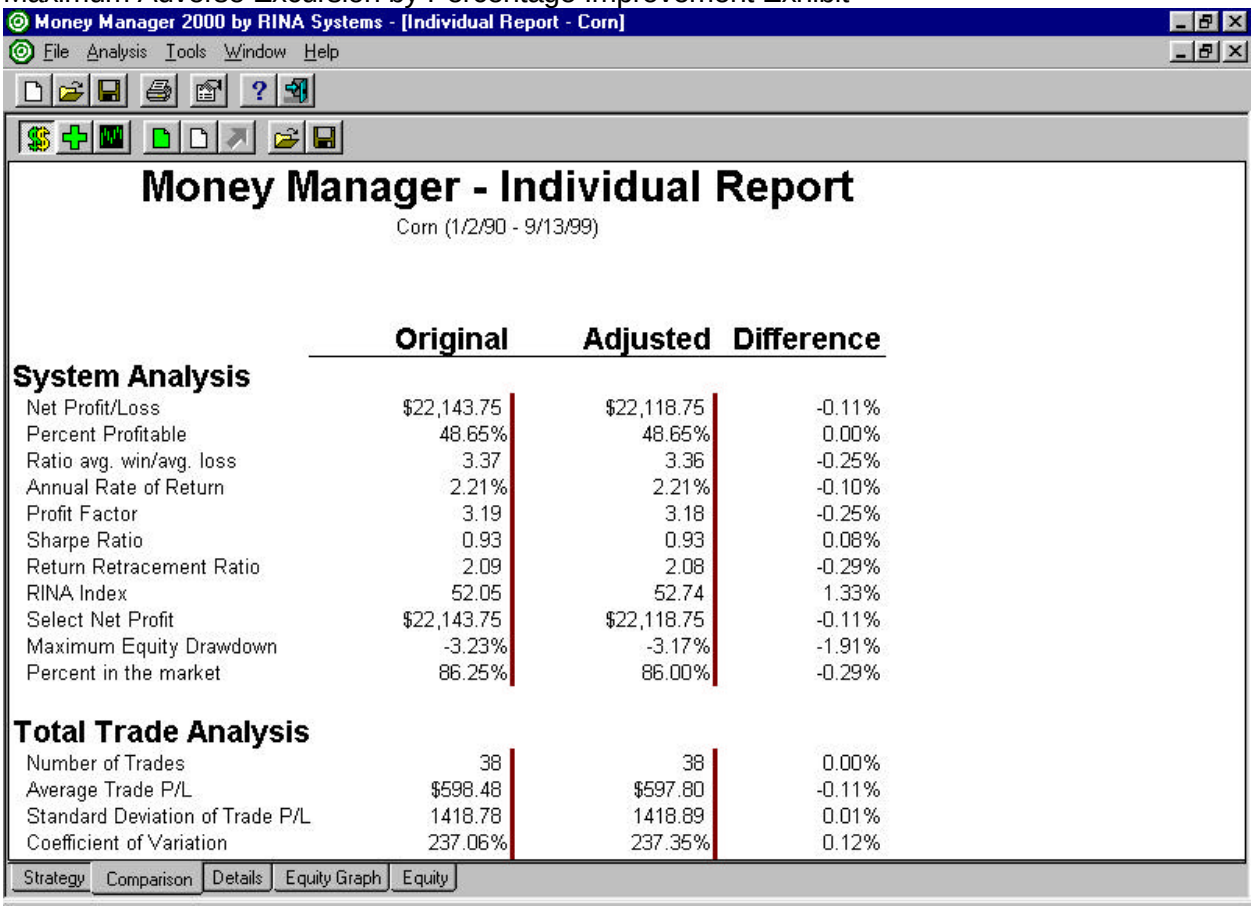


There are typically two to three levels at which to liquidate positions. Can you spot the levels you might place your stop logic?

Money Management: Maximum Adverse Excursion

Although the performance of the system is truly not effected by implementing this percentage stop logic, it does however offer a more dynamic stop logic over time. Any time we are able to minimize equity drawdown in a robust format the more confidence we will have trading the system over time. In this example we have used 9% MAE.

Maximum Adverse Excursion by Percentage Improvement Exhibit

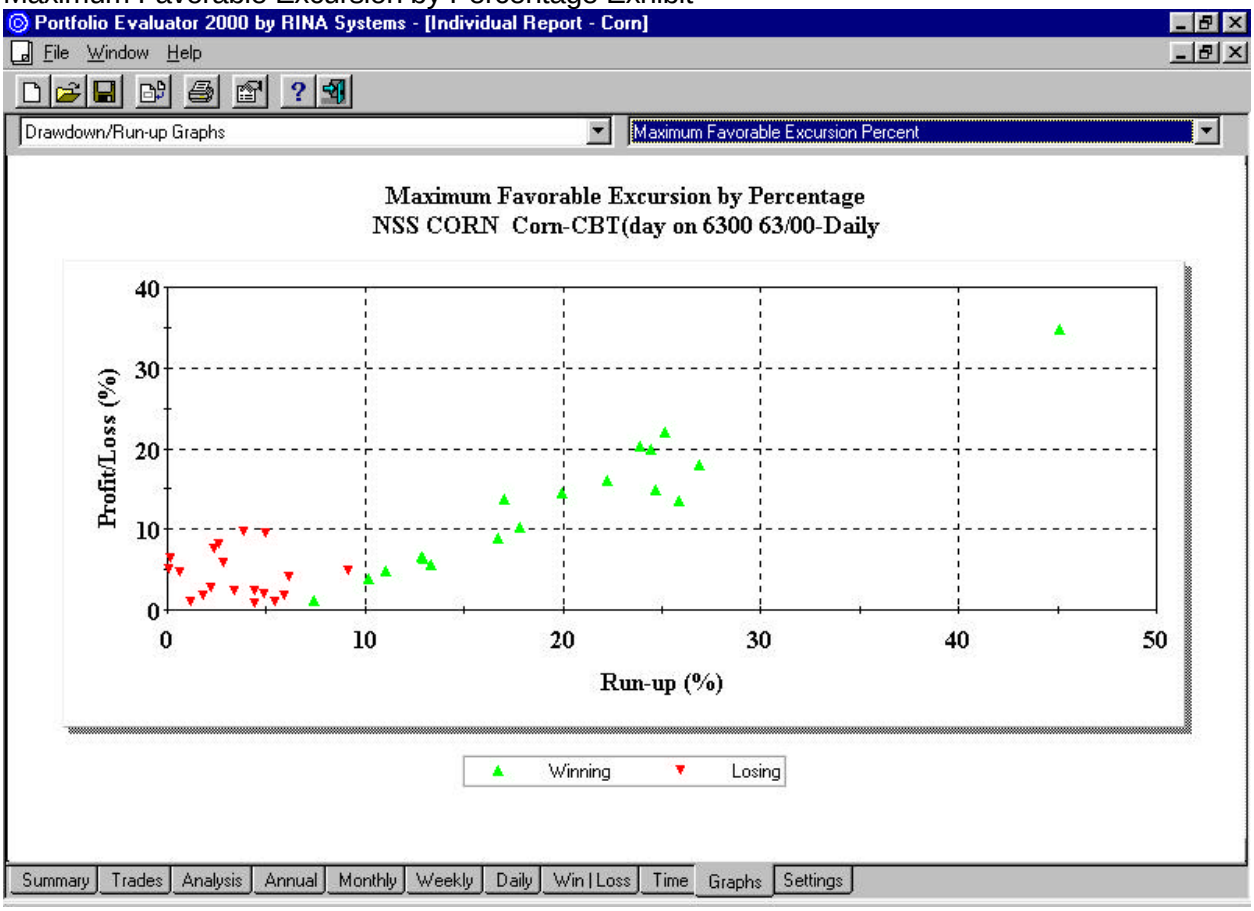


	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$22,143.75	$22,118.75	-0.11%
Percent Profitable	48.65%	48.65%	0.00%
Ratio avg. win/avg. loss	3.37	3.36	-0.25%
Annual Rate of Return	2.21%	2.21%	-0.10%
Profit Factor	3.19	3.18	-0.25%
Sharpe Ratio	0.93	0.93	0.08%
Return Retracement Ratio	2.09	2.08	-0.29%
RINA Index	52.05	52.74	1.33%
Select Net Profit	$22,143.75	$22,118.75	-0.11%
Maximum Equity Drawdown	-3.23%	-3.17%	-1.91%
Percent in the market	86.25%	86.00%	-0.29%
Total Trade Analysis			
Number of Trades	38	38	0.00%
Average Trade P/L	$598.48	$597.80	-0.11%
Standard Deviation of Trade P/L	1418.78	1418.89	0.01%
Coefficient of Variation	237.06%	237.35%	0.12%

Maximum Favorable Excursion

Maximum Favorable Excursion (MFE): This graph is best used to determine opportunities to add to positions. It displays each trades run-up to realized profit in a scatter graph format. The green up arrows represent winning trades and the red down arrows losing trades. Look to add to positions in an area that captures the majority of winning trades while simultaneously limiting the systems expose to profit erosion. For more complete information concerning MFE refer to the book **Campaign Trading** by John Sweeney.

Maximum Favorable Excursion by Percentage Exhibit

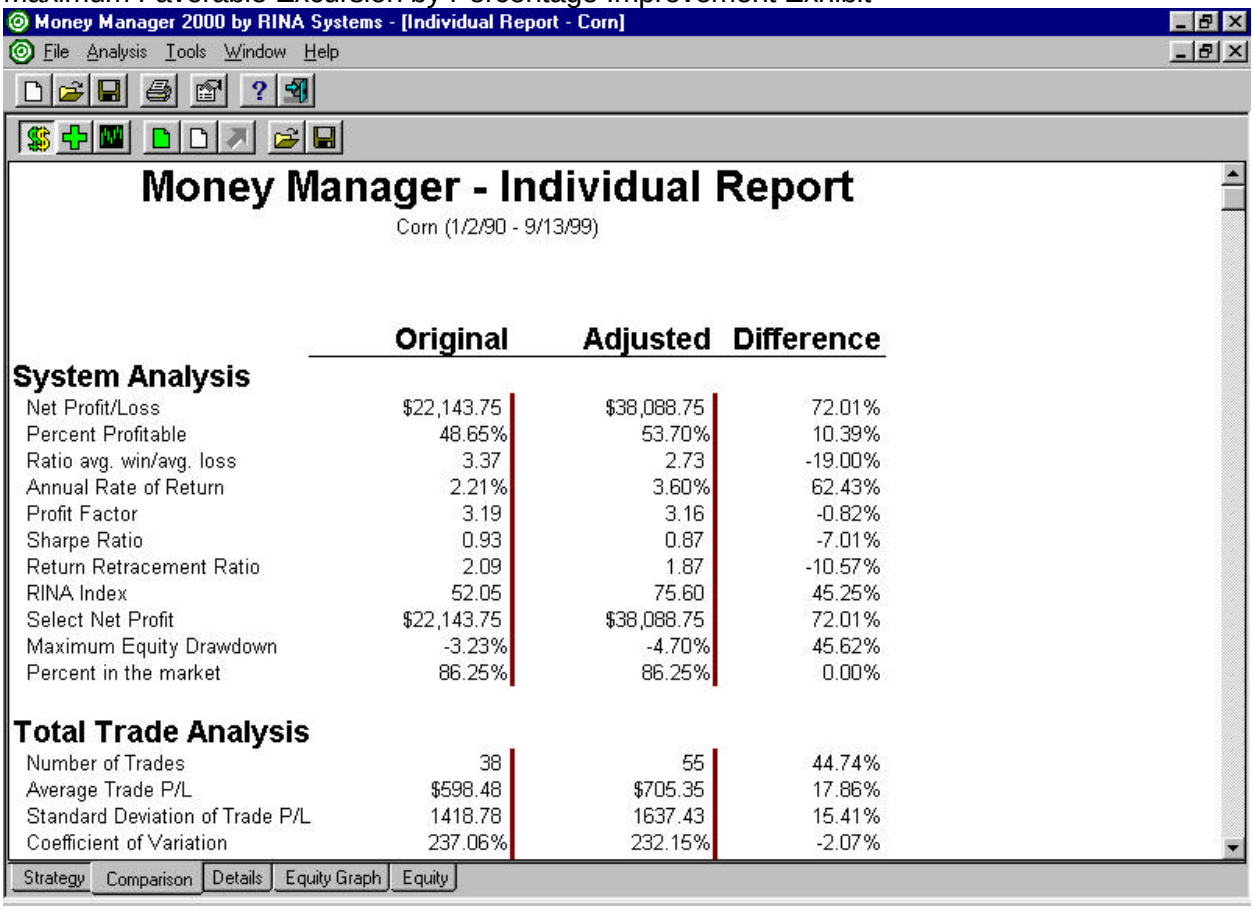


For more information concerning the use of MFE refer to the article **The Maximum Favorable Excursion Strategy** in the March 1999 issue of Technical Analysis of Stocks and Commodities.

Money Management: Maximum Favorable Excursion

Let's add two contracts any time a trade generates an unrealized profit of 10% or more.

Maximum Favorable Excursion by Percentage Improvement Exhibit



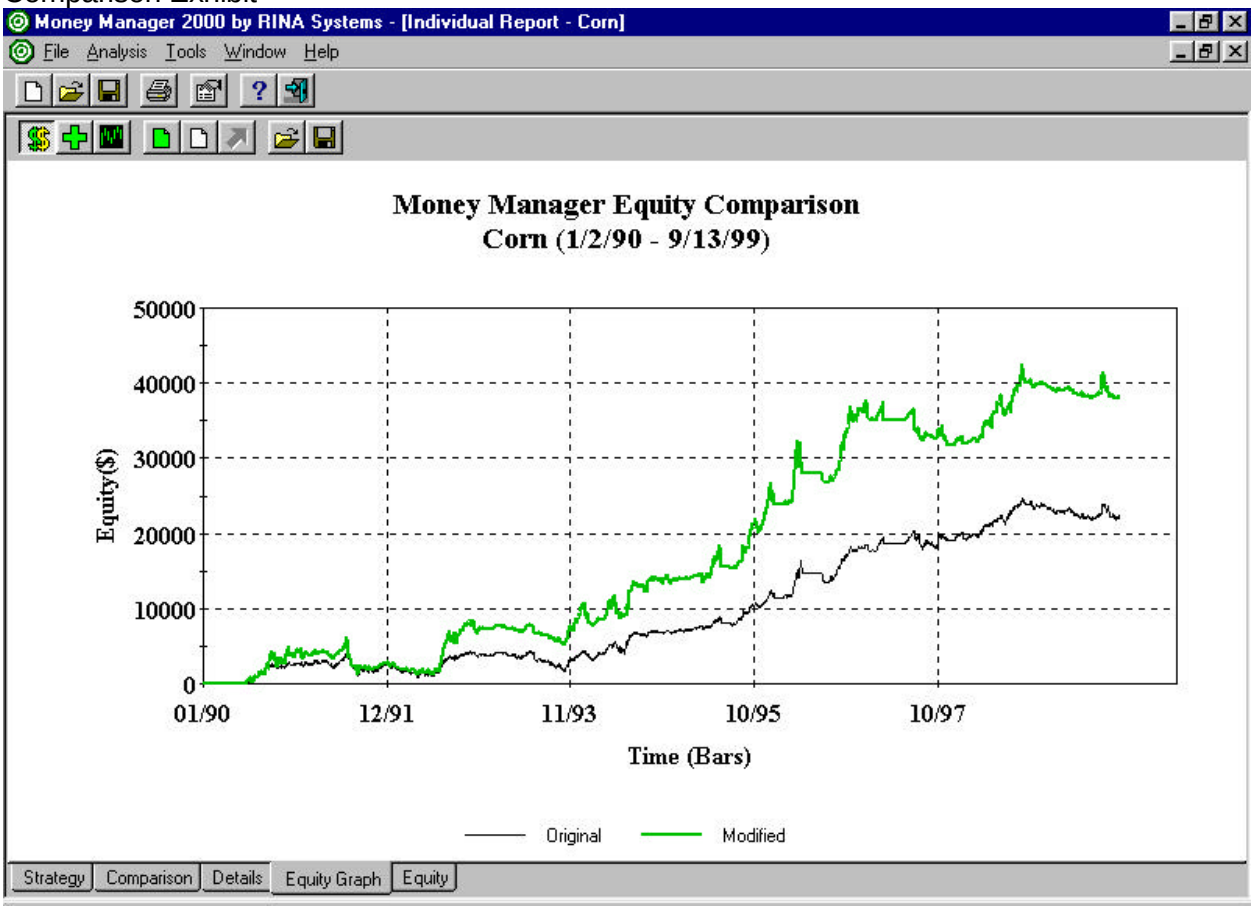
	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$22,143.75	$38,088.75	72.01%
Percent Profitable	48.65%	53.70%	10.39%
Ratio avg. win/avg. loss	3.37	2.73	-19.00%
Annual Rate of Return	2.21%	3.60%	62.43%
Profit Factor	3.19	3.16	-0.82%
Sharpe Ratio	0.93	0.87	-7.01%
Return Retracement Ratio	2.09	1.87	-10.57%
RINA Index	52.05	75.60	45.25%
Select Net Profit	$22,143.75	$38,088.75	72.01%
Maximum Equity Drawdown	-3.23%	-4.70%	45.62%
Percent in the market	86.25%	86.25%	0.00%
Total Trade Analysis			
Number of Trades	38	55	44.74%
Average Trade P/L	$598.48	$705.35	17.86%
Standard Deviation of Trade P/L	1418.78	1637.43	15.41%
Coefficient of Variation	237.06%	232.15%	-2.07%

Money Management Tip: The MFE strategy is more effective if the trading system has an average Run-up coefficient of variation figure less than 150% and Exit Efficiency greater than 40%.

Money Management: Maximum Favorable Excursion

Comparison equity graphic: This graphic details the increase in profitability between the original and modified Yen trading system after applying the money management strategies.

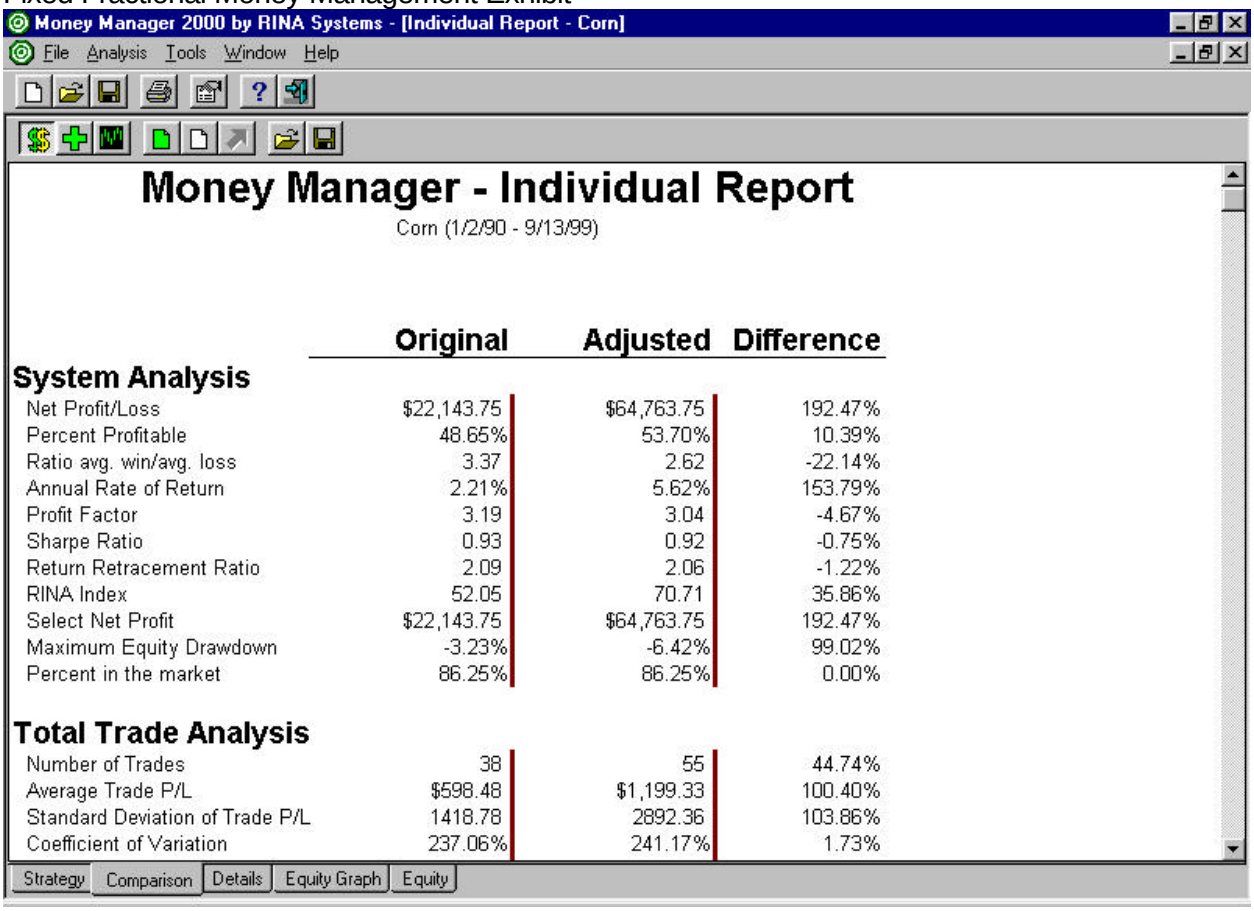
Comparison Exhibit



Money Management: Fixed Fractional

The fixed fractional strategy allows us to slowly increase the number of contracts trade as our account equity grows. As our trading capital grows so too does the number of contracts traded. In this example we have combined the Fixed Fractional strategy (20% capital with 10K margin requirement) with Maximum Favorable Excursion (2 contracts added @ 10%) to show how these two strategies can dramatically improve trading performance.

Fixed Fractional Money Management Exhibit

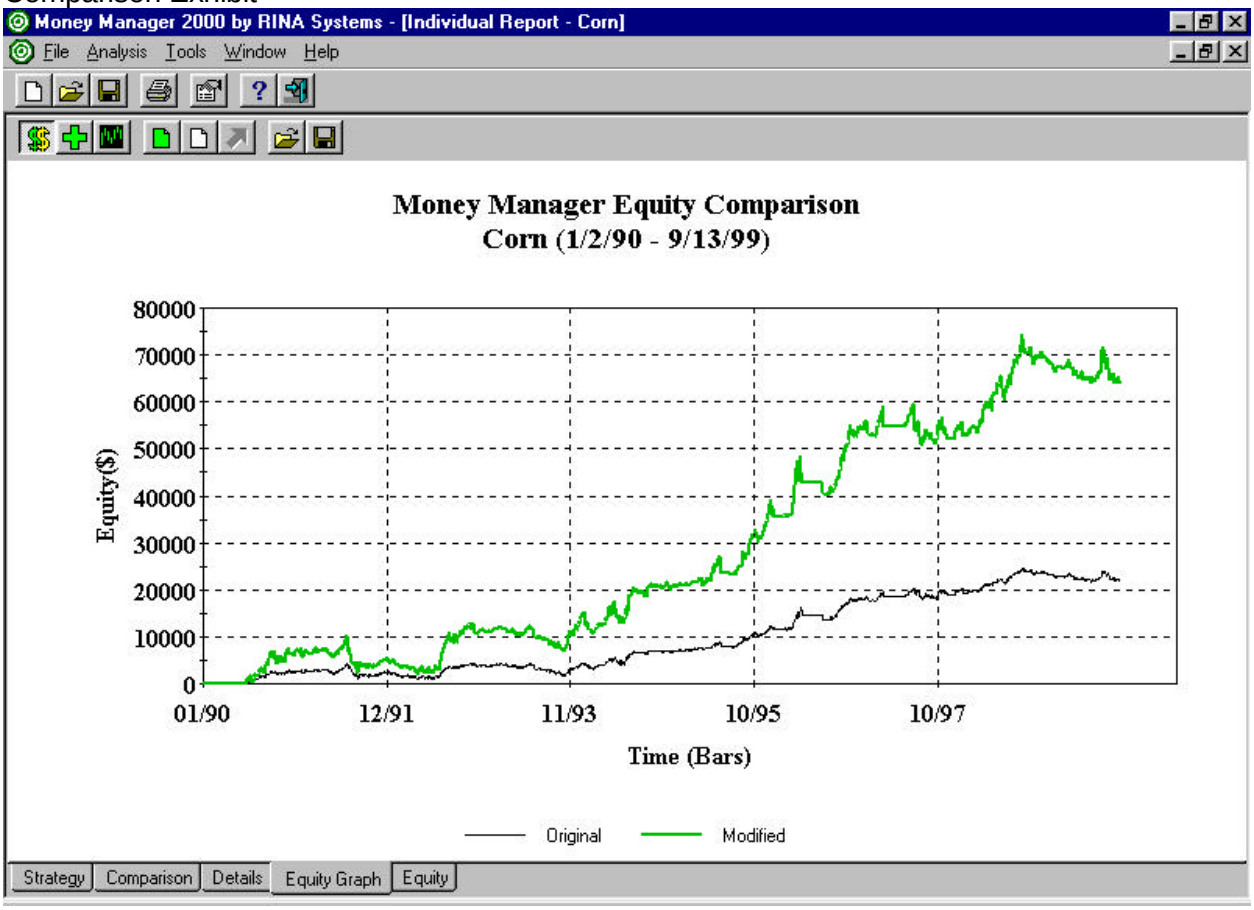


	Original	Adjusted	Difference
System Analysis			
Net Profit/Loss	$22,143.75	$64,763.75	192.47%
Percent Profitable	48.65%	53.70%	10.39%
Ratio avg. win/avg. loss	3.37	2.62	-22.14%
Annual Rate of Return	2.21%	5.62%	153.79%
Profit Factor	3.19	3.04	-4.67%
Sharpe Ratio	0.93	0.92	-0.75%
Return Retracement Ratio	2.09	2.06	-1.22%
RINA Index	52.05	70.71	35.86%
Select Net Profit	$22,143.75	$64,763.75	192.47%
Maximum Equity Drawdown	-3.23%	-6.42%	99.02%
Percent in the market	86.25%	86.25%	0.00%
Total Trade Analysis			
Number of Trades	38	55	44.74%
Average Trade P/L	$598.48	$1,199.33	100.40%
Standard Deviation of Trade P/L	1418.78	2892.36	103.86%
Coefficient of Variation	237.06%	241.17%	1.73%

Money Management: Fixed Fractional w/MFE

Comparison equity graphic: This graphic details the increase in profitability between the original and modified Yen trading system after applying the money management strategies.

Comparison Exhibit



Portfolio Format

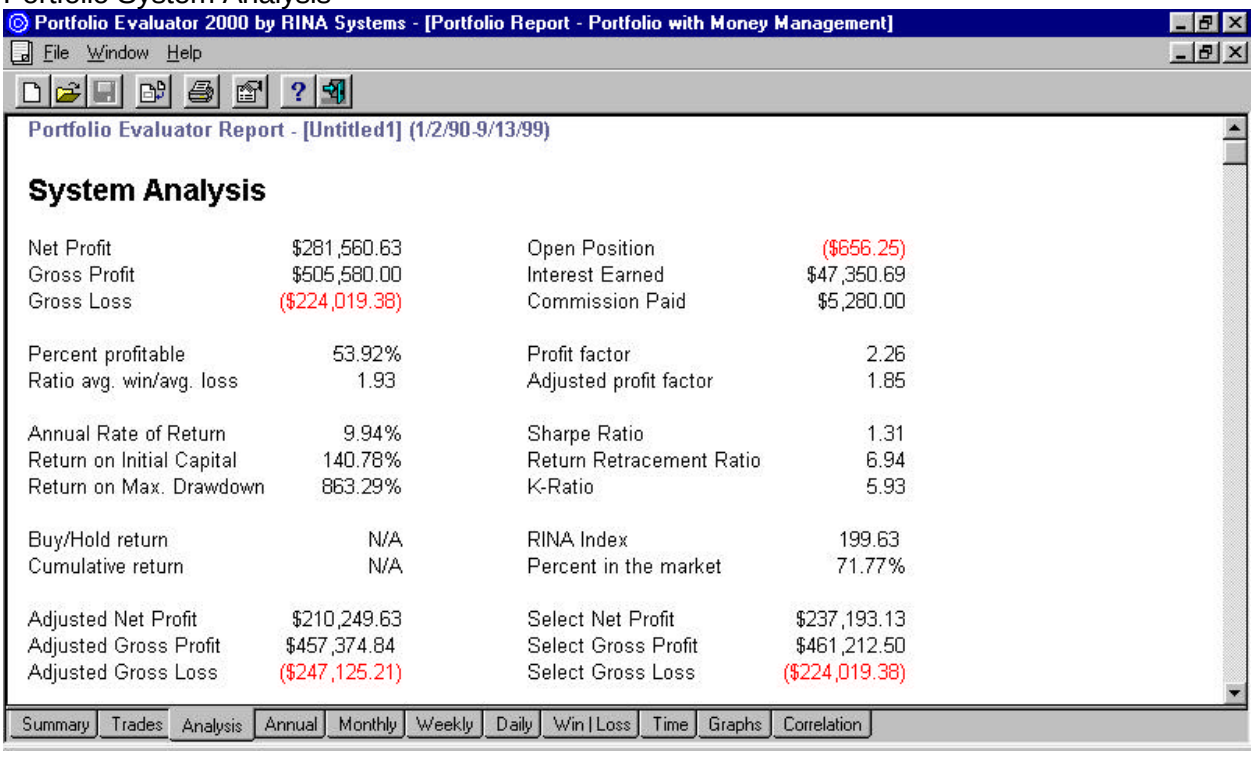
This format exists when a single system is applied to multiple markets. This type of portfolio can be used to determine the profitability of a trading strategy across a wide range of markets. This format is often considered to be one of the more "robust" applications of system testing and trading. This is because if the same system is applied to several markets on which it is profitable this may be considered to be more statistically significant then results obtained from applying the system to a single market.

To construct our sample portfolio we will combine our Yen and Corn trading systems after having applied appropriate money management strategies. This is not intended to be a completed portfolio. It is only intended to outline the benefits of trading multiple markets with money management.

Having examined the performance results for both systems let's combine them together to generate a performance report for the portfolio. To create this portfolio we will use Portfolio Evaluator by RINA Systems. This portfolio report will yield a great deal of information concerning the value of trading multiple systems.

One of the most important reasons for trading a portfolio is to diversify risk. The positive outcome of combining individual systems into the portfolio could include a greater return to variability ratio (Sharpe Ratio) or a portfolio equity drawdown of lesser magnitude and duration.

Portfolio System Analysis



Let's take closer look at both systems and how they work together as a portfolio.

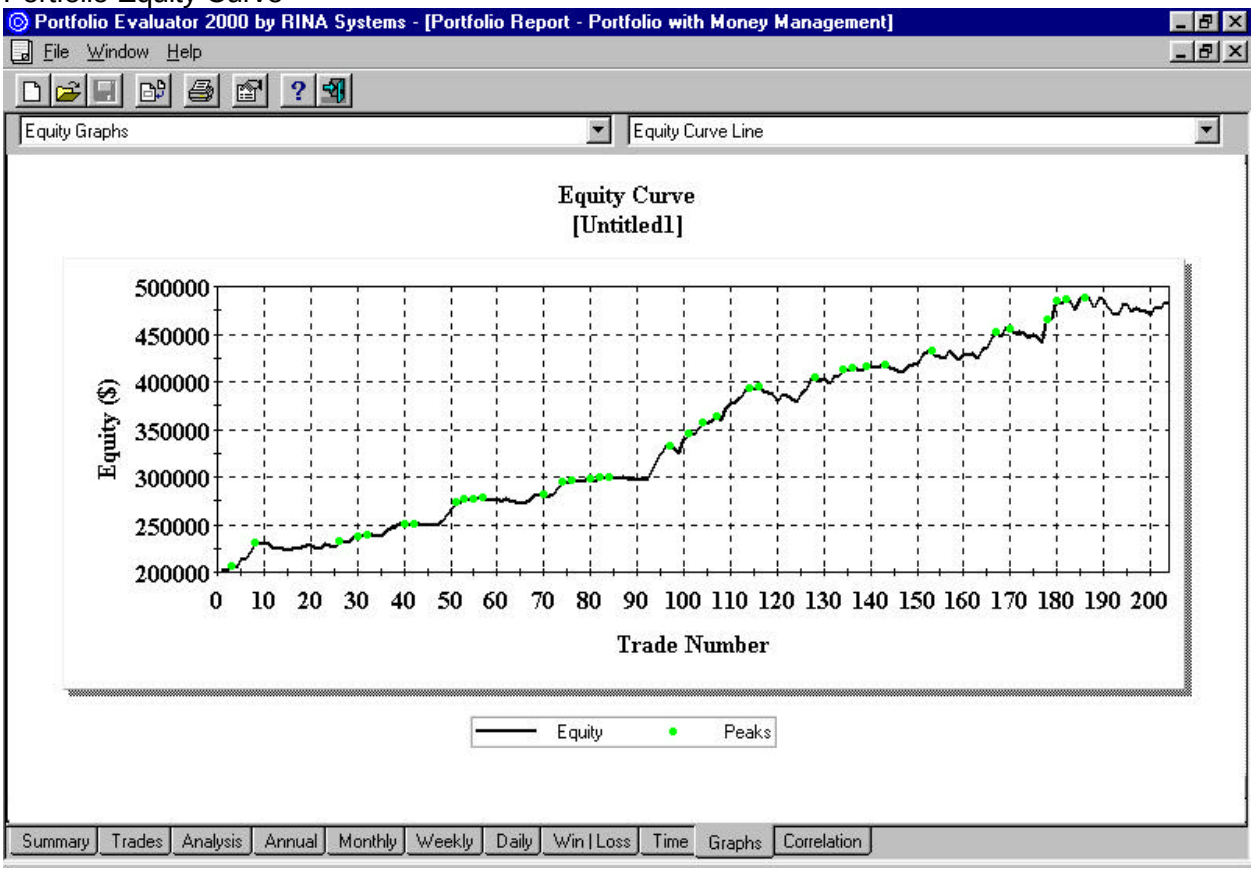
Table1 Portfolio Results

	Corn	Yen	Portfolio
Net Profit	$64,763	$216,796	$281,560
Profit Factor	3.04	2.13	2.26
Ratio Avg. Win/ Avg. Loss	2.62	1.81	1.93
RINA Index	70.71	153.06	199.63
Return Retracement Ratio	2.06	5.12	6.94
Sharpe Ratio	.92	1.08	1.31
Max. Percent Equity Drawdown	6.42%	8.42%	6.55%

Notice in particular that the RINA Index, RRR, Sharpe Ratio and Max. Percent Drawdown all perform better at the portfolio level then they do independently. Although there are other performance calculations that can be reviewed these numbers in particular certainly suggest improved performance trading both markets as a portfolio.

Take a look at the combined equity curve. Notice that the equity curve is extremely steady and easy to trade.

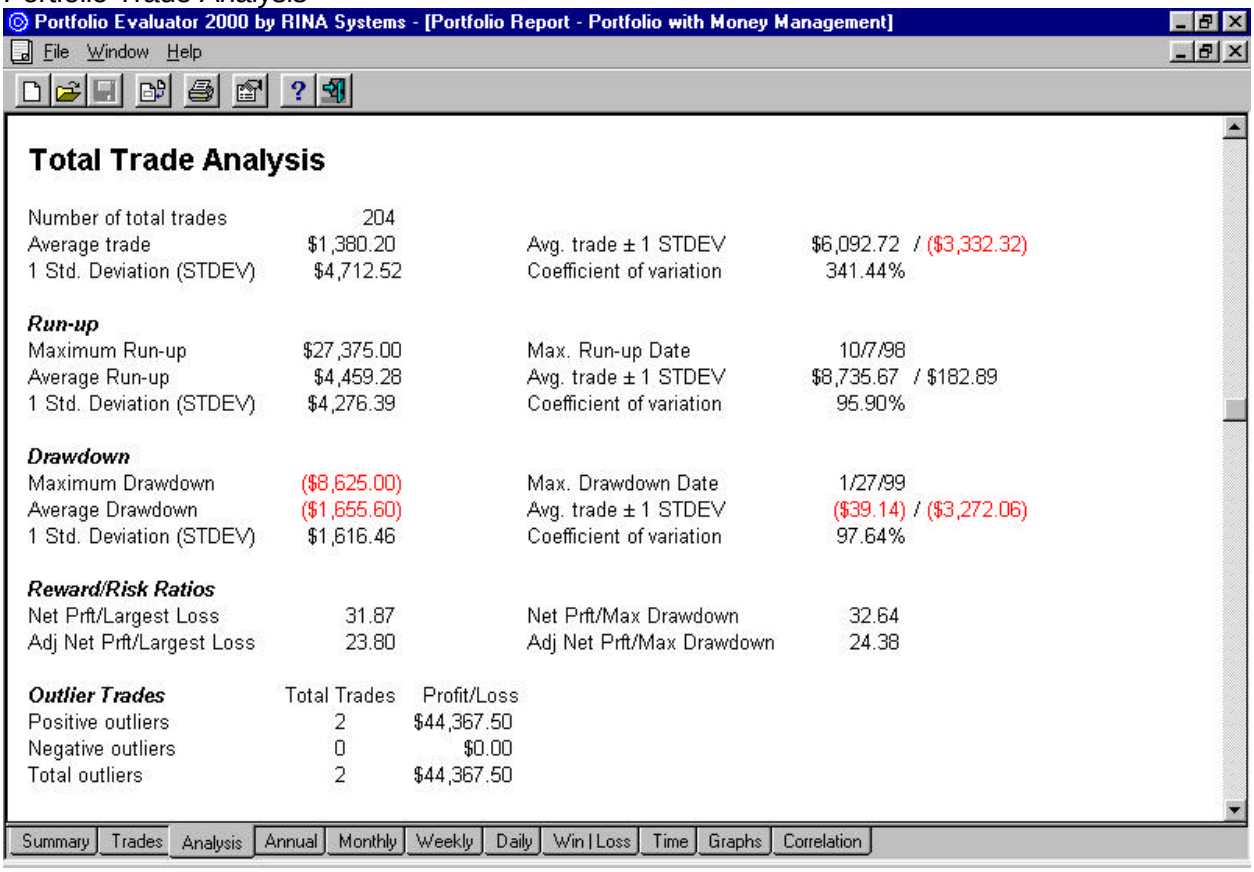
Portfolio Equity Curve



Portfolio Total Trade Analysis

Notice that the combined portfolio is able to maintain consistency when it comes to the average trade, run-up and drawdown figures. Refer to the next page for a graphical representation of the portfolio's stability.

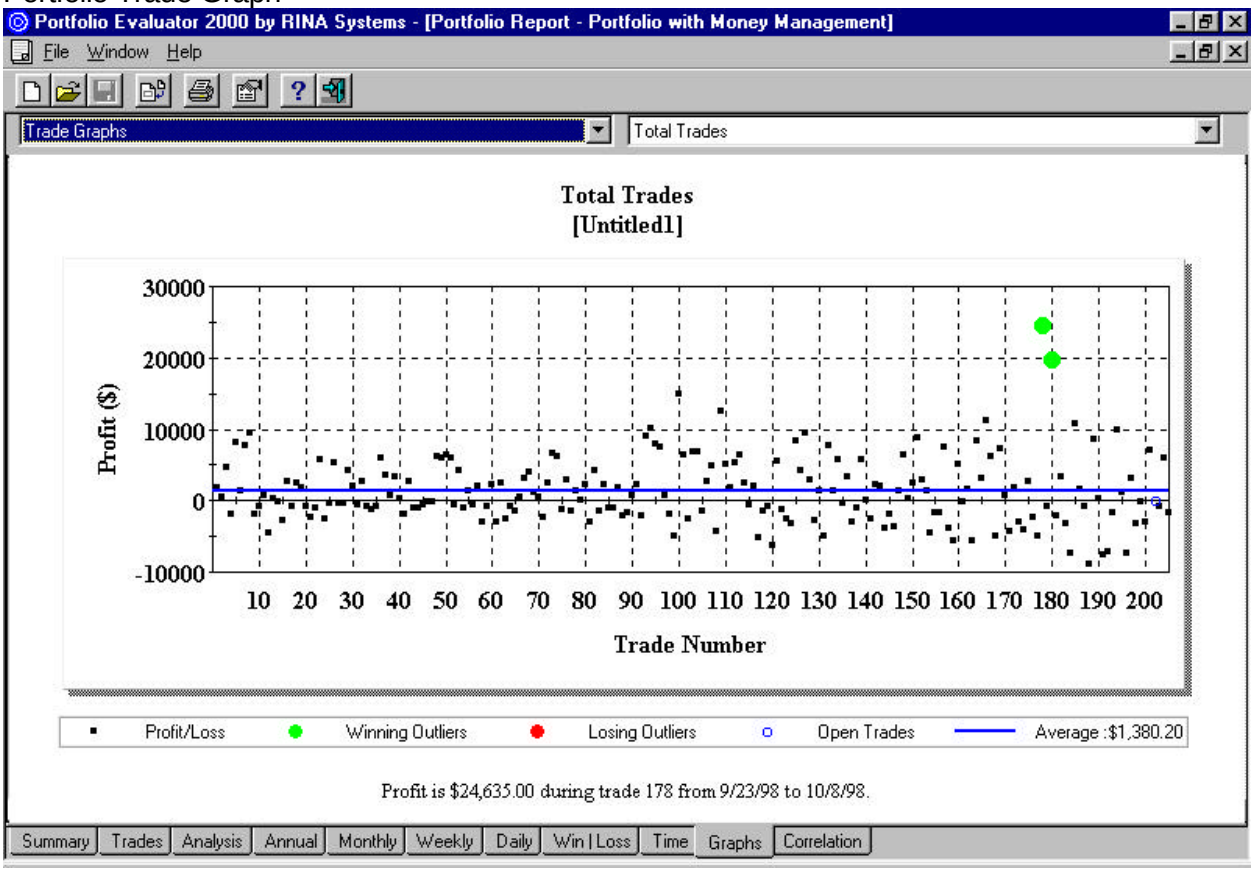
Portfolio Trade Analysis



Portfolio Total Trade Graph

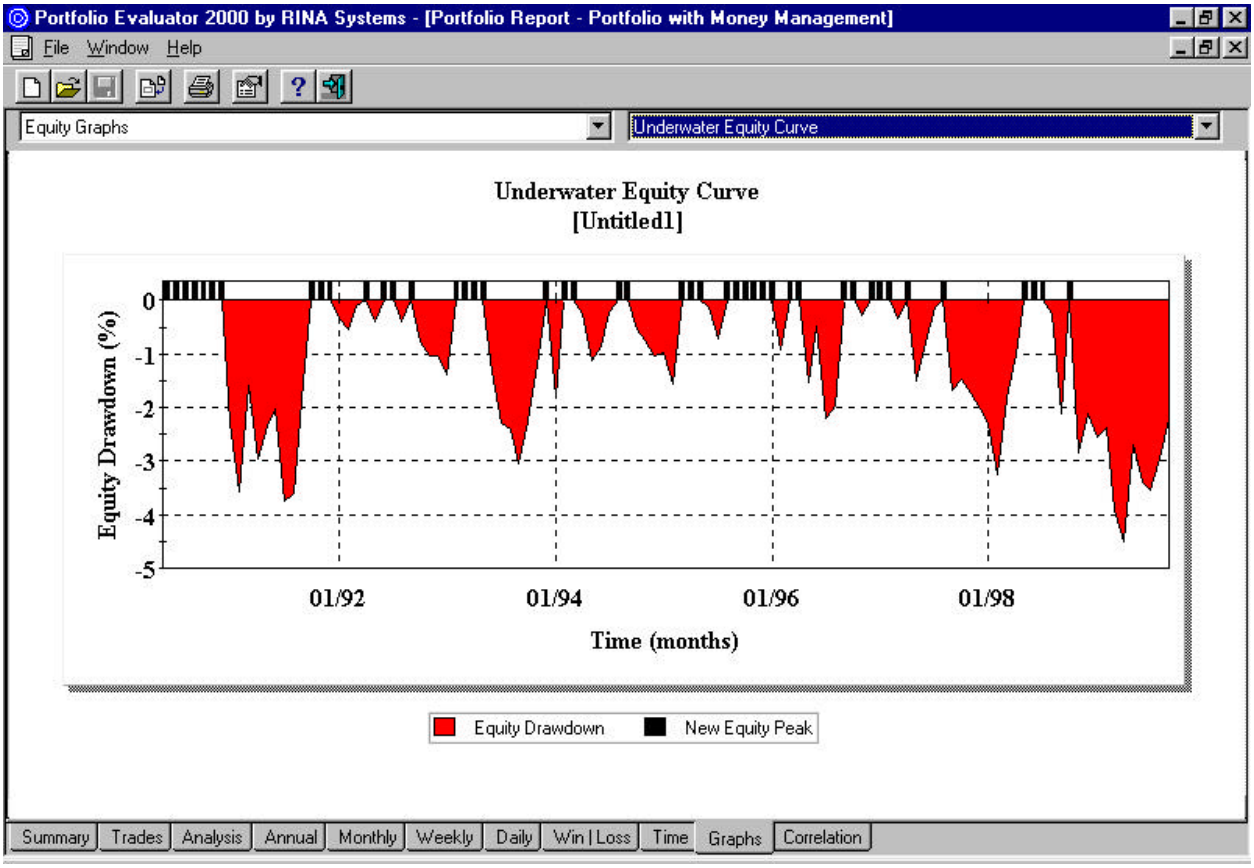
Notice that the combined portfolio only generates two outlier trades (trades 178 and 179). Both of these trades were generated by the Yen system after catching an extended trend in late 1998. Trade 178 was the original system trade while trade 179 was signaled due to the MFE money management strategy.

Portfolio Trade Graph



Portfolio Underwater Equity Curve

Our final portfolio graphic uses the underwater equity curve to provide a graphical representation of drawdown. Notice that despite the addition of the money management strategies the underwater equity drawdown for the portfolio is extremely manageable for most traders.



Workshop Summary

- In this workshop we have evaluated two very different markets. The Yen being a volatile market and Corn being relatively quite.

- We applied appropriate trading system to these markets to take full advantage of the trending nature of both markets.

- The next step was to evaluate trading performance. From this detailed evaluation we were able to note specific system strengths which allow us to apply a number of money management strategies.

- After having applied the money management strategies we then selected the market settings that best fit our trading style (aggressive or conservative).

- The final stage was to combine the two systems together with applied money management strategies to create a semi-diversified portfolio. Other markets should be added to the portfolio to provide more market diversification. Due to time constraints we are only able to combine two markets.

The steps shown in this presentation can be used for all system on all markets. They also translate well between commodities, stocks and mutual funds. So no matter what market you trade or how you decide to trade, the steps outlined in this presentation will help maximize your profitability. If you have question in the future please feel free to contact David Stendahl at 513 469 7462 or by e-mail at Dsinvest@msn.com

Good luck in your trading …

Recommended Readings

Introductory Books

Fosback, Norman G., Stock Market Logic
Fullman, Scott H., Options: A Personal Seminar.
Harris, Sunny., Trading 101 and Trading 102
Kolb, Robert W., Options: The Investors Complete Tool Kit.
Murphy, John J., Technical Analysis of the Futures Markets.
Pring, Martin J., Technical Analysis Explained.
Schwager Jack, Market Wizards.
Schwager Jack, New Market Wizards.
Schwartz, Martin. Lessons from Wall Street Champion Traders.
Weinstein, Stan, Secrets for Profiting in Bull and Bear Markets.
Zweig, Martin, Winning on Wall Street.

Advanced Books

Babcock, Bruce, Trading Systems.
Balsara, Nauzer. J., Money Management for Futures Traders.
Bressert, Walter, The Power of Oscillator/Cycle Combinations.
Chande, Tushar S., & Kroll, Stanley, The New Technical Trader.
Daigler, Robert T., Advanced Option Trading.
Deel, Robert, Trading the Plan.
DeMark, Thomas R., The New Science of Technical Analysis.
Douglas, Mark, The Disciplined Trader.
Elder, Alexander, Trading for a Living.
Eng, William, Options - Trading Strategies That Work.
Gehm, Fred, Quantitative Trading & Money Management.
Jurik, Mark, Computerized Trading.
Kaufman, Perry, Smarter Trading.
Krause, Robert P., The Volatility Handbook.
Le Beau, Charles, Computer Analysis of the Futures Market.
McMillan, Lawrence G., Options as a Strategic Investment.
Murphy, John, J., Intermarket Technical Analysis.
Nison, Steve, Japanese Candlestick Charting Techniques.
Pardo, Robert, Design, Testing, and Optimization of Trading Systems.
Plummer, Tony, Forecasting Financial Markets.
Pring, Martin, Market Momentum.
Shaleen, Kenneth H., Technical Analysis and Option Strategies.
Schwager Jack, Schwager on Futures: Technical Analysis.
Schwager Jack, Managed Futures Myths and Truths.
Soros, George, The Alchemy of Finance.
Stendahl, David, Profit Strategies
Sun Tzu. The Art of War.
Sweeney, John, Campaign Trading.
Wagner, Gary S., & Matheny Bradley L., Japanese Candlestick Charting.
Wilder, Wells J., New Concepts in Technical Trading Systems.
Wilmott, Paul, & Dewynne, Jeff, Option Pricing.
Vince, Ralph, The New Money Management.