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Robert McCullough

Robert McCullough — Equity Curve

Robert McCullough writes the frequently quoted newsletter *Investotalk*, and is President of Liberty Research Corporation which produces and distributes Investograph Plus, a technical analysis and charting program. He has spoken at many meetings of computer oriented investors, and last year published the book *A New Look at Technical Analysis*.

Bob graduated from the University of Texas with a degree in Chemical Engineering. He soon became interested in computers and joined IBM to develop real time process control and laboratory automation computer systems. He became interested in applying some of the pattern recognition techniques used in computerized laboratory analysis to the stock market when he read Hurst's *The Profit Magic of Stock Market Analysis*.

Bob combined his experience in trading, programming and engineering in the development of Investograph Plus. In this work, he has developed several unique indicators and mechanical trading systems.

• Topic: Trading the Equity Curve

In this seminar, Bob will focus on using the trading equity curve to improve the performance of mechanical trading systems. He will talk about the primary types of mechanical trading systems and what causes them to experience drawdown periods. He will discuss the best types of trading systems to use for different kinds of tradable items.

You will learn how the moving averages of equity curves, combined with the equity curves themselves can serve as a money management technique to reduce drawdowns and even turn losing periods into winning periods. Bob will use several examples of mechanical trading systems to show how this technique can quickly identify changes from congestion periods to trending periods and vice versa. He will also discuss how to adjust the equity curve for any phenomenon which causes account drawdowns. Bob will explain how applying his techniques in conjunction with several of the systems he discusses, can signal when and how to place limit orders, thereby significantly reducing slippage.

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ROBERT McCULLOUGH
132 Riverview Road
Liberty Hill, TX 78642
Phone: 800-827-0090
FAX: 512-329-2766

Trading with Equity Curve Management

Definition of an equity curve

Rules for using the equity curve for money management

- Trading system termination logic

- Trading system signal reversal logic

Why the equity curve is important and how it provides insight into when a trading system makes or loses money

The most common types of trading systems

- Trend following systems

- Reaction trading systems

- Price pattern trading systems

- Reaction/price pattern systems

- Trend following/price pattern trading systems

Best trading systems for different types of tradeables

- Stocks

- Mutual funds

- Equity options

- Index options

- Futures contracts

Use of equity curve system termination and signal reversal money management

- Best kinds of raw equity curves

- Controlling shape of raw equity curve

Summary

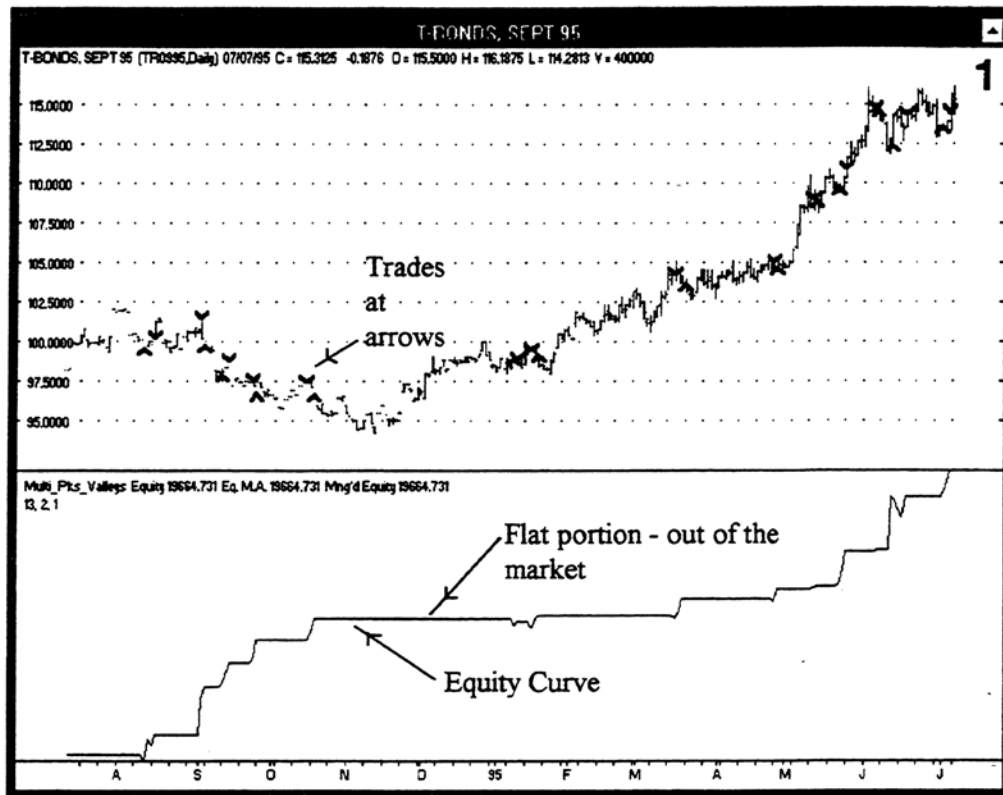
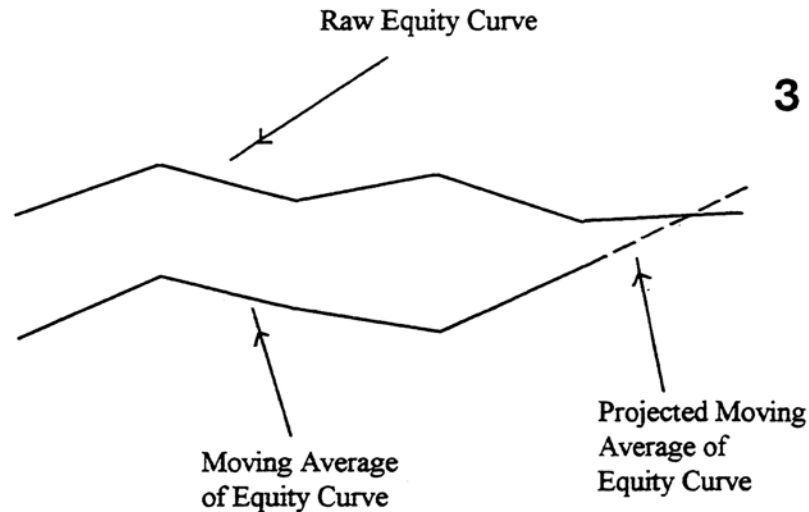


Chart 1.

T-Bond Futures Contract with Trading Simulation and Equity Curve

Equity Curve Management



Rules for Managing Equity Curve (Reversal Logic):

1. If base system trading rules trade on opening or closing prices and raw equity curve is above its moving average at the end of the trading period, maintain position established by basic trading rules.
2. If base system trading rules trade on opening or closing prices and raw equity curve is below its moving average at the end of the trading period, reverse position established by basic trading rules.
3. If base system uses stop or limit orders, project where the moving average of the equity curve will be one period into the future. Calculate the price where the equity curve will cross the projected moving average line. Compare that price to the stop or limit order price calculated by the base system. Determine if change in position caused by crossing the M.A. is offset by change in position due to base system. If so, stay in current position. Otherwise, follow base system, if stop or limit will keep the raw equity curve above its M.A., or continue to follow reverse signals if raw equity curve is below its M.A.

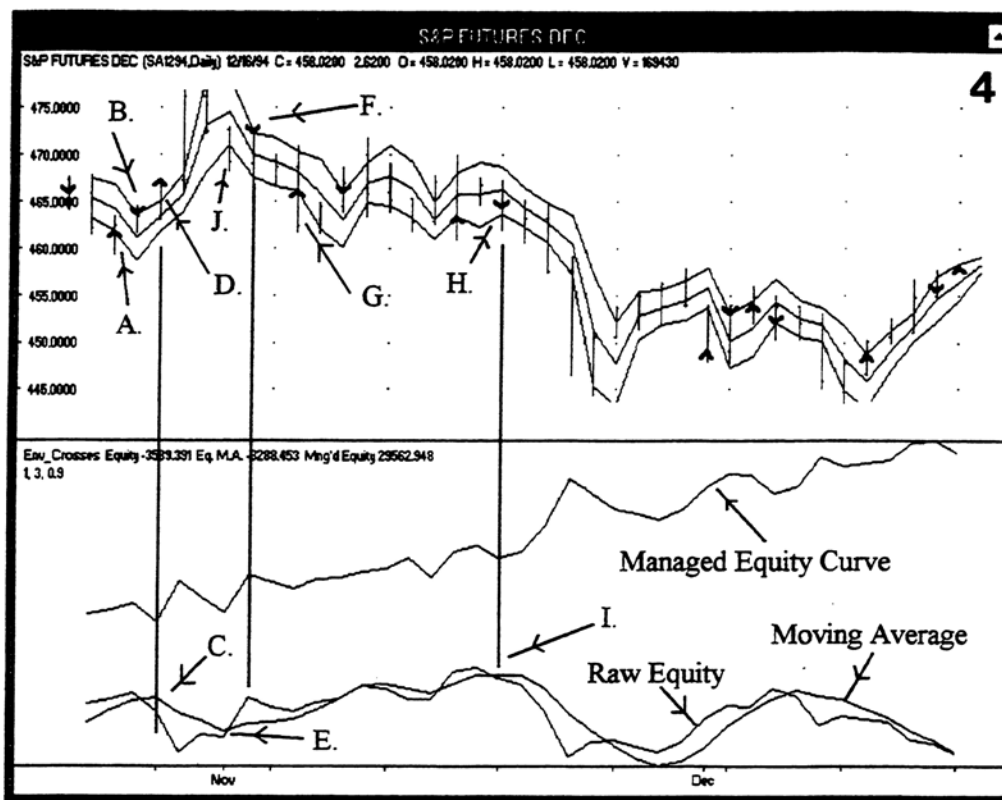


Chart 2.

Trading the S&P500 Futures Contract with an Envelope Crosses Trading System

1. Use no commissions/slippage on Raw Equity Curve.
2. Points A. and B. - Normal trading at envelope edges.
3. At C., Raw Equity Curve drops below M.A. - Reverse to long position at point D.
4. System doesn't reverse to short at J., because projected M.A. would be crossed there (point E.) creating normal long position and system was already short.
5. Short position taken at F., because Raw Equity Curve is above M.A.
6. Normal trading occurs at point G.
7. Reverse from long to short at point H. because, at the close, the Raw Equity Curve was below the M.A.
8. For systems that use limit orders or stop orders, limit orders become stop orders and stop orders become limit orders, if under M.A.

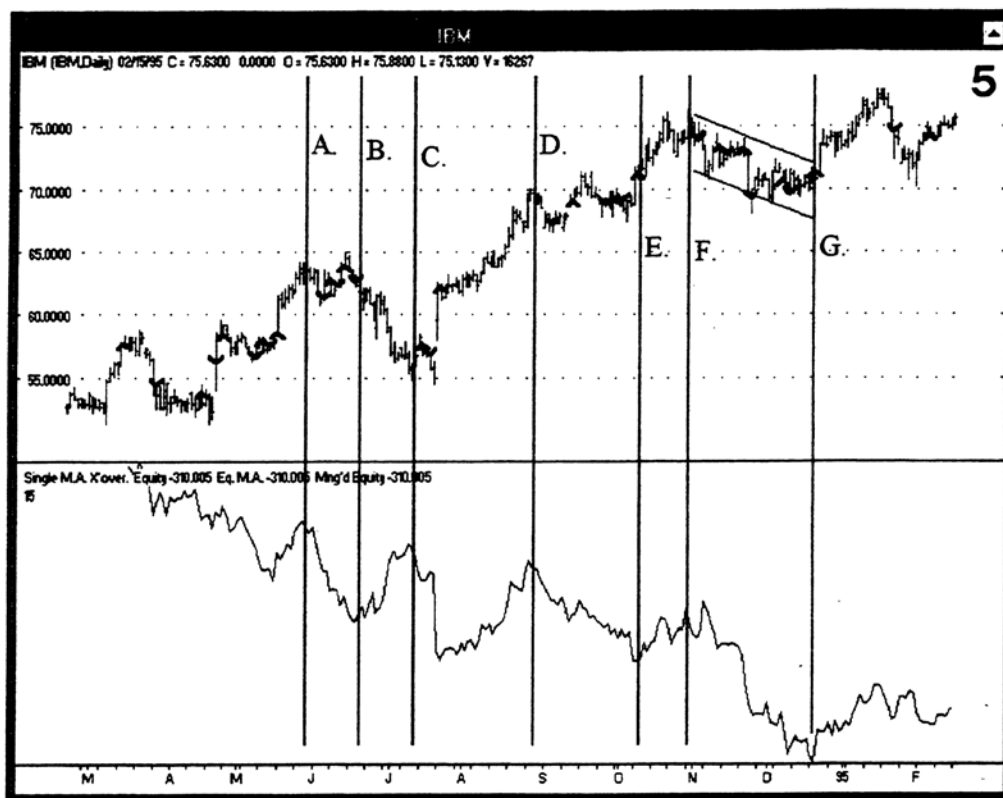


Chart 3.

Trading IBM shares with a single, arithmetic moving average crossover trading system

"A trend following system only makes money in trends."

(Actually, it's a little more complicated than that.)

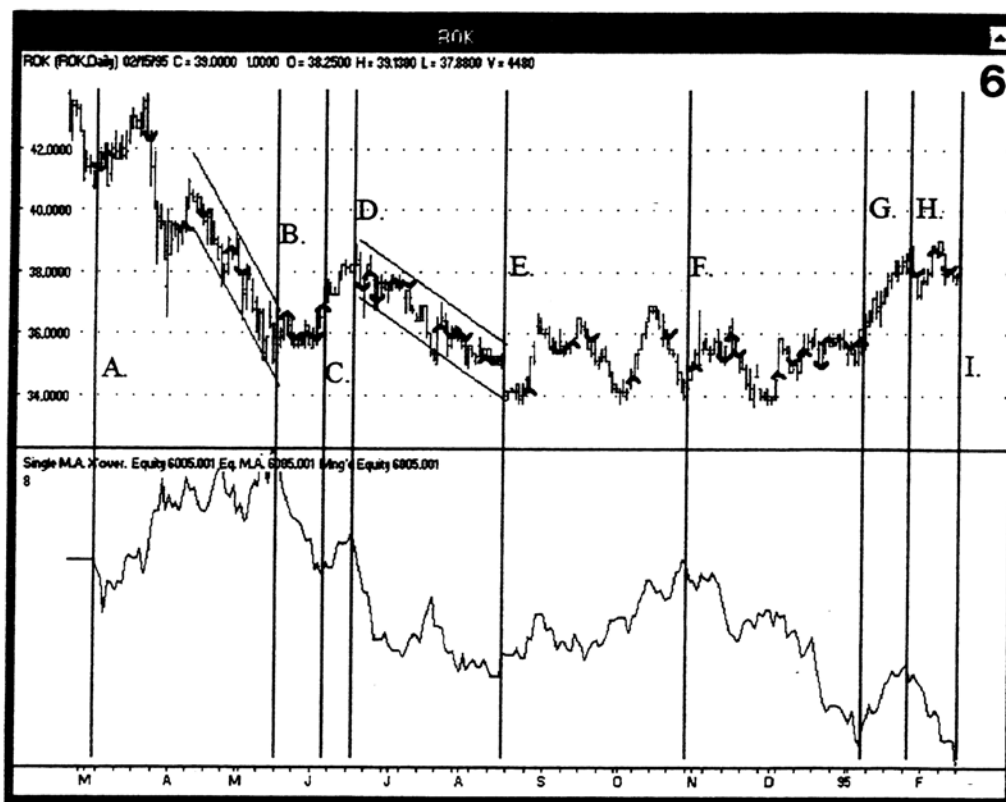


Chart 4.

Trading ROK shares with a single, arithmetic moving average crossover system

A trend following system must be in a **STRONG** trend to make money.

- A. - B. Sharp trends with V turning points - makes money.
- B. - C. A short duration, narrow congestion period - loses money.
- C. - D. Sharp, short period of trending - makes money.
- D. - E. Slow trend - loses money.
- E. - F. Wide range congestion period - makes money.
- F. - G. Mostly narrow congestion - loses money.
- G. - H. Sharp trend - makes money.
- H. - I. Congestion period - loses money.

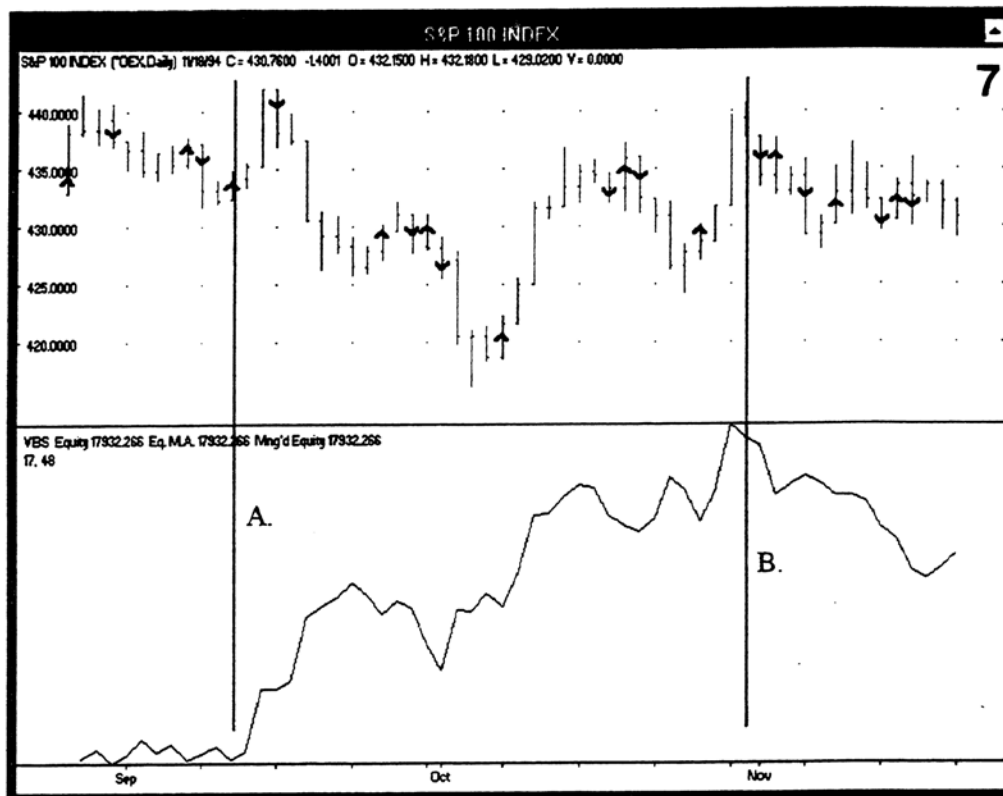


Chart 5.

Volatility Breakout System

1. Calculate the average true range for the last N days.
2. Calculate a fraction of that average true range.
3. Add that value to each day's close to obtain buy stops.
4. Subtract that value from each day's close to obtain sell stops.
5. Reverse to short when long and sell stop is hit.
6. Reverse to long when short and buy stop is hit.
7. This is a trend following, stop and reverse system that is always in the market.
8. Made money between A. and B. when market was in several small trends. Lost money after B. when market was in congestion.

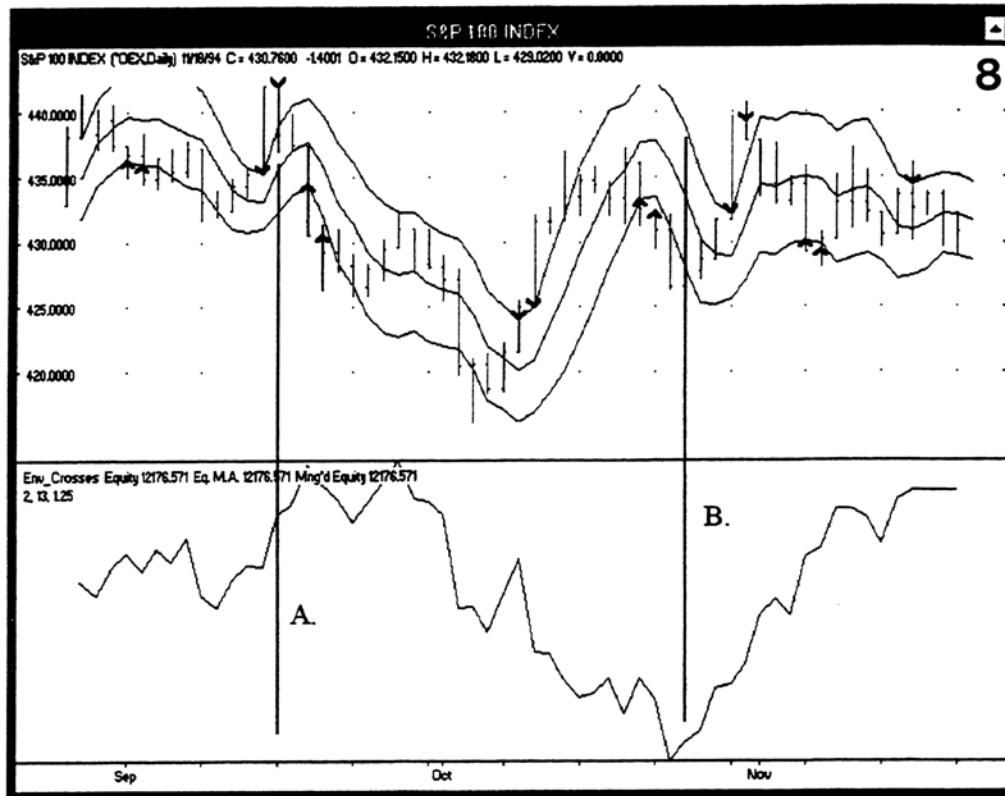


Chart 6.

Envelope Crosses System

1. Calculate an envelope based on trend and volatility.
2. Go long when the bottom edge of the envelope has been touched or crossed a specified number of times.
3. Exit long position when the top edge of the envelope is reached.
4. Go short when the top edge of the envelope is touched or crossed a specified number of times.
5. Exit short position when the bottom edge of the envelope is reached.
6. This is a reaction trading system that is not always in the market.
7. And advantage of this system is that it is executed with LIMIT orders.
8. Lost money between A. and B. when market was in several small trends. Made money after B. when market was in congestion.

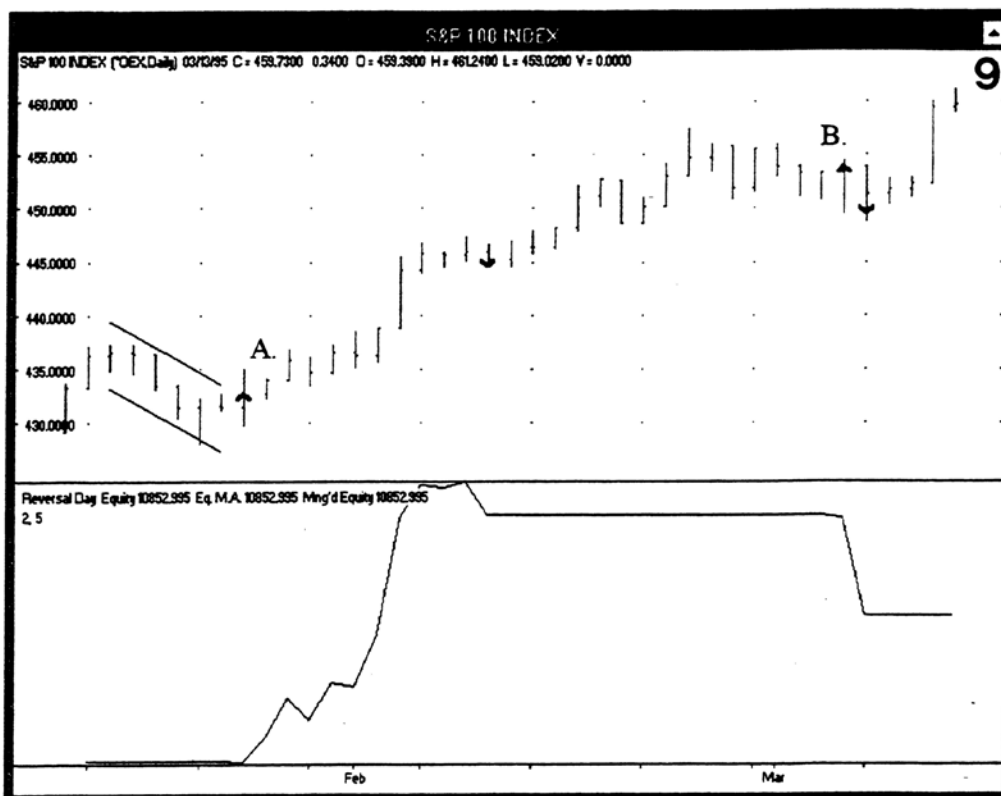


Chart 7.

Reversal Day Trading System

1. Slope of a least squares line must be negative, low must be lower than the previous day's low, and close must be higher than previous day's high for a long position to be taken.
2. Exit long position when drop below lowest low of the previous two days.
3. Slope of a least squares line must be positive, high must be higher than the previous day's high, and close must be lower than previous day's low for a short position to be taken.
4. Exit short position when rise above highest high of the previous two days.
5. Makes money if the pattern "works".

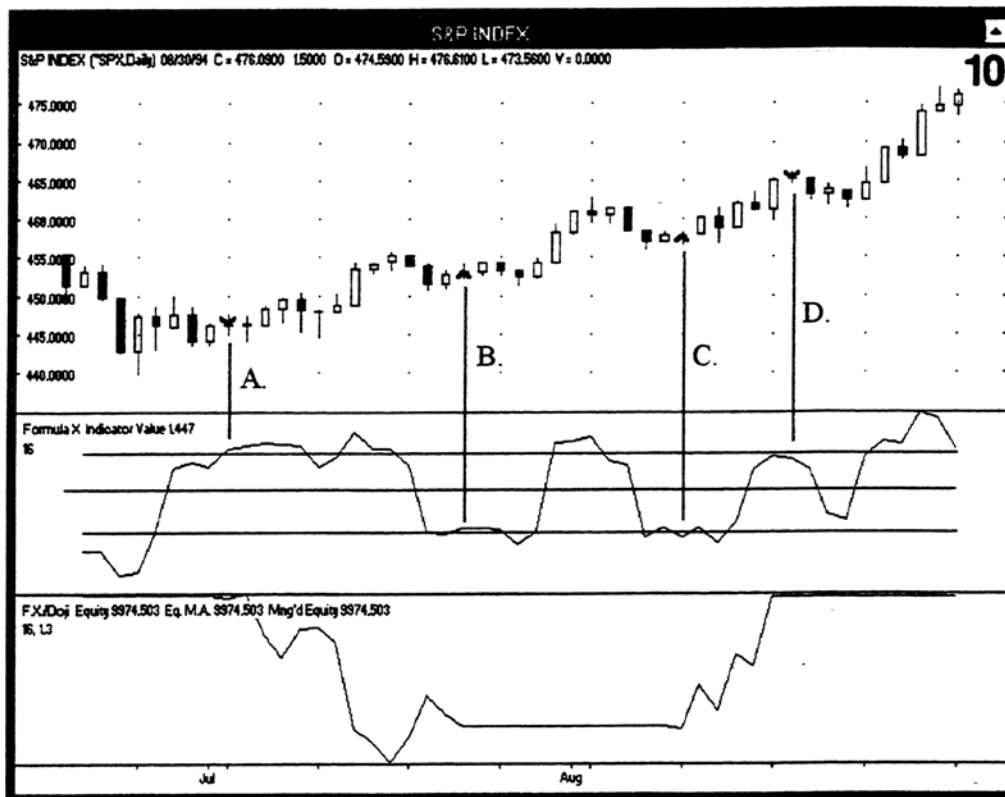


Chart 8.

Overbought/Oversold Oscillator Combined with Doji Candlestick (Reaction Trading with Reversal Pattern)

1. Overbought/oversold oscillator must be less than "oversold" threshold and doji candlestick pattern must be present to enter a long position.
2. Exit long position when overbought/oversold oscillator rises above midrange and turns back down.
3. Overbought/oversold oscillator must be greater than "overbought" threshold and doji candlestick pattern must be present to enter a short position.
4. Exit short position when overbought/oversold oscillator drops below midrange and turns back up.
5. Has difficulty making money in a strong trend.



Chart 9.

Above Simple M.A. and "Long" Candlestick System (Trend Following with Continuation Pattern)

1. Must be above simple moving average and a "Long" candlestick must be in place (with close > open) to enter a long trade.
2. Exit when first sign of weakness is shown (overbought/oversold oscillator weakens).
3. Must be below simple moving average and a "Long" candlestick must be in place (with close < open) to enter a short trade.
4. Exit when first sign of strength is shown (overbought/oversold oscillator strengthens).
5. Has trouble making money in congestion.

Dollar Volatility and Commission Costs Are **Extremely** Important When Using Trading Systems

1. Trading stocks - difficult for mechanical systems
 - a. Trade most volatile stocks.
 - b. Use weekly data to improve dollar volatility to commission ratio and reduce trading frequency.
 - c. Trade more size.
 - d. Use longer term moving averages, etc.
2. Trading mutual funds - can be more difficult than stocks
 - a. Lower volatility.
 - b. Usually have no intraday trading.
 - c. Limits on switching funds.
 - d. Transaction costs can be high.
 - e. Use same approaches as with unleveraged stocks.
 - f. Find funds with accomodating switching privileges.
3. Trading equity options - most mechanical systems work OK
 - a. Best chance of making money in the "stock market" with individual stocks using mechanical systems.
 - b. Use underlying stock prices for signals.
 - c. Liquidity can cause problems.
 - d. Try to use systems that trade every 4-5 days (the "10 day" cycle).
4. Trading index options - most mechanical systems work OK
 - a. Good liquidity - especially the OEX.
 - b. Good approach for the small speculator who wants to use leverage and limit risk.
 - c. Try to use systems that trade every 4-5 days (the "10 day" cycle).

5. Trading futures contracts - many mechanical systems work on most volatile contracts
 - a. Very active systems should be traded only with contracts requiring margins of \$2,000 or more per contract.
 - b. Lower volatility contracts should be traded with systems that will trade every 4-5 days.

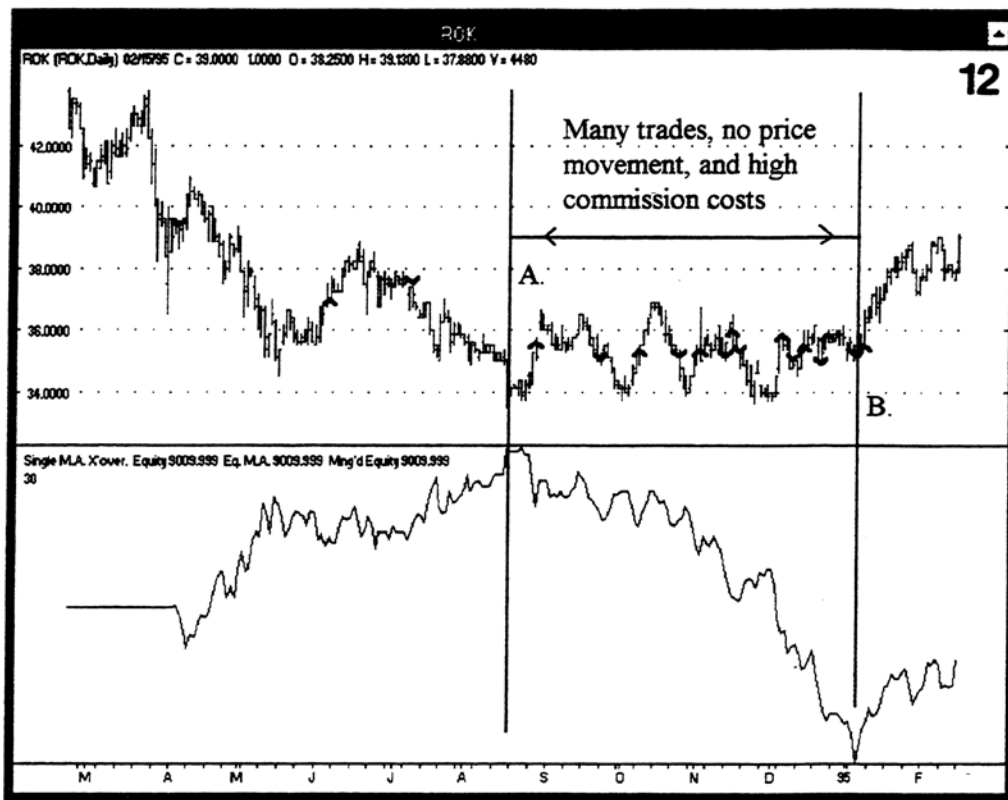


Chart 10.

Trading Rockwell with 30 day M.A. Crossover
Trading System loses because of large
number of trades with high commission costs.

(Assume \$30 commission for 500 shares traded.)

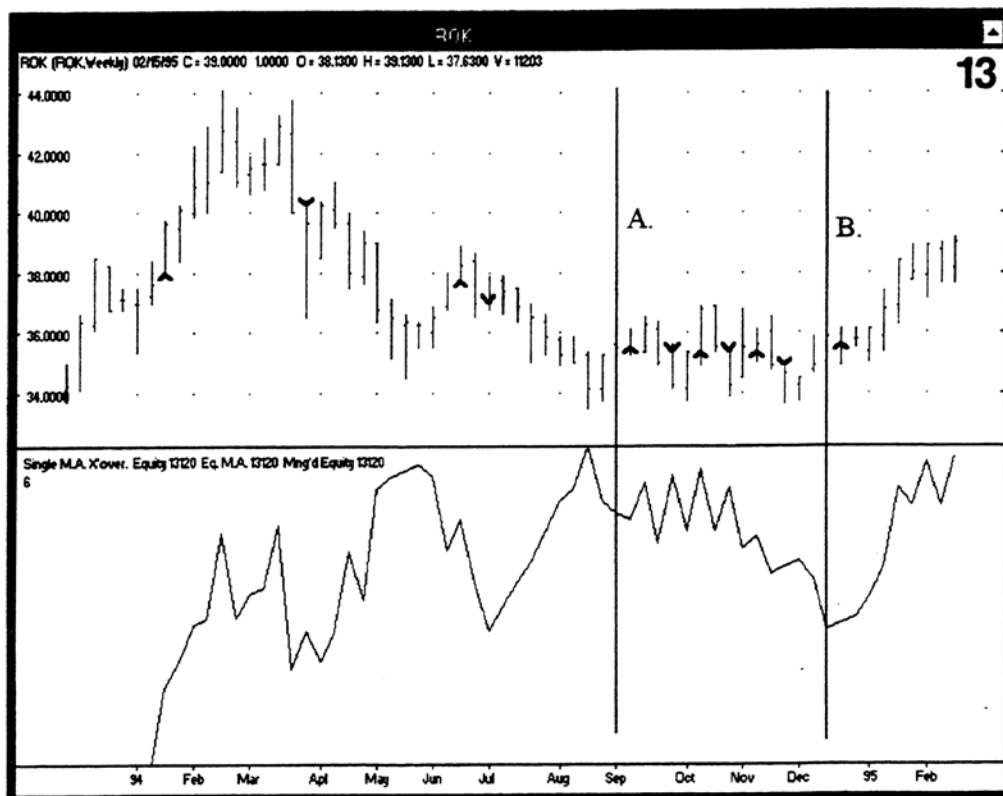


Chart 11.

Trading Rockwell with 6 week M.A. Crossover
Trading System wins because of fewer trades.

(Assume \$30 commission for 500 shares traded.)

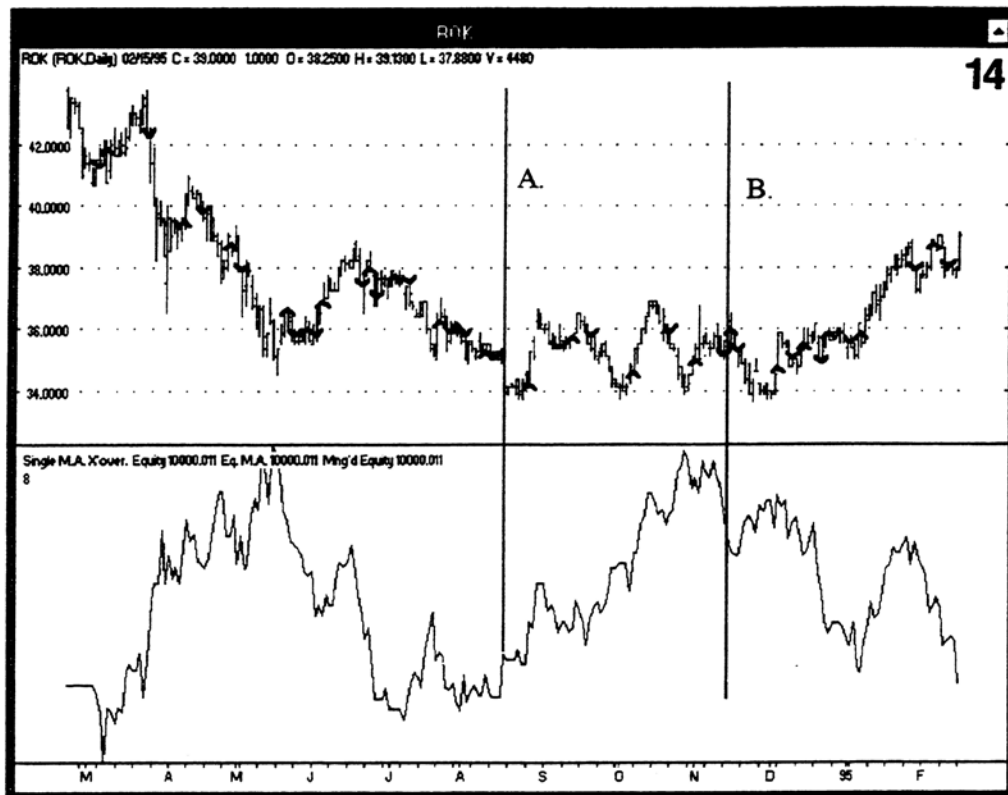


Chart 12.

Trading Rockwell with 8 day M.A. Crossover
Trading System turns sideways market into
a series of small trends.

(Assume \$30 commission for 500 shares traded.)

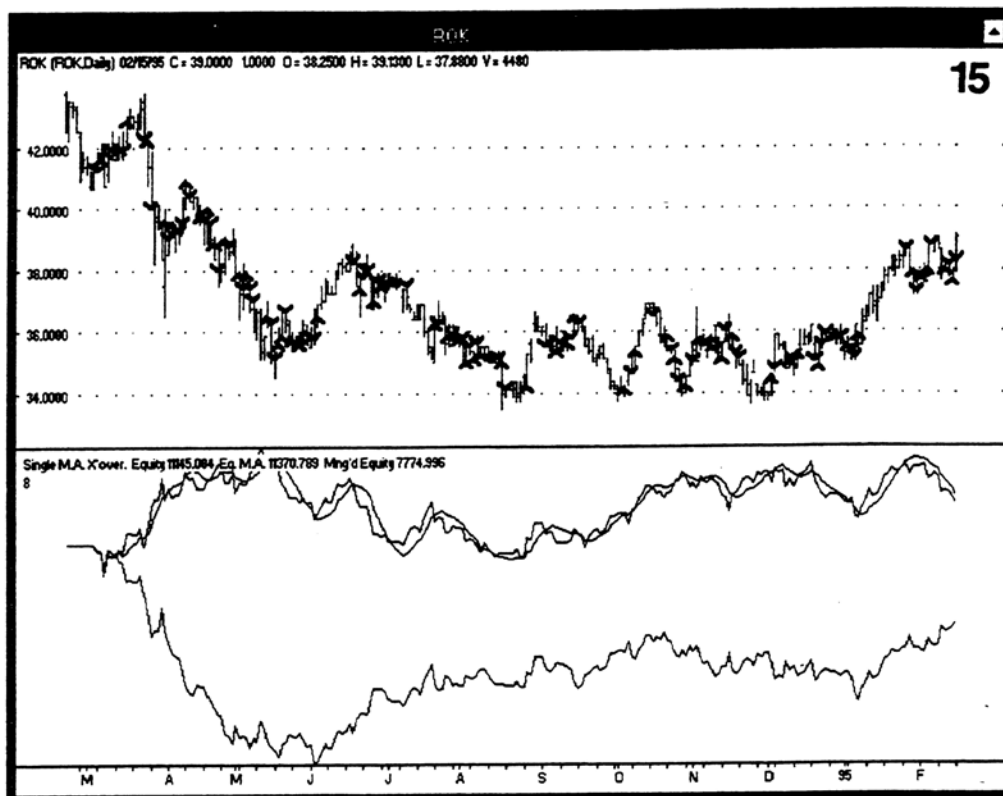


Chart 13.

Trading Rockwell with 8 day M.A. Crossover
Trading System loses money because of high activity
and high commission cost to dollar
volatility ratio.

(Assume \$30 commission for 500 shares traded.)

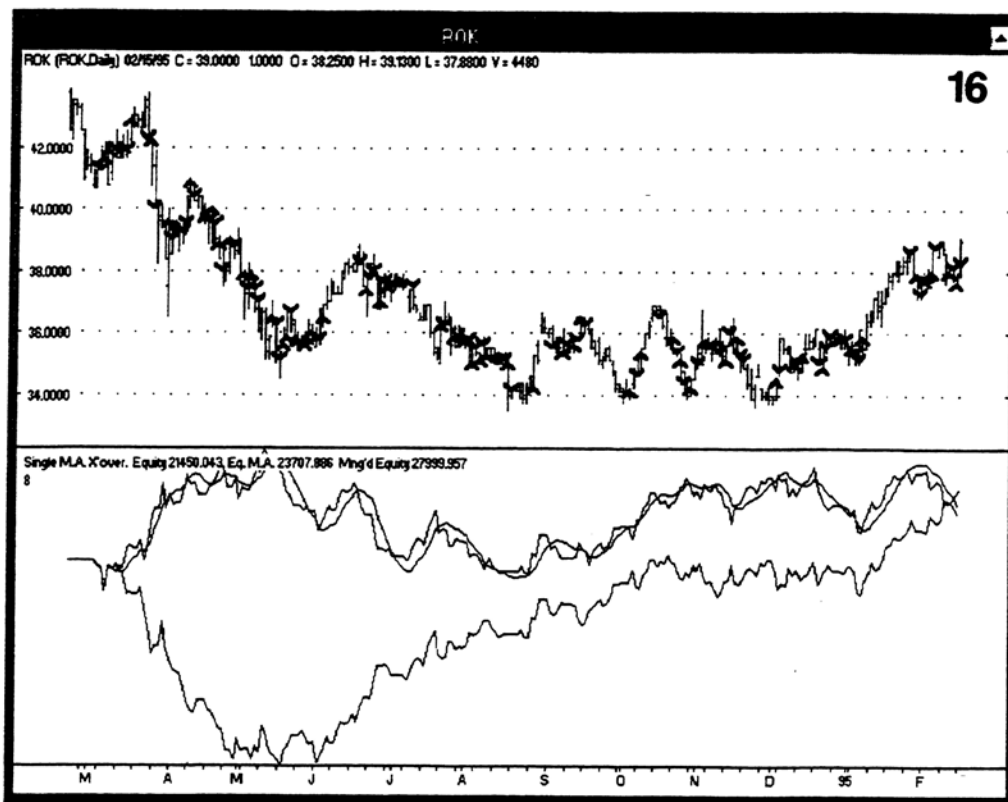


Chart 14.

Trading Rockwell with 8 day M.A. Crossover
Trading System makes money because of improved
commission cost to dollar volatility ratio.

(Assume \$50 commission for 5000 shares traded.)

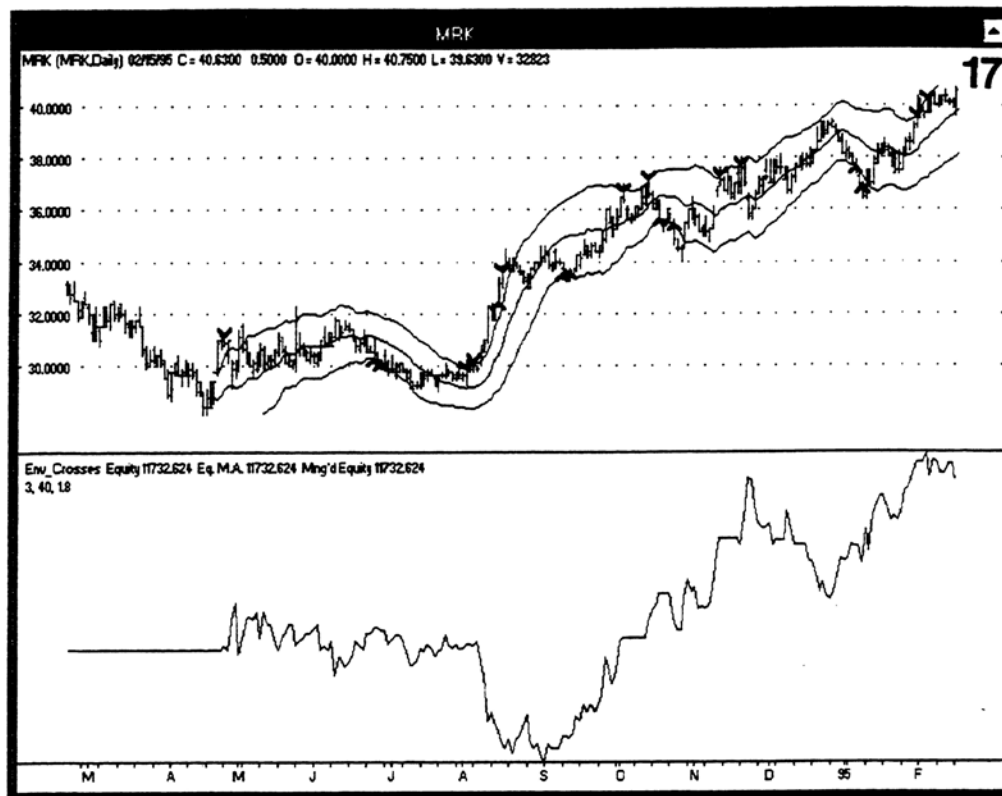


Chart 15.

Trading the 40 day cycle with an Envelope Reaction
Trading System makes money with Merck

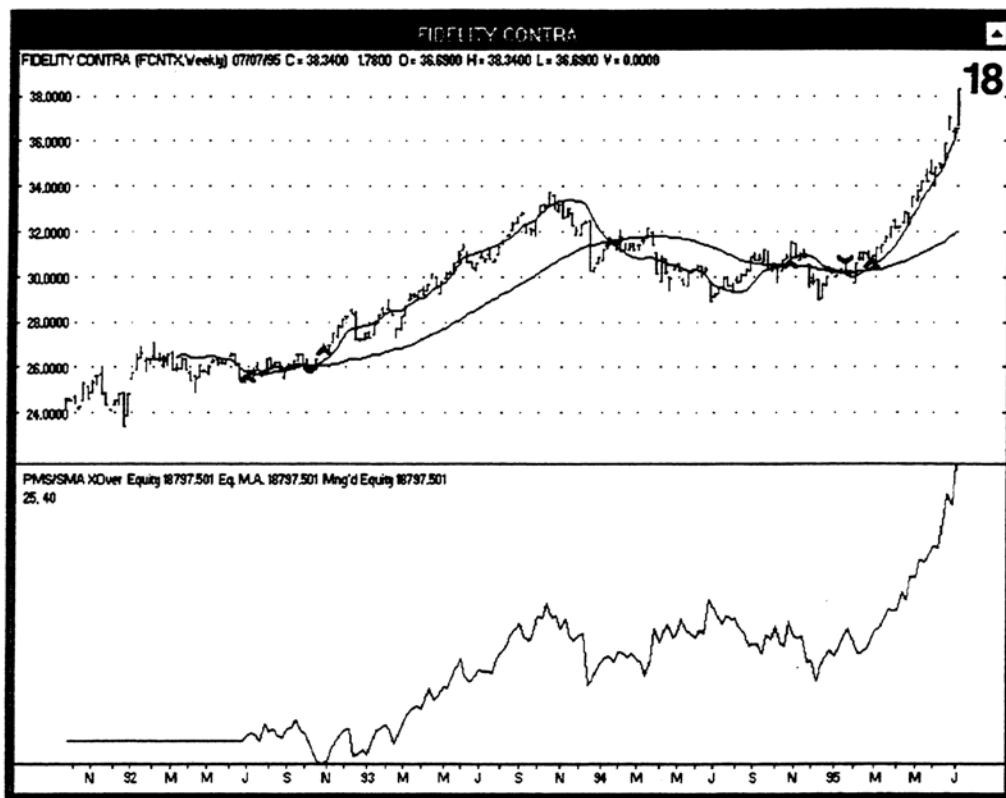


Chart 16.

Use Fast Moving Average and Slow Moving Average Crossover Trading System with Fidelity Contra

Using weekly data with a very slow
moving average was important.

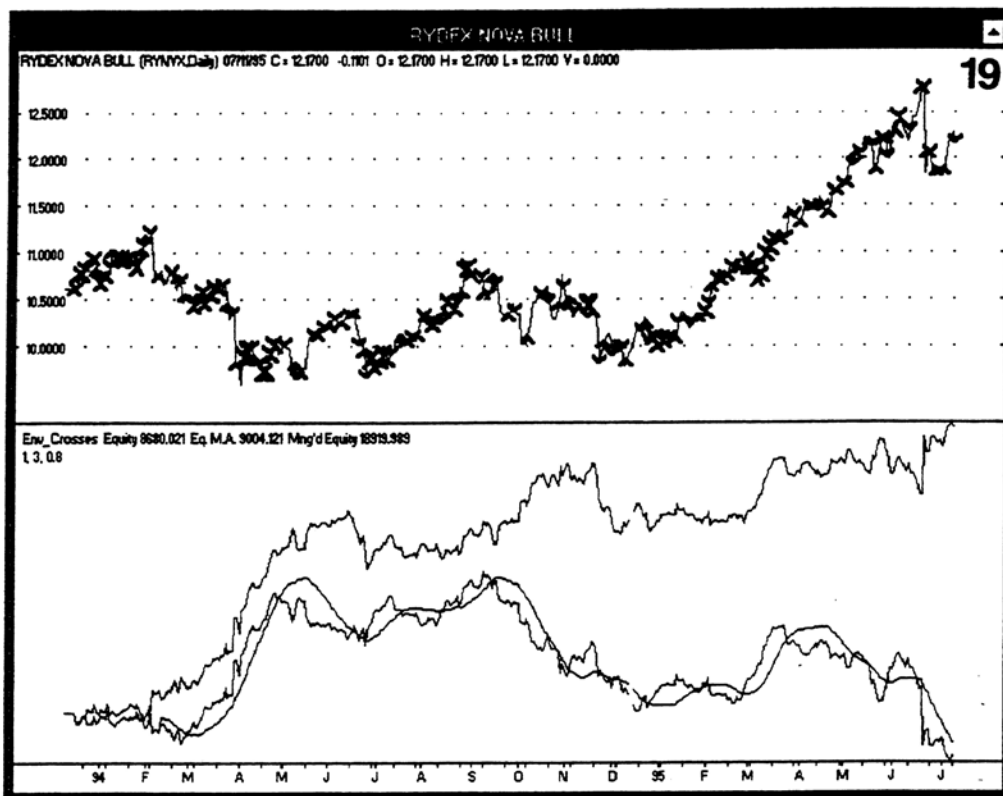


Chart 17.

High Frequency Trading of RYDEX NOVA
and URSA funds worked because
of zero commission costs.

(Assume an account size of approximately \$20,000)

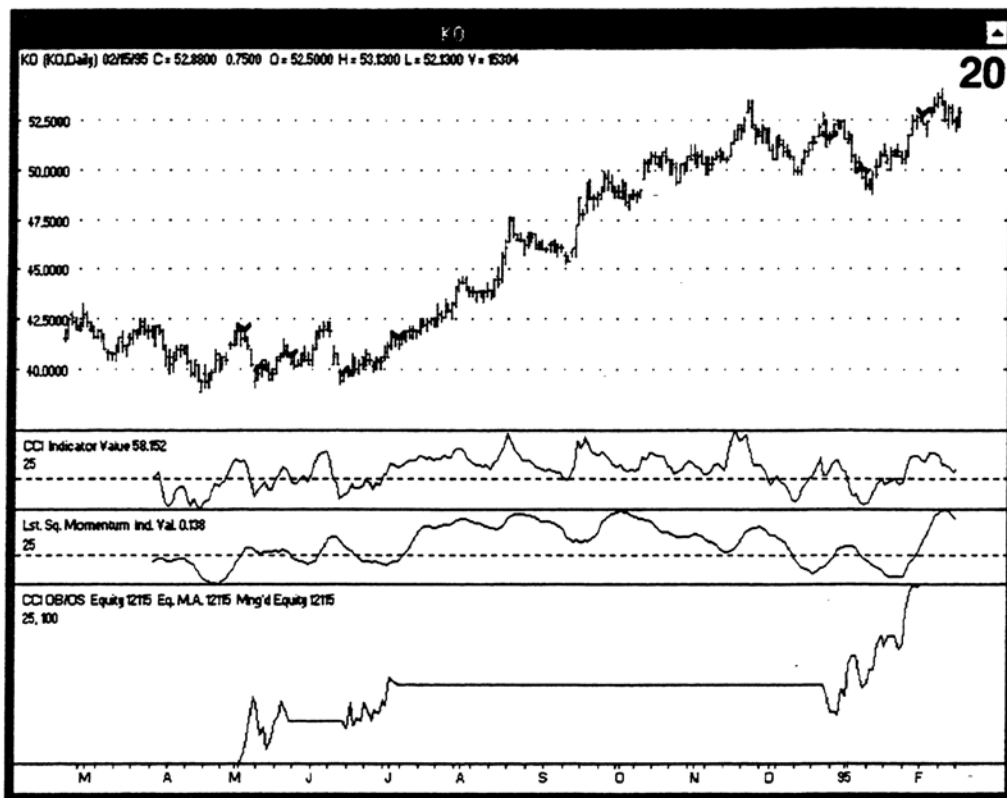


Chart 18.

Trading Coca Cola Options with CCI
overbought/oversold logic
filtered by momentum

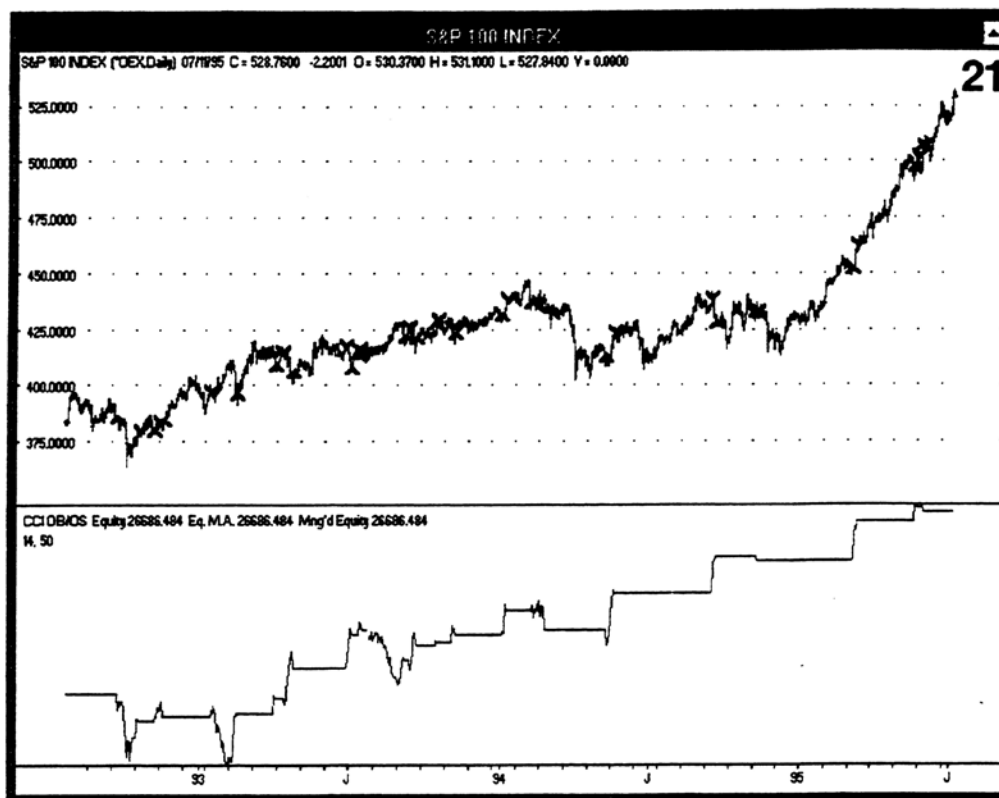


Chart 19.

Trading OEX Options with CCI
overbought/oversold logic
filtered by momentum



Chart 20.

Trading the S&P500 Futures Contract
with a trading system that is highly
dependent on low commissions and
high dollar volatility.

(\$32/contract turnaround commission, dollar volatility
in a typical day would be \$1,250 range)

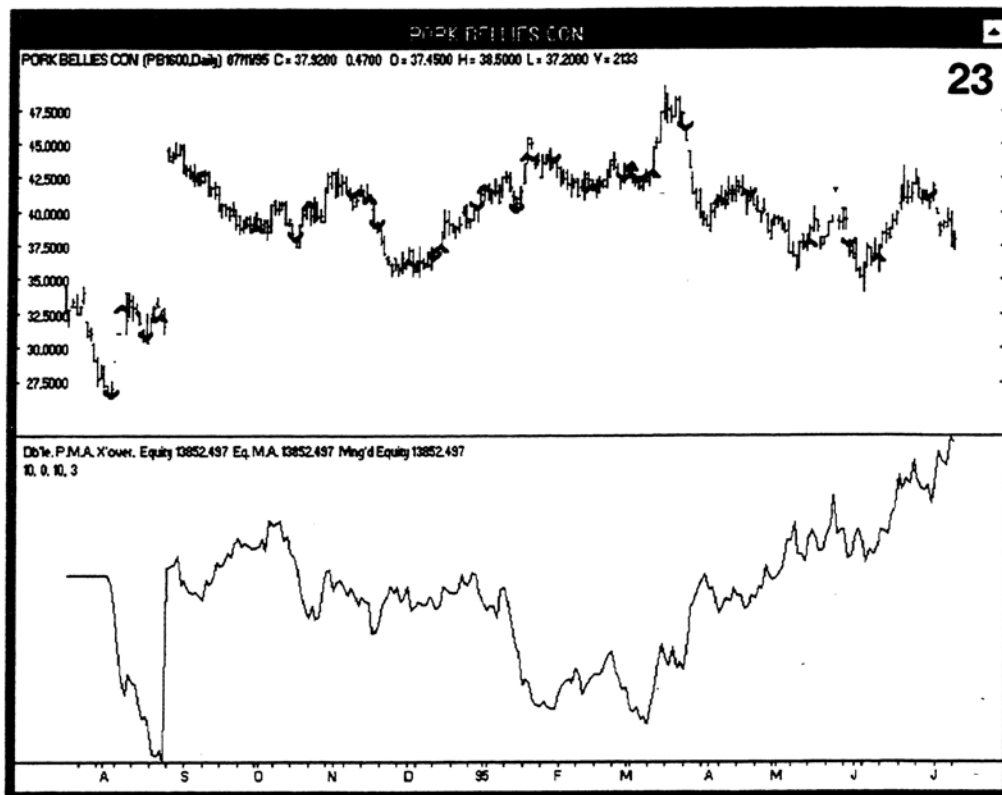


Chart 21.

Trading Pork Bellies Contract with a moving
average crossover trading system
tuned to a ten day cycle

(Ten day moving average and a ten day moving average
displaced by three days)

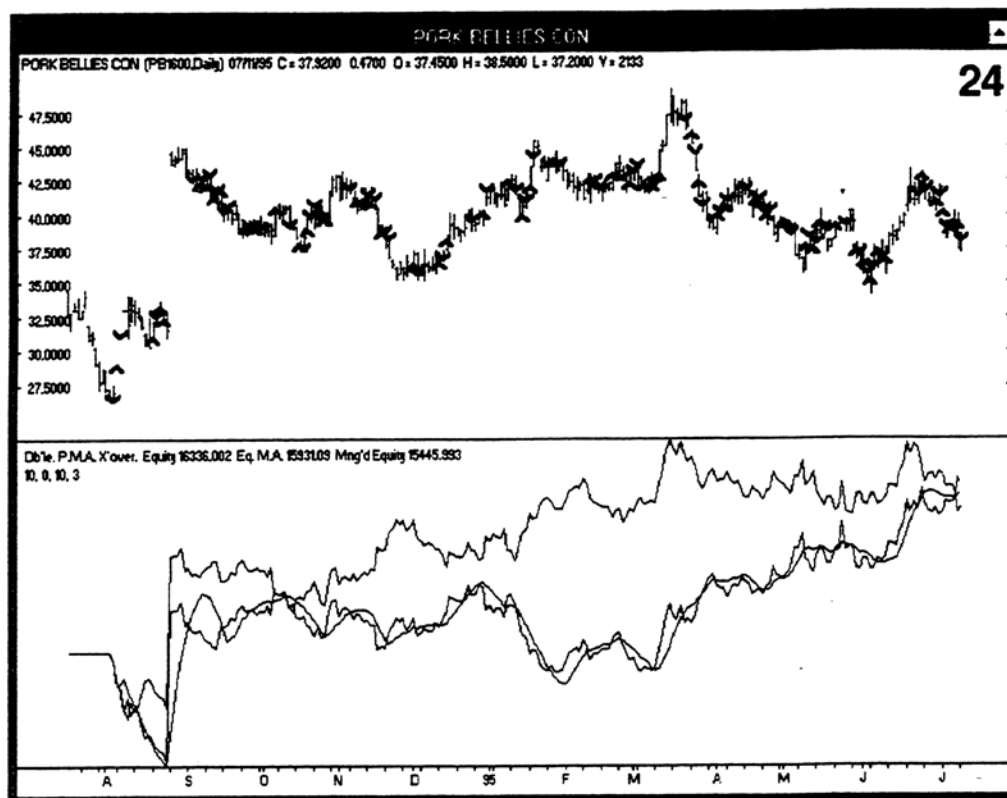
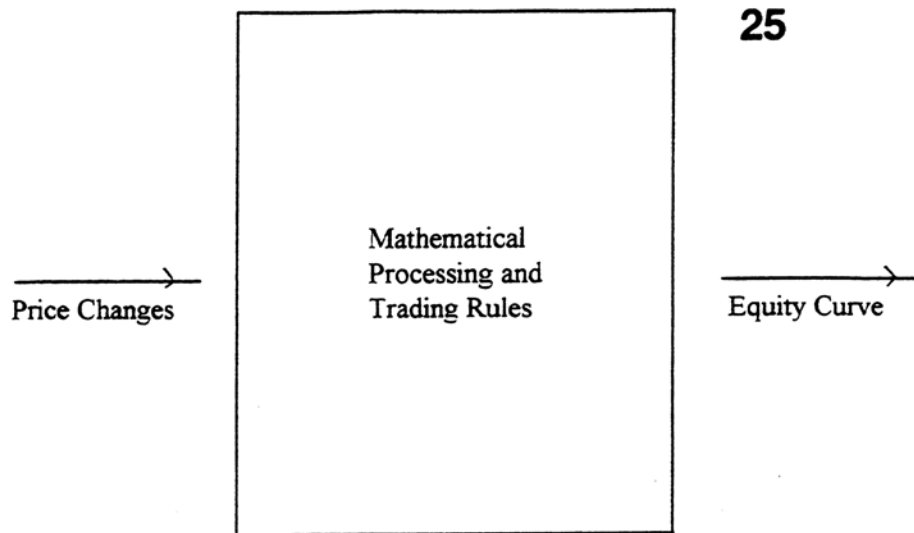


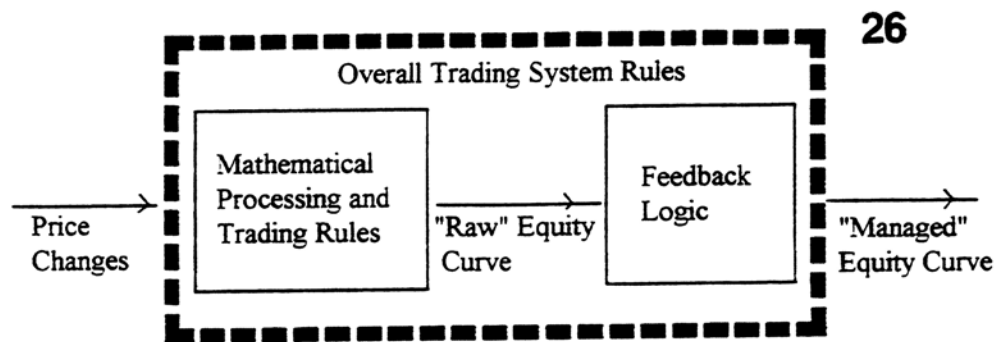
Chart 22.

Trading Pork Bellies with moving average
crossover trading system tuned to a ten day cycle

(Improved with reversal equity curve
money management)



An equity curve isn't a "real equity curve" until actual transactions take place.



Equity curve management is just an extension of "the trading rules".

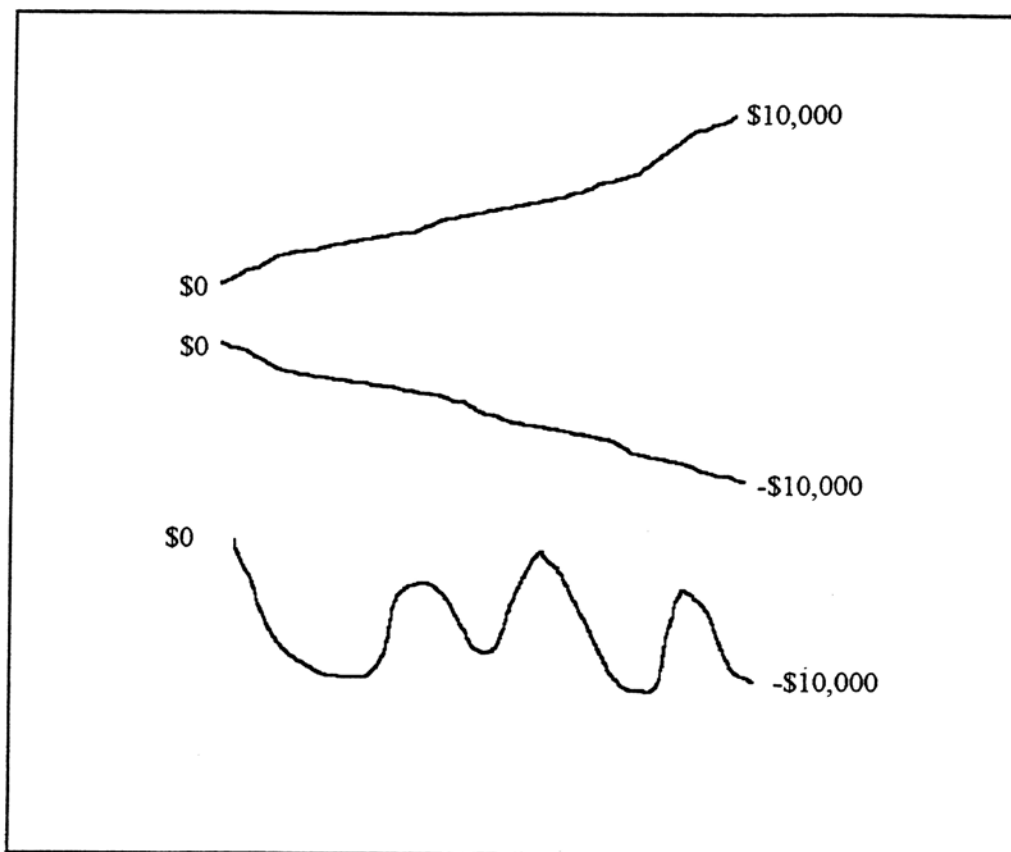


Chart 23.

Which is the best raw equity curve?

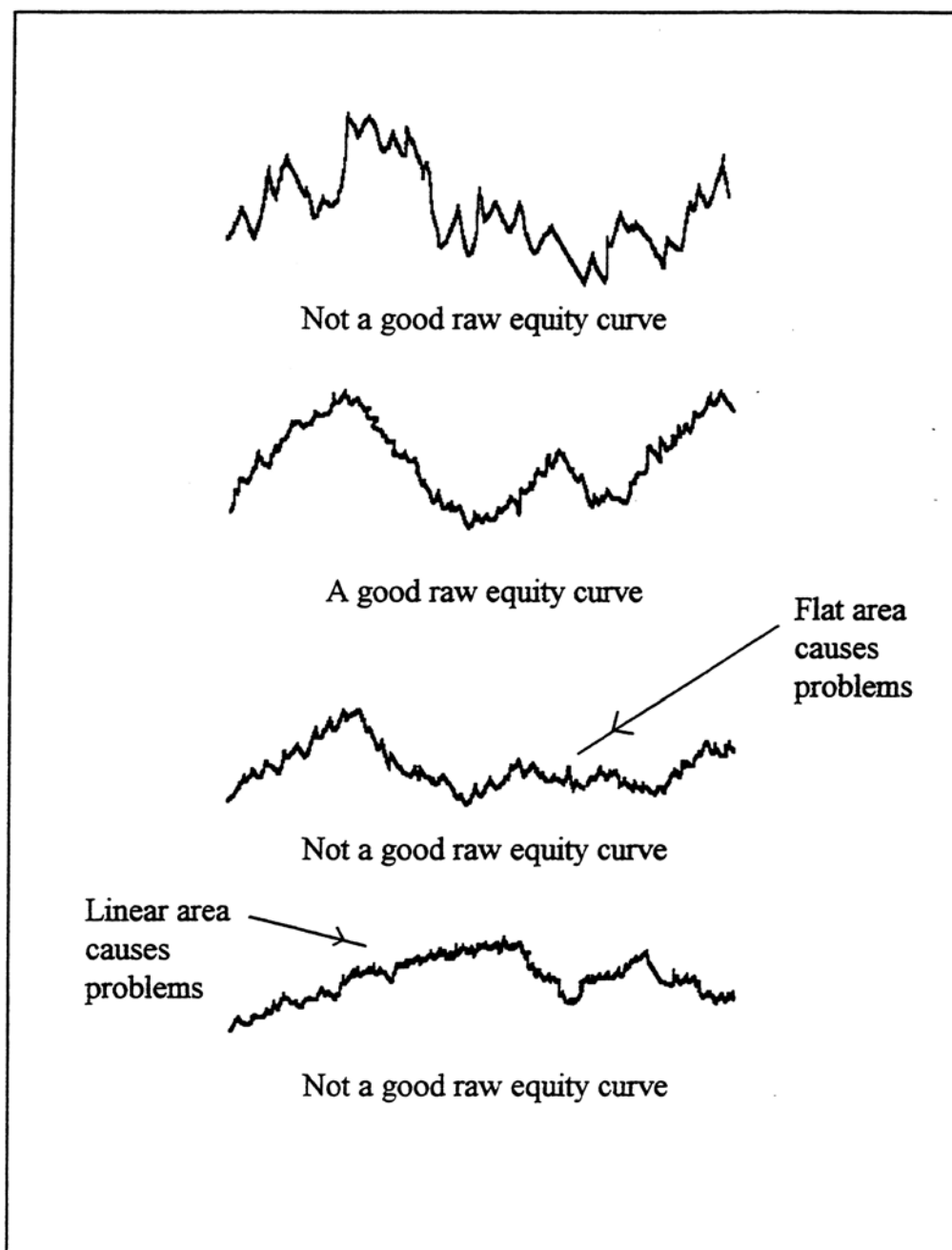


Chart 24.

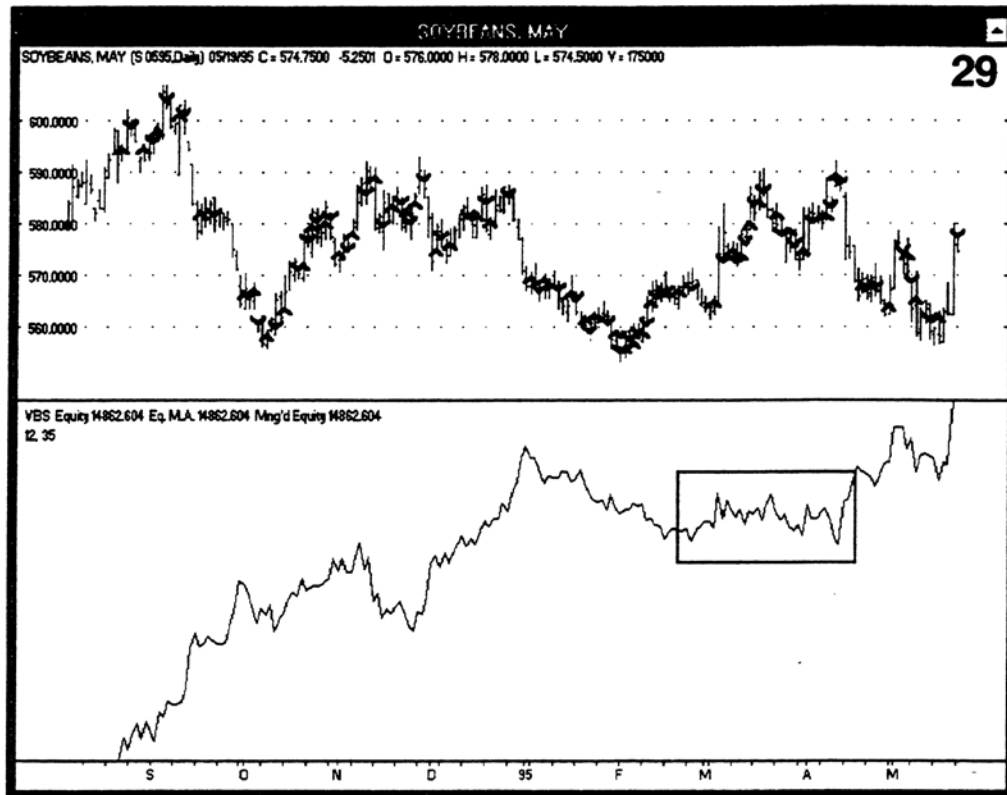


Chart 25.

Trading Soybeans with a Volatility Breakout System

1. Soybeans futures contracts are in a "gray area" as far as volatility is concerned.
2. This chart is not too bad for logic reversal money management, but is a little choppier than ideal.
3. The period in the rectangle looks troublesome.



Chart 26.

VBS Trading with best moving average reversal logic money management

1. Period between A. and B. has poor results because of crisscrossing the moving average line.
2. You can't predict the horizontal pattern, but the "choppiness" is fairly consistent.



Chart 27.

VBS Trading with best moving average reversal logic money management

1. Period between A. and B. does better than with reversal logic.
2. Other parts of the curve are improved also.
3. Using termination logic will frequently improve a choppy, raw equity curve.

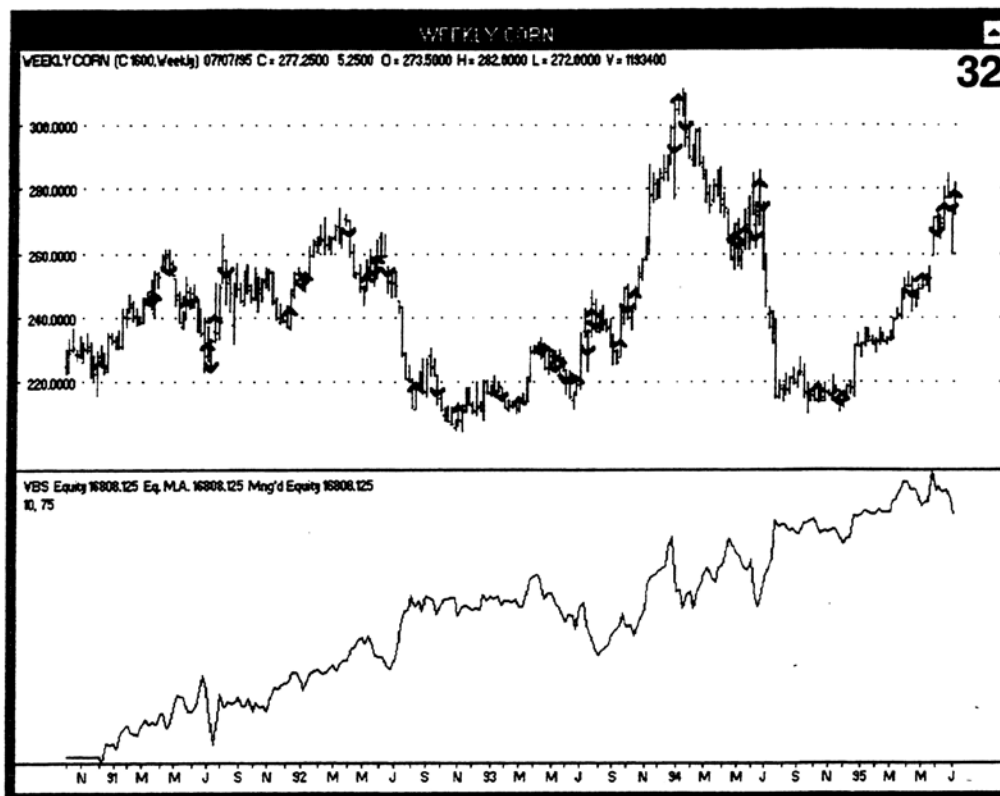


Chart 28.

VBS Trading with weekly corn

1. Using weekly bars helps the trading results because of more volatility per bar.
2. The choppiness of the curve could be trouble.
3. Strong linearity could also be trouble.

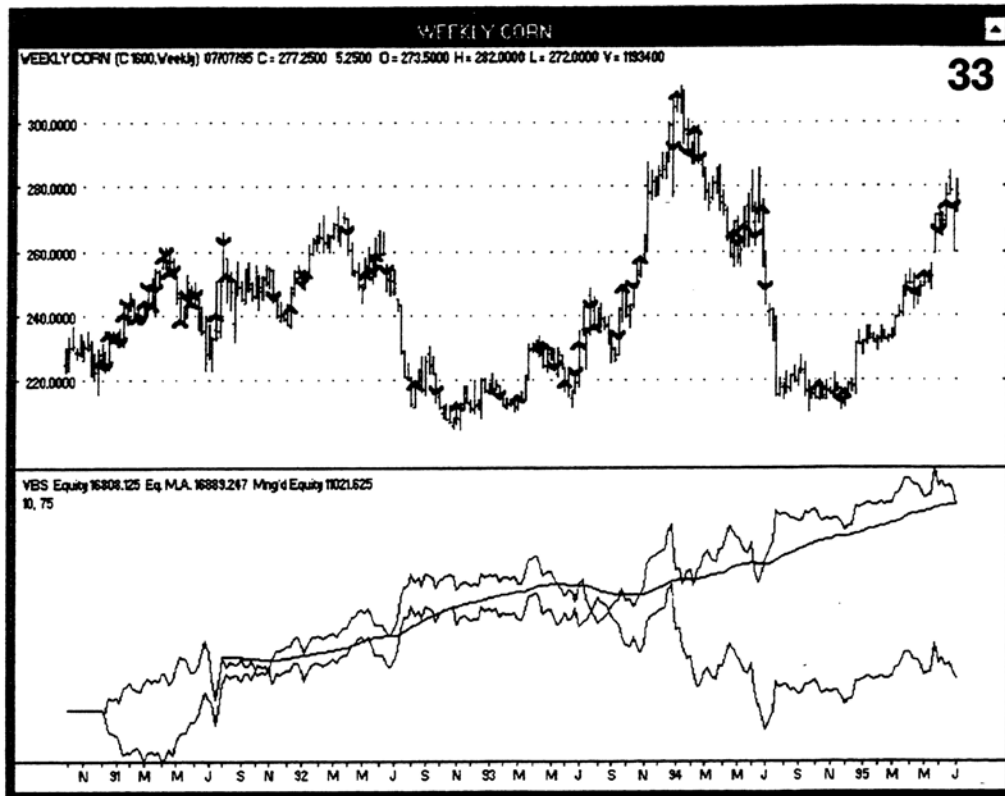


Chart 29.

VBS Trading with weekly corn using best moving average reversal logic money management

1. The crisscrossing of the moving average curve causes some problems.
2. The system still manages to make money.



Chart 30.

VBS Trading with weekly corn using best moving average termination logic money management

1. The crisscrossing of the moving average curve still causes some problems.
2. The system makes more money than with reversal logic.

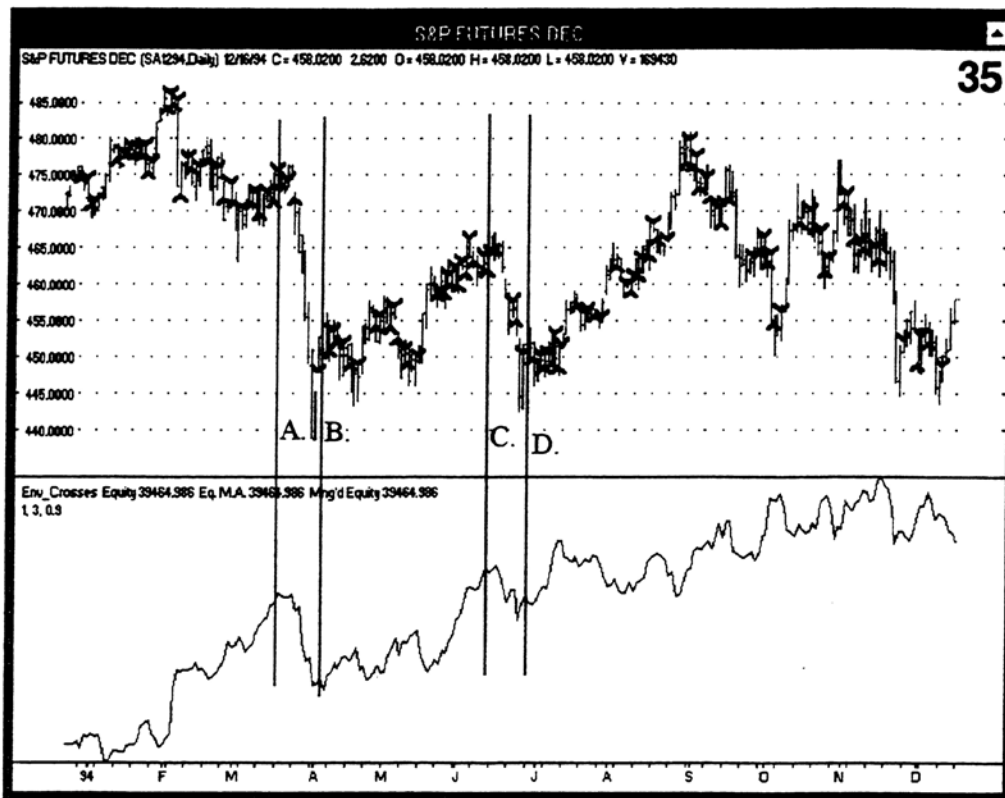


Chart 31.

Envelope Crosses Trading with S&P500 Futures Contract

1. At first glance, the chart looks choppy, but a closer look shows that the curve has very small "jiggles" superimposed on intermediate duration waves.
2. The down moves in the raw equity curve are highly correlated to sharp, short duration "trends" (for example at A.-B. and C. - D).
3. This period is characterized by a large number of congestion periods.

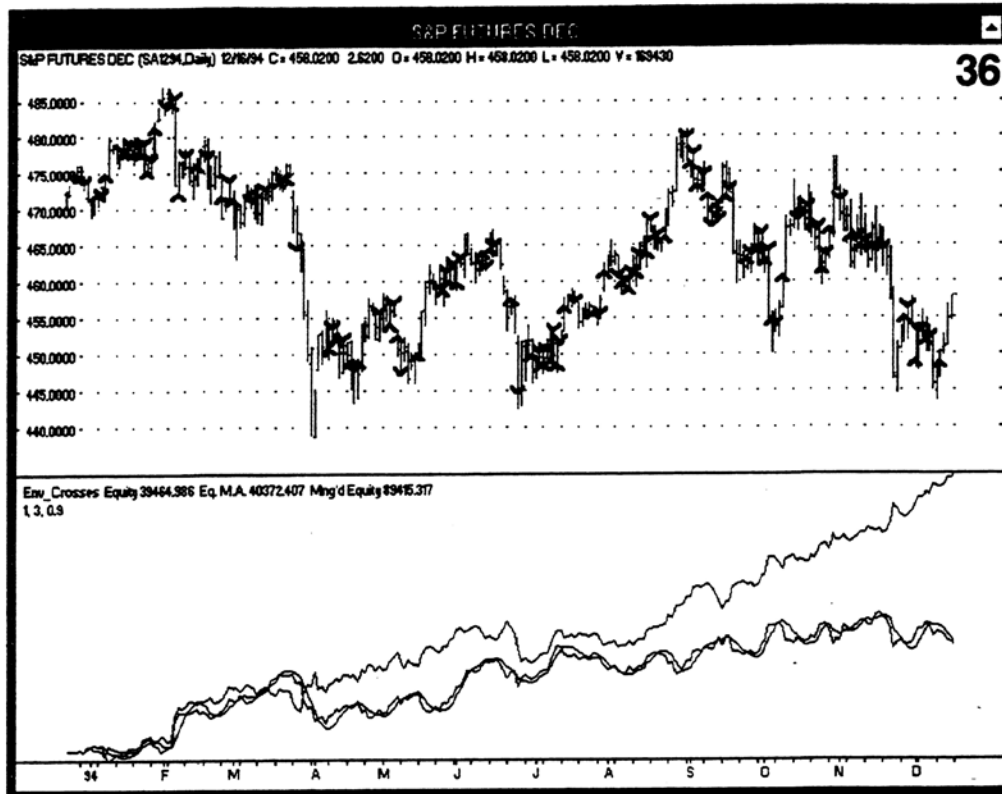


Chart 32.

Envelope Crosses Trading with S&P500 Futures Contract with reversal logic money management

1. Using a moving average that tracks the raw equity curve very tightly enables system to "pick" off the intermediate term moves in the raw equity curve.
2. Catching these up and down moves enables the system to attain much better results.

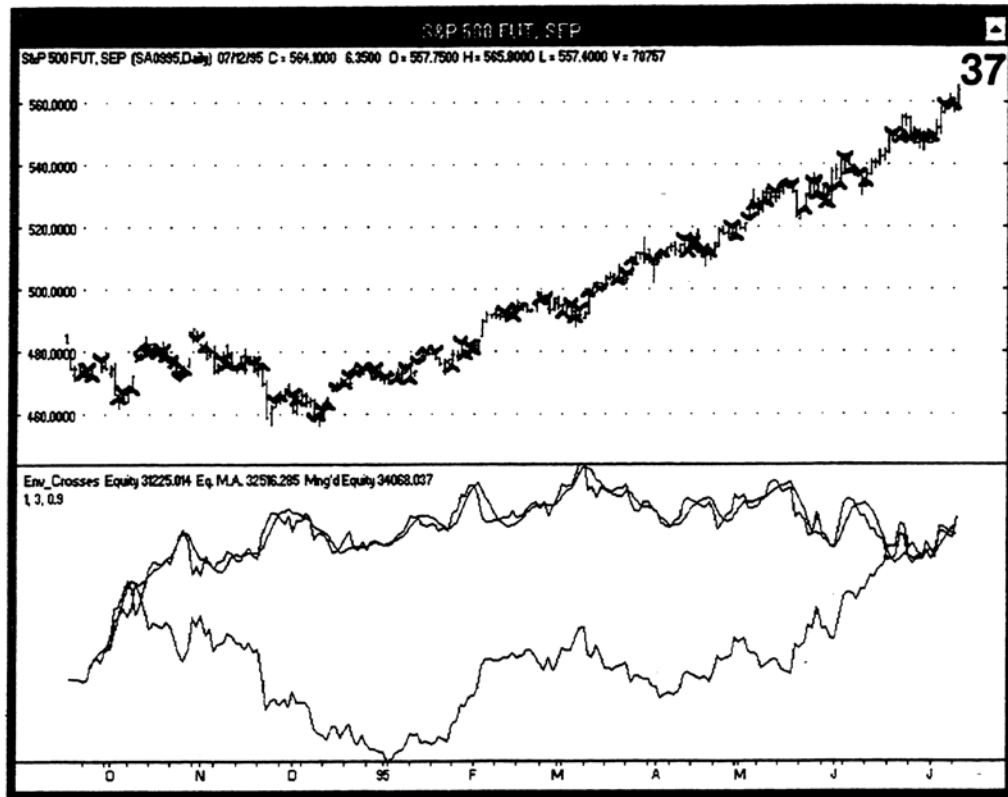


Chart 33.

Envelope Crosses Trading with S&P500 Futures Contract with reversal logic money management

(A different period with a VERY strong
trend - used same parameters)

1. Performance is not as good but system still made money.
2. Backtesting against different kinds of markets is probably more important than testing against long periods of time.

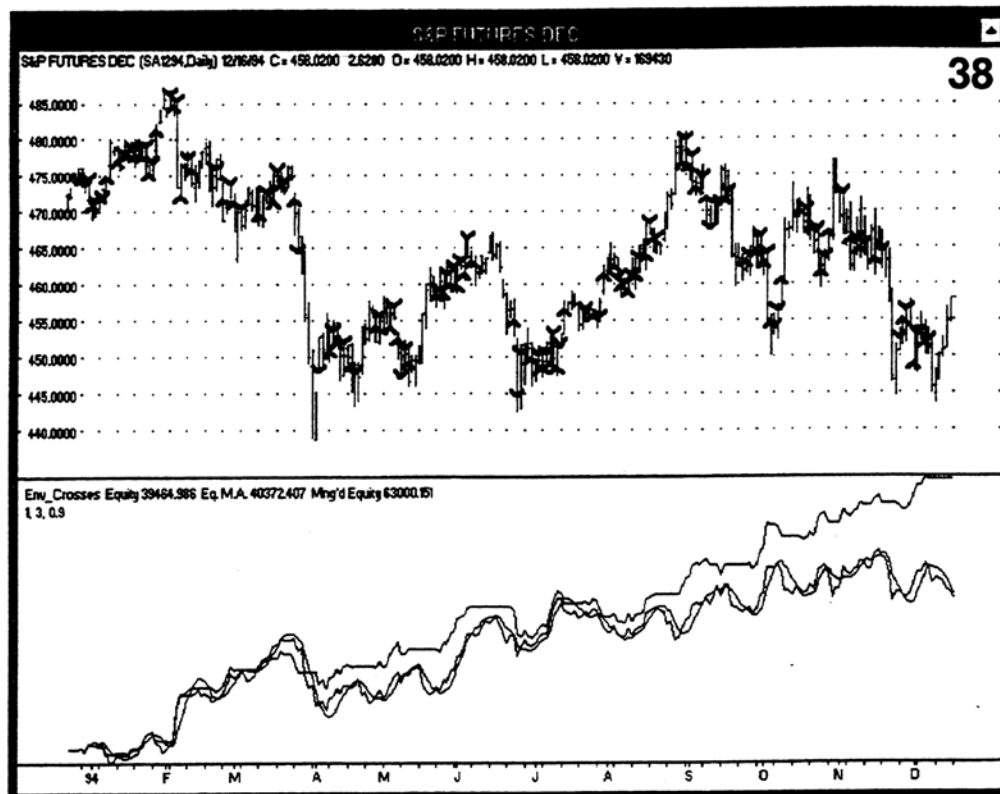


Chart 34.

Envelope Crosses Trading with S&P500 Futures Contract with termination logic money management

(Performance was not as good but
the maximum drawdown was lower.)



Chart 35.

VBS Trading with S&P500
Futures Contract with a relatively
loose average true range percentage
value used for calculation of
reversal stops

1. Produces a very choppy raw equity curve.
2. The range of the raw equity curve is very narrow.

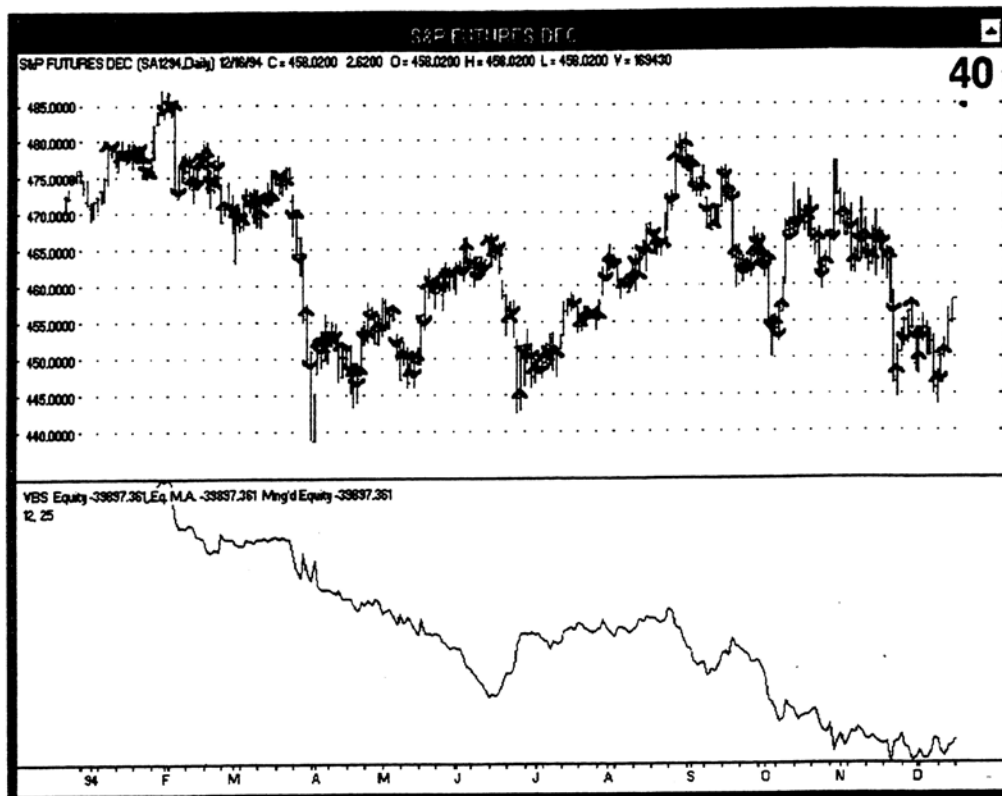


Chart 36.

VBS Trading with S&P500
Futures Contract with a smaller average
true range percentage
value used for calculation of
reversal stops

1. Produces a much tighter raw equity curve that is more "trendy" because stops are closer to each day's close.
2. The range of the raw equity curve is much wider.

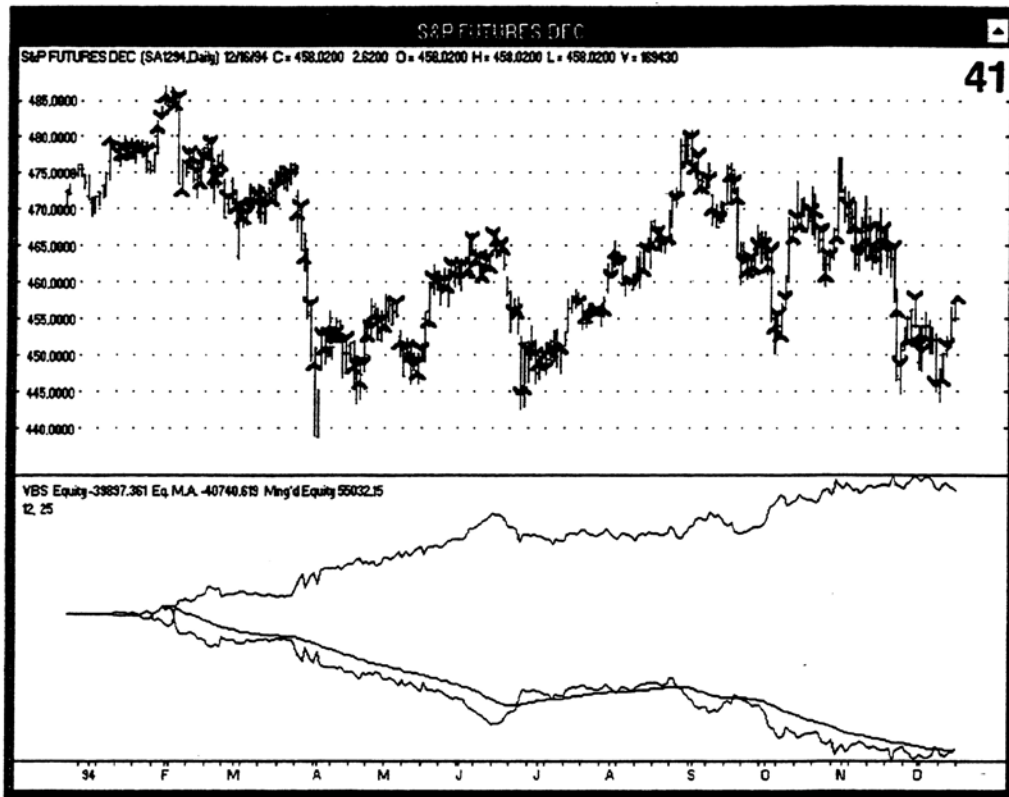


Chart 37.

VBS Trading with S&P500
Futures Contract with a smaller average
true range percentage
value used for calculation of
reversal stops

1. Uses a slow exponential moving average for reversal logic money management .
2. Most of the transactions are done with limit orders.

Summary

1. Obtaining a plot of an equity curve under the price curve is important in understanding how a trading system works.
2. A raw equity curve plotted without transaction costs and slippage can be helpful in determining if prices are in congestion or in a trend. They can possibly be used to detect the presence or absence of other profitable or unprofitable phenomena.
3. The transaction cost to volatility ratio is probably the most important variable in determining what kind of trading system to use with a trading vehicle.
4. A raw equity curve is only an intermediate step in the mathematical processing of a mechanical trading system.
5. The best raw equity curves have up and down waves with small noise movements superimposed on the much larger waves.
6. The shape of raw equity curves can be controlled to some extent.