Technical Analysis of CAN SLIM Stocks

A Major Qualifying Project Report

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1. Abstract

This MQP combines fundamental and technical analysis by adding value to the CAN SLIM investment methodology through the concept of complete trading strategies. We utilize the TradeStation trading platform to evaluate five set-ups - Donchian channel 20-day and 55-day, Keltner channel, Bollinger bands, moving average crossover and volume breakouts – by back-testing 559 CAN SLIM stocks for 2007. For comparison purposes we employ system quality calculations and Monte Carlo analysis to assess the performance of each set-up.

2. Introduction and Statement of the Problem

$51 trillion. That's how much the stock market's value is estimated at, making it about four times the size of the U.S. economy. Its significance as a part of the American financial system cannot be downplayed. It has provided Americans with immense profit opportunities, enabling them to buy a new house, send their child to a top-tier university or retire early. These are dreams which each of us have but only a few know the best path for realizing them. And how else given the seemingly infinite number of investment instruments - stocks, bonds, all those exotic derivatives, mutual funds, hedge funds... Most people do not have the courage NOT to follow an analyst's advice after watching CNBC or reading a free investment newsletter. They simply do not believe they could have a greater return by investing on their own and beating the average annual return of a mere 7.84% of the S&P 500 for the past 50 years. (Moneychimp) And in part, they are right. To be a successful trader, you need to be disciplined, to learn to disregard all the headlines and analysts' comments, taking emotions out of the game. You need to adhere to your own rules under any circumstances. You need to decide what you trade, when you trade, how you enter a position and how you exit it, when you take profits and when you stop your losses.

The purpose of this MQP is to show individual investors a way to implement all the above rules by introducing them to the development of complete trading strategies. As with many other stock trading strategies, ours incorporates fundamental and technical analysis. We have decided that the former has already been perfected trough the CAN SLIM methodology created by William O'Neil (O'Neil, 2002) and offered by Investor's Business Daily (IBD). That's why we do not intend to spend any more time deciding which stock has the necessary fundamental

characteristics but concentrate on the latter part of the equation. Bill O'Neil and IBD provide the individual investor with a list of CAN SLIM stocks but they offer only limited advice on when and how to buy or sell them. In our MQP we solve this issue by using the TradeStation trading platform which allows for the testing of various technical indicators on the CAN SLIM stocks.

In the first part of this report we will introduce you to the essence of fundamental and technical analysis. We will cover those concepts we deem to be pertinent to this MQP. After that we will guide you through the world of CAN SLIM stocks – what they are, where you can find them and how we are going to use them. Then we will introduce you to the complete trading strategies and their five steps – set-up, entry, exit with a profit, exit with a loss and money management. In the end we will analyze the CAN SLIM stocks for 2007 using TradeStation by testing five set-ups while keeping the other aspects of the complete trading strategy constant. To compare the performance of each set-up we will use system quality calculations and Monte Carlo analysis which will allow us to differentiate between the strengths and weaknesses of each strategy. Finally, we reach the conclusion that the trend-following moving average crossover strategy combines the best out of the six strategies we back-test with the CAN SLIM characteristics.

3. Background Research

3.1.   Fundamental Analysis

Fundamental analysis is a method used to determine the value of a stock by analyzing the financial data essential to the company with the goal of projecting future price movements. Investors examine the company's financials and operations by looking at sales, earnings, dividends, growth potential, assets, debt, management, products and competition, in order to verify if a stock should be bought or sold. An important characteristic of fundamental analysis is that it focuses exclusively on those variables that are directly related to the company. The general market and the behavioral variables in its methodology are in secondary focus.

There are two different fundamental analysis methodologies. Value investors assign a fair value to stocks by using a methodology that was developed by Graham and Dodd (Value Investing). If this fair value is not equal to the actual market price of the stock, fundamental analysts believe that the stock is under- or overvalued and that it will settle towards the fair value.

On the other hand, growth investors buy stocks at any given price and hope to sell it even higher. Although a stock might have a high price, indicated by a high price to earnings ratio, investors purchase the stock because of its potential high growth. Growth investing is considered riskier; however it is appealing to investors because of the high returns it promises.

Generally, a follower of the fundamental analysis approach would initially start looking at the overall economy and work their way down from industry groups to individual companies. When the economy expands, most companies tend to benefit from this and grow, while most companies usually suffer when the economy declines.

Certain industry groups are prone to gain a better advantage relative to others in an expanding economy. The investor should determine those groups that will be best affected by the current economic environment. In determining this, important factors to be considered are the overall growth rate, market size, and the importance of the group to the economy.

When a certain industry group is selected, the investor should select a list of companies before going on with a more detailed analysis. It is important to find the leaders and the innovators within the group. In this selection process, the investor should consider the company's business plan, management and sensible financials. By understanding the company's business, traders can better position themselves to categorize stocks within their relevant industry group.

Quantitative analysis is the biggest part of fundamental analysis. This engages looking at past data to forecast future earnings. Some of the variables used for fundamental analysis that are relevant to CAN SLIM Stocks are explained below.

3.1.1. Earnings per Share (EPS)

Earning per Share indicates the profitability of a company.

Calculated as: Earnings per Share $= \dfrac{Earnings}{Number\ of\ Shares\ in\ Issue}$

Earnings per Share is a key ratio used in share valuations. It shows how much of the company's profits, after tax, each shareholder owns.

3.1.2. Price-to-Earnings Ratio (P/E)

Although Earnings per Share is a great way to compare earnings across companies, it lacks in notifying the investor anything about how the market values the stock.

Calculated as: Price to Earnings Ratio $= \dfrac{Market\ Value\ Per\ Share}{Earnings\ Per\ Share}$

The P/E ratio is one way for investors to obtain an idea about how much the market is willing to pay for a company's earnings.

3.1.3. Return on Equity (ROE)

Return on Equity is an indicator of a company's efficiency.

Calculated as: Return on Equity $= \dfrac{After-Tax-Income}{Stockholders'\ Equity}$

It shows how much profit a company is able to generate given the resources provided by its stockholders. Companies with high and growing ROE are said to have great potential.

3.2.   Technical Analysis

While fundamental analysis focuses on determining the fair value of a stock by looking at its financials, technical analysis considers the past price movements of a stock to determine its future actions. Technical analysis is often described as an art which requires experience, skills and dedication in order to be mastered. Due to the nature of this short-term project, we will use the TradeStation platform to catch-up to the level of an experienced and skilled trader and apply technical analysis to the CAN SLIM stocks. Technical analysis is a versatile tool that can be applied to stocks, bonds, futures, options, commodities and other securities whose price is set by the forces of supply and demand. (Technical Analysis) Furthermore, technical analysis makes an extensive use of charts – e.g. bar charts, candlesticks charts, point and

figure charts. It can also be applied to different time frames depending on the trading preferences of the investor – intra-day, daily, weekly, monthly and even yearly.

Technical analysis has been developed at the beginning of the century on the basis of the Dow Theory – a theory pieced together from the writings of Charles Dow by William P. Hamilton, Robert Rhea and E. George Schaefer. Three important assumptions can be derived from the Dow Theory:

- Price reflects all information available

- Prices trend and their movements exhibit certain patterns

- Price is what interests investors and not how it is arrived at

The first assumption states that price embodies all information available to the public. Here technical analysis differs strongly from fundamental analysis as the former assumes that price is the fair value of a stock while the latter uses all kinds of relevant data to come up with it.

Technical analysts (also called technicians) believe that each stock has an underlying trend or that at least not all of the stock movements are random. Once identified, the trend is used by technicians to capitalize on the future price movement of the stock.

The third assumption runs again technical analysis counter to fundamental analysis by emphasizing the final price of a stock rather than any other fundamental characteristics or finding out why the price is what it is. Much effort is directed toward .predicting the future price direction so according to technical analysts it only makes sense to look at past price movements.

Price movements are best observed when plotted on a chart. Thus, charts have become the technicians' main tool to assess the current state of a stock, where it is coming from and where it is heading to.

The next subsections will guide you through some terms and techniques which are relevant to technical analysis and which we use in this MQP.

3.2.1. The Bar Chart

One of the most widely used charts is the bar chart. For the formation of a bar chart you need the close, high and low values of the price of a stock.

Figure 1: Bar Chart (What Are Charts?)

As you can see in Figure 1 the top and bottom of the bar represent the highest and lowest points reached by the price of the stock during the time period. The horizontal line is the closing price of the stock. Depending on the trading horizon, the close, high and low values could refer to minutes, hours, days, weeks or even months. Bar charts offer a great way to analyze the closing price relative to the high and low. If the stock closes higher in value relative to the open, then the bar is usually shaded black. If the bar is shaded red then the close is lower than the open.

3.2.2. Average True Range (ATR)

The Average True Range is a technical indicator developed by J. Welles Wilder and is a measure of the stock's volatility. (Average True Range) To derive the ATR Wilder started with the concept of the True Range which is defined as the greatest of the following:

- Current high less the current low

- The absolute value of the current high less the previous close

- The absolute value of the current low less the previous close

The ATR is simply the moving average of the True Range over a specified time period. For example, a more volatile stock will have a higher ATR (e.g., ATR of 4) than a stock experiencing lower level of volatility (e.g., ATR of 2).

3.3.   CAN SLIM

CAN SLIM is a formula created by William J. O'Neil and represents a growth stock investment strategy that combines fundamental and technical analysis. Bill O'Neil is the founder of the Investor's Business Daily (IBD), author of the book "How to Make Money in Stocks" and a highly successful trader whose approach helps both individual and institutional investors improve their returns. CAN SLIM is a checklist for seven common characteristics all great performing stocks have before their major price increase. In the next subsections we will walk you through each part of the CAN SLIM stock selection process.

3.3.1. C: Current Earnings Growth

The first and foremost indicator of a stock's performance has been shown by IBD's research to be the current earnings growth of the company. The "C" rule says that stocks must show a major percentage increase in their current quarterly earnings per share when compared to the same quarter one year ago. The general rule of thumb is the higher the EPS growth, the better. However, those increases should be at least 25% and, preferably, they should be accelerating in at least the three most recent quarters.

3.3.2. A: Annual Earnings Growth

In addition to the strong quarterly earnings results a stock should also show a major and consistent increase in its annual earnings growth for the past three years. A CAN SLIM stock should exhibit at least a 25% increase in its annual earnings per share in each of the last three years. It is considered an even better indication if the return on equity is higher than 17%.

3.3.3. N: New Products, New Services, New Management, New Price Highs

IBD's research shows that all great performing stocks are characterized by a novel event that triggers the major increase in their stock prices. Often that could be a shakeup at the top management level that will change the strategic path the company pursues. This could also be a pioneering product or service that increases the company's market share and improves its competitive advantage. O'Neil's investment strategy views the price of each stock as its quality measure. Thus, stocks reaching new highs have proven their quality and have the best potential to continue climbing up.

3.3.4. S: Supply and Demand

Successful investors understand that any major price movement is subject to the interactions between the market players. Thus, if the demand for a stock is greater than the supply of it, the stock price increases. IBD recommends that investors watch closely the trading volume of the stock as a major change in volume signals that institutional investors are buying or selling. As a stock begins its rising price movement CAN SLIM investors should look for a volume change of at least 50% when compared to the average trading volume over the last 50 days. Similarly, they

should stay alert of any new highs made on a weaker volume, or any new lows made on higher volume indicating institutional selling.

3.3.5. L: Leader or Laggard

IBD's research shows that 37% of a stock's move is directly tied to the performance of the industry the stock is in, and another 12% is due to strength in its overall sector. To find the best stocks investors should look into the top 22% of industry groups. Within those industry groups they should further focus on the leading stocks based on their fundamentals, price movements and market activity. One way to distinguish the end of a bearish market and confirm a new bullish market rally is to see emerging leaders making new highs.

3.3.6. I: Institutional Sponsorship

Institutions such as mutual funds and pension funds are the major market players and only they are capable of propelling a stock to a new high. Because of their enormous power in the marketplace due to their immense holdings investors should keep a close eye on the stocks under their belts. A stock candidate for a major price increase should be owned by at least several institutional sponsors. As a rule of thumb investors should also look for an increasing number of first-class money managers who are accumulating the stock.

3.3.7. M: Market

The market direction is deemed as the most critical indicator for investing by IBD. Studies show that most stocks make their major price gains when the overall market is bullish. 75% of all stocks also tend to move in the same direction as the market – either up or down. In order to gauge the market direction investors should follow closely the market indexes (DJIA, S&P 500, NYSE Composite) and look for

movements signaling market tops or bottoms. An indication of a new uptrend is an attempt at a rally in one of the indexes which then must follow through the fourth to tenth day of the rally with another strong day – a major price advance supported by rising total market volume.

3.3.8. Our CAN SLIM Stock Selection

The backbone of this MQP are the CAN SLIM stocks with their unique fundamental characteristics and price movements. At the beginning of the project we decided to back test all CAN SLIM stocks for the past five years. However, due to software and data crunching limitations imposed by TradeStation we decided to focus on the CAN SLIM stocks for 2007.

In order to back-test all the CAN SLIM stocks from January 1st, 2007 to January 1st, 2008 we created an indicator for the RadarScreen tool within TradeStation which allows us to scan all the NYSE and NASDAQ stocks. A stock needs to meet the following criteria to qualify as a CAN SLIM stock and, thus, suitable for our back-testing:

- Be listed on the NYSE and NASDAQ exchanges
- Have a minimum stock price of $15
- Have at least two quarters in the last year with EPS growth of at least 25%
- Have annual EPS growth for the last two years of more than 20%
- Have ROE greater than 17

We acknowledge that these criteria do not meet the whole checklist of CAN SLIM requirements. However, we do believe that they represent the most critical points of

the CAN SLIM investment strategy and the conclusions from our research are by no means affected by them.

The TradeStation indicator came up with 204 NASDAQ and 358 NYSE stocks that met all the above criteria during that period (See Appendix 11.6). However, when we started testing the trading strategies on them, 3 stocks had to be removed from the list due to data retrieval error, leaving us with a total of 559 CAN SLIM stocks.

3.4.   TradeStation

TradeStation is a trading platform which allows for the formulation of strategies, their back-testing using historical data and automation execution of trades in real-time. (TradeStation About) It is technical analysis software package which uses a built-in proprietary programming language called EasyLanguage to develop numerous technical indicators and strategies. In addition to being a valuable research and testing tool, TradeStation can complete trades with TradeStation Securities acting as the broker.

3.5.   Performance Measurements

3.5.1. Expectunity and System Quality Measurement

Expectunity is a system developed by Van K. Tharp, Ph.D. which conceptualizes the amount one should expect to make on average over many trades per dollar risked. Tharp combines a very simple probability notion, expected value, with technical analysis and psychological concepts to provide traders with quantitative measurements of risk and expected profit (Tharp, 2006).

Below we explain the terminology created and utilized by Van Tharp.

Expectancy: It is simply a combination of the winning/losing probability and the winning/losing payoff of a method.

Opportunity: The frequency at which you will be able to apply your system to obtain its expectation. In other words, it is the number of trades a system will make in a particular unit of time (e.g., a year).

Risk: It is defined as the initial entry price of a stock minus the exit price of the stock that will be realized if the trade moves in a direction opposite of what was predicted (1R). This exit point is designed to help traders protect their capital. If a stock is bought at $50, and the trader decides to sell if it drops to $48, the initial risk is $2 per share; hence 1R is equal to $2.

R-Multiples: A trade's reward/risk ratio. To calculate a trade's R-multiple, divide the number of points captured at the exit of the position by the initial risk.

Expectunity: It is a combination of expectation and opportunity. This combination determines the worth of any trading system or method. Multiplying the expectancy times the opportunity factor provides the concept of expectunity.

Van Tharp's expectunity methodology was later revised and improved by Michael J. Radzicki, Ph.D, Worcester Polytechnic Institute. By adjusting the expectunity with the standard deviation of R-Multiples amongst all trades performed, he created the Systems Quality concept. This concept accounted for the volatility between the trades, providing a fair comparison ground amongst a wide range of strategies.

3.5.2. Monte Carlo Analysis

The Monte Carlo method is a computational technique which generates results based on repeated random sampling. The term "Monte Carlo" is a reference to the famous casino "Monte Carlo" in Monaco where one of the method's founders' uncle would borrow money to gamble. The use of randomness and the repetitive nature of

the process are analogous to the gambling activities happening in the casino. (Investopedia)

Monte Carlo simulation is a method that helps reduce the uncertainty involved in estimating future outcomes. Monte Carlo's characteristics make it useful for applications to complex, non-linear models or in the performance measurement of other models. With Monte Carlo analysis the researcher can estimate the probability of certain outcomes by simulation multiple times using random variables.

When the Monte Carlo technique is used to simulate trading, samples from the list of trades are generated to form a trading sequence. Then, each trading sequence is analyzed, and the results are sorted to determine the probability of each result, with each being assigned a confidence level. With Monte Carlo a trader can determine that, after thousands of different sequences of trades had been analyzed, his return on equity ratio might be 19% with 95% confidence, or in 95% of all cases. Thus, Monte Carlo allows the trader to see what could have happened if the trading sequence was randomized and the ROE calculated for each one of them. (Bryant)

In our MQP the performance measurements we focus on by using Monte Carlo are profit factor, worst case drawdown and the return to drawdown ratio. The first one is calculated by gross profit by gross loss. It can also be interpreted as the number of dollars made for every dollar lost.

Drawdown is defined as a percentage retracement in equity from a peak to trough prior to a new equity high being made. The worst case drawdown measures the amount of money required to survive the largest equity dip during the back-testing period. Drawdowns can be easily spotted in equity curves graphs which show the value of a trading account graphed over a period of time. A drawdown is identified by looking from the highest peaks to the lowest peaks moving forward. The return on drawdown ratio determines which strategy has the highest returns while enduring

the least amount of volatility. A higher ratio is generally better because it means that the strategy receives a higher return relative to risk.

4. Complete Trading Strategies

In the opening paragraph we stated that along with the important contributions this MQP makes to the academic research on trading, we also target individual investors who are willing to challenge their principles to achieve higher returns and peace of mind. We believe that the only way to consistently compare different approaches of trading CAN SLIM stocks is to develop complete trading strategies. The characteristics and principles embedded in a complete trading strategy allow for the collection and analysis of measurable data and their interpretation to form conclusive suggestions to our audience as to how to invest in CAN SLIM stocks.

Complete trading strategies provide us with insight into many areas but more importantly they do not allow us to confuse ourselves and limit our performance by making decisions we are neither intellectually nor psychologically capable of doing. Many people believe that trading is all about predicting where the market is going and being right all the time. In reality, the market is comprised of thousands of individuals taking positions every second so it is delusional, useless and expensive to think that you can time its direction or understand its workings. An obvious question arises: "If I cannot predict the market, does that mean I cannot outperform it and I should simply invest in a mutual fund getting the average return of S&P 500?" The answer is short: No. A guru of trading Charlie Wright, whose book "Trading as a Business" we refer to numerous times in this MQP, argues that successful traders make money because they do not predict the market but rather trade it correctly. The latter is achieved by following sound trading rules which have nothing to do with predicting the market. (Wright, 1998)

In order to be profitable in the long-run trading requires a disciplined approach to developing a complete trading strategy by following proper trading principles. In our MQP these take the form of five steps:

1. Set-up: Decide under what conditions you will enter the market

2. Entry: Decide how exactly you will enter the market

3. Exit with a profit: Decide how to exit the market and take your profits

4. Exit with a loss (Money Management Stop): Decide how much you are willing to lose at each trade

5. Cash Management: Decide how much of your capital to allocate to each position

Due to the complexity of creating an algorithm for implementing money management using TradeStation, we do not use this aspect of the complete trading strategy in our MQP. We focus on comparing the set-up while keeping the entry, the exit with a profit and the money management stops constant. In the next five subsections we will walk you through the details of each one of these rules for successful trading.

4.1.   Set-up

The set-up is a condition or a set of conditions which are required to hold true before considering taking a position in the market. The set-up does not get you in the market, it is not used to purchase or sell a position. Examples of set-ups include:

- A longer moving average crossing above a shorter moving average

- Price moving above a moving average

- Price being at the highest high of a certain time period

Charlie Wright argues that any indicator could be used as the set-up in a profitable strategy. There can be an infinite number of set-ups as they are limited only by your imagination. The set-up only prepares you to get you in the market; it neither gets you long or short nor does it determine your profits or losses. It is the interaction between the set-up and the entry that makes your strategy more precise in executing its trades, and, ultimately, more profitable. (Wright, 1998)

4.2.   Entry

Once the set-up rules have been met, the signal by which the strategy gets you in the market is called the entry. There are two rules to which an entry should adhere:

1. The direction of the price should follow the direction expected by the set-up
2. The entry should be designed to capture all the price movements it was intended for

The first rule states that if the set-up alerts you that a long position is being made, the direction of the price should confirm it, that is, go up. Thus, our entry confirms the buy signal given by the set-up and only then gets us in the market.

The second rule makes sure that our entry catches all of the price movements that it was designed for. This rule will be violated if, for example, the entry misses a big price move. Thus, the entry used must be customized to meet the specifics of your strategy.

Examples of buy entries are:

- A buy stop order above the current bar's high
- Buy at market after a close over the previous bar's high

The first example uses a stop order which states that if the market should move above a certain specified price you are stopped into a position. The second example

gets you at the market determined price but only if the close is higher than the previous bar's high.

4.3.   Exit with a profit

In this MQP we use the concept of a set-up and entry to take a position in the market. In order to take profits at a predetermined price level, or based on certain market conditions, various exit strategies can be used. These are used with a profit objective and are not targeted at protecting your initial capital. The latter is achieved by your money management stops, which we will talk about more in the next subsection. Exits with a profit are based on certain market activity and should be used only to get you out of the market if specific market conditions are met. Examples of exits with a profit are:

- A tightening exit which gets you (say) 50% out of your position when profits reach 50%, then another 25% when profits reach 75% and the rest 25% when profits reach 100%

- A trailing Average True Range hanging from the highest point after the entry date

In the first example the strategy exits the position and takes profits at predetermined profit levels. In the second example the strategy generates an order to exit the position at the highest price since the entry of the trade less the ATR value. This stop value moves up (trails) as the trade progresses. The second example is the actual exit with a profit that we use in our MQP and it stays constant across all tests.

4.4.   Exit with a loss (Money management stop)

Money management stops are used for only one purpose – to protect your initial equity. They represent the maximum amount the trader is willing to risk at the beginning of the trade. Usually, the money management stops are a simple dollar figure or a percent of the capital. However, to account for the volatility across financial instruments they can also be based on technical indicators such as the ATR. For example, a money management stop exits the position if the stock reaches a calculated using the ATR dollar amount below the current bar's closing price. This order is only used for the bar of entry to protect against an initial reversal.

4.5.   Money Management

A complete trading strategy is finalized by the concept of money management which deals with position sizing and risk control. This technique determines how much of your equity you allocate to each trade and how you diversify your portfolio amongst various investment instruments. The size of the trade and the subsequent addition to it at the right time are crucial for the development of a successful and profitable strategy. For example, skilled traders manage their money to benefit from the market moves. They pyramid up when the market moves in their favor and use their accumulated profits to add to their position without risking their initial capital. This is the most intricate part of a complete trading strategy and is deemed by many as the one that can give you a market edge. Due to the same reason, it is also very complicated one to code and requires extensive back-testing.

5. Back-Testing using TradeStation

5.1. Overview of the Back-Testing Procedure

Back-testing is an integral part of developing an effective trading strategy. In back-testing traders apply their strategies to historical data and check how they would have performed in those past market conditions. The results obtained can be studied to evaluate the strategy's efficiency and performance. Traders can also optimize their strategies, determine the flaws, and gain confidence in their strategy before applying it to the real markets.

Back-testing assumes that a system's past statistical character is a good indicator of its future statistical character, hence any strategy that worked well in the past is likely to work well in the future, and conversely, any strategy that performed poorly in the past is likely to perform poorly in the future. In order not to be misguided by back-testing results, it is advisable to test the strategy across various time frames and under different market conditions. Even though a strategy yields positive results in a bull market, the results might be completely different in a bear or a sideways market. It is often a good idea to back-test over a long time frame that encompasses several different types of market conditions.

As mentioned before, we chose to trade the 559 CAN SLIM Stocks of 2007 on a daily basis. In order to retrieve comparable results for the five set-ups in our back-testing procedure, we assume ceteris paribus, keeping all the other aspects of a complete trading strategy constant.

When back-testing the six possible trading strategies we determined, we alternated our set-up between moving average crossover, Bollinger bands, Keltner channel, Donchian channel 20-day and 55-day, and volume breakouts.

We chose "Buy stop order one tick above the current bar's high" as our entry, which essentially places a buy stop order once the price reaches one tick higher than what was confirmed by the set-up.

A Trailing Average True Range serves as our exit with a profit, where a 3-ATR limit was hanging from the highest point in the stock's price movement. A 3-ATR resistance was also set to the price of the stock at the day of entry, which was geared towards protecting our initial capital from a potential wrong buy signal. In order to effectively utilize the back-testing results we retrieve, all the open positions are closed on the last trading day of 2007. The strategies we apply in TradeStation also require data since October 18th, 2006, however, the period in which we start trading is January 1st, 2007.

5.2. Moving Average Crossover

The moving average is a trend following indicator that is commonly used in technical analysis. It shows the average value of a stock's price over a pre-determined time period. By smoothening data series, it makes it easier to recognize trends, measure momentum and define areas of possible support and resistance. Two arithmetic averages of the same asset price are calculated based on two length inputs specified by traders.

The most common utilization of moving averages it to build a trading strategy based on moving average crossovers. This strategy will use two moving averages, and will provide a buy signal when the short-term average advances above the long-term average.

An upward trend is said to occur when a short-term average crosses above a longer-term average, yielding a buy signal. Similarly, a downward trend said to occur

when a short-term average crosses below a long-term average, resulting in a sell or sell-short signal.

In our MQP we look at the intersection of two moving averages, a 9-day and an 18-day. When the 9-day moving average crosses over the 18-day moving average, we interpret is as a buy signal. Conversely, a sell signal is interpreted when the reverse crossover occurs.

5.3.   Bollinger Bands

Developed by John Bollinger, Bollinger bands are an indicator that allows traders to compare volatility and relative price levels over a period time. It is a technique that uses moving averages with two trading bands and simply adds and subtracts a standard deviation calculation from the moving average. Many traders use them primarily to determine overbought and oversold levels. The indicator consists of three bands designed to cover the majority of a stock's behavior:

1. A simple moving average in the middle

2. An upper band (Simple moving average plus 2 standard deviations)

3. A lower band (Simple moving average minus 2 standard deviations)

Standard deviation is a mathematical formula that measures volatility, showing how the stock price can be spread around its actual value. Sharp price increases or decreases, and hence volatility, will lead to a widening and, respectively, contracting of the bands. At times of low volatility, when the bands are tightened, Bollinger Bands do not give any hints of a stock's behavior. Bollinger recommends using a 20-day simple moving average for the center band and 2 standard deviations for the outer bands.

Alone, Bollinger bands serve two primary functions: identify periods of high and low volatility and recognize when prices are at extreme, and possibly unsustainable, levels. Although these functions indicate buy or sell signals, the pattern is not geared towards determining the price behavior of a stock. Other technical analysis tools are recommended to help determine the direction of a potential breakout.

When using this chart pattern, bands are designated as price targets. If the price deflects off the lower band and crosses above the 20-day simple moving average the upper band comes to represent the upper price target. In a strong uptrend, prices usually fluctuate between the upper band and the 20-day simple moving average. In such a trend, crossing below the 20-day simple moving average initiates a sell signal. When the stock price recurrently strikes the upper Bollinger Band, the price is thought to be overbought. Likewise, when the price strikes the lower band, it is thought to be oversold, and a buy signal would kick in.

5.4.   Keltner Channel

Chester W. Keltner introduced and developed the Keltner Channels in his book "How to Make Money in Commodities" (Staff). Simply, Keltner Channels are three moving average bands:

1. The middle line represents the moving average of the closing price of the asset

2. The upper channel represents the average of the high asset price, calculated over a 10-day period (1.5 Average True Ranges above the moving average)

3.   The lower channel represents the average of the low asset price calculated over a 10-day period (1.5 Average True Ranges below the moving average)

When the stock price is approaching the lower channel the market is considered oversold, which should indicate a buy signal to traders. Similarly, when the stock price is closer to the upper channel the market is considered overbought, indicating a sell signal.

5.5. Volume Breakout

The volume of an asset represents the number of shares or contracts traded in the market during a given period of time, as a measure of activity. In technical analysis, the volume indicator serves a heavy role in determining the worth of a market move. A higher volume increases the significance of any price movements. Trading activity also relates to the liquidity of a stock, so a higher volume also indicates that the security can be easily traded.

The volume breakout strategy plots current daily trading volume of the security against the 10-day average daily volume. In our MQP, a buy signal is interpreted when the former exceeds the latter by at least 50%, as suggested by William O'Neal's CAN SLIM methodology.

5.6. Donchian Channel 20-Day and 55-Day

Donchian channels are price channels designed to work well with trend-following systems. This simple breakout system is developed by Richard Donchian, considered to be the father of successful trend following (Lee). It plots the highest high and lowest low over the last X time period intervals. The signals derived from this system are based on the following basic rules:

- Buy/ Buy to cover when prices penetrate and close above the upper channel

- Sell/Sell short when prices penetrate and close below the lower channel

The Donchian channel strategy aims at initiating a position at the beginning of a new trend through the penetration of either the upper or the lower channel. The theory behind this study states that if the current price manages to exceed the range's high propped up by enough momentum, then a new high, signaling an uptrend, will be established. Conversely, price crossing below the range's low indicates a new downtrend.

In our MQP we test two time intervals using the Donchian channels – a 20-day and a 55-day time period. The shorter-term system is expected to generate more trades but also to catch the breakouts earlier while the longer-term system is expected to be "smoother" – have less trades but with a higher percentage of winners.

6. Results Attained from Back-testing

In this section we exhibit the results of our back-testing for the different strategies. At first we present the settings for each strategy then we provide screen shots to only three of the stocks we tested; AAPL: Apple Inc. (NASDAQ), MTL: Mechel OAO (NYSE) and RIMM: Research in Motion Limited (NASDAQ). However, we only provide explanatory comments about the performance of each strategy on AAPL to avoid repetitive remarks. We also present the results for each strategy based on the Monte Carlo simulation and the system quality calculations which we discuss in Section 7.

6.1. Bollinger Bands

6.1.1. TradeStation Settings

TradeStationChart Settings	
Interval	Daily
Start Date/Time	10/18/2006 16:00
End Date/Time	1/2/2008 16:00
TradeStation Strategies Applied	
BBands+ATR(On)	
TradeStation Strategy Inputs	
Description	Value
BBands+ATR – Bollinger Price	Close
BBands+ATR – Test Price Long Band	Close
BBands+ATR – Days Back	20
BBands+ATR – No. of Standard Deviation	2
BBands+ATR – ATR Days Back	10
BBands+ATR – No. of ATRs	3
BBands+ATR – Initial Stop ATRs	5
BBands+ATR – Initial Stop ATR Days Back	2
TradeStation Strategy Settings	
Initial Capital	$100.00
Commission (per Trade)	$0.00
Slippage (per Trade)	$0.00
Interest Rate	0.00%

Table 1 - TradeStation Settings for Bollinger Bands

6.1.2. AAPL: Apple Inc. (NASDAQ)
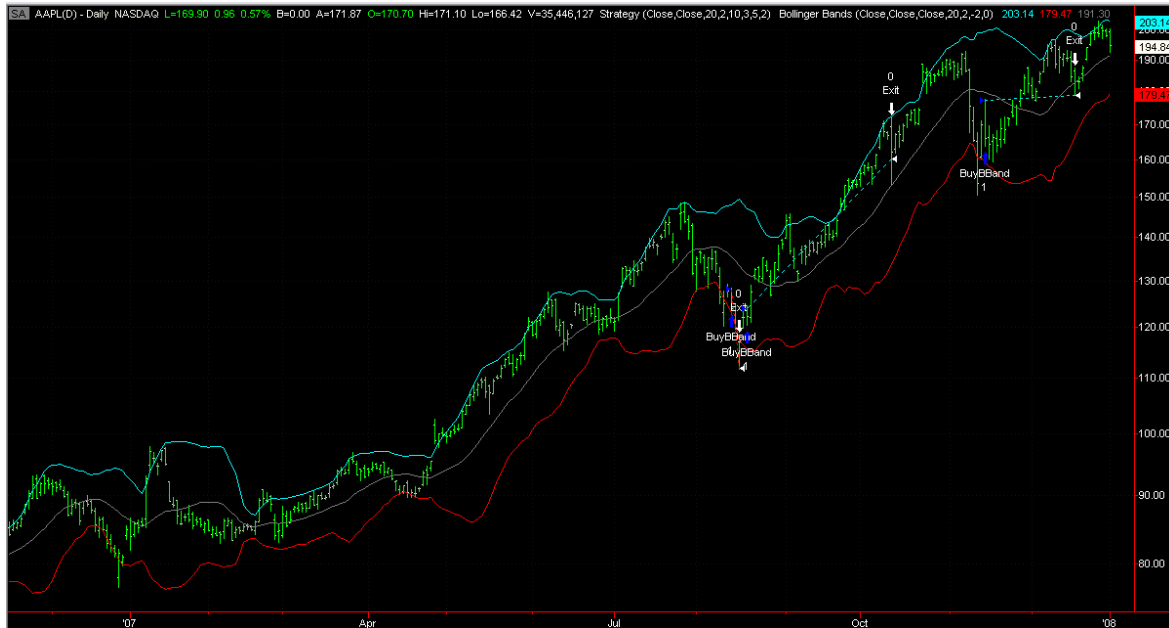
Figure 2- Trades Generated by Bollinger Bands, AAPL

The above figure shows the performance of the Bollinger bands strategy over the trading period. The blue line is the upper Bollinger band, the gray line is the moving average and the red line is the lower Bollinger band. The "BuyBBand" label shows when the strategy takes a long position and the label "Exit" is our exit with a profit based on an ATR value. The Bollinger bands capture only the uptrend starting in late August and miss the big move from the beginning of 2007. The exit also gets us prematurely out of the position. Overall, as we will later see from the performance measures, this strategy does not work well with CAN SLIM stocks.

6.1.3. MTL: Mechel OAO (NYSE)
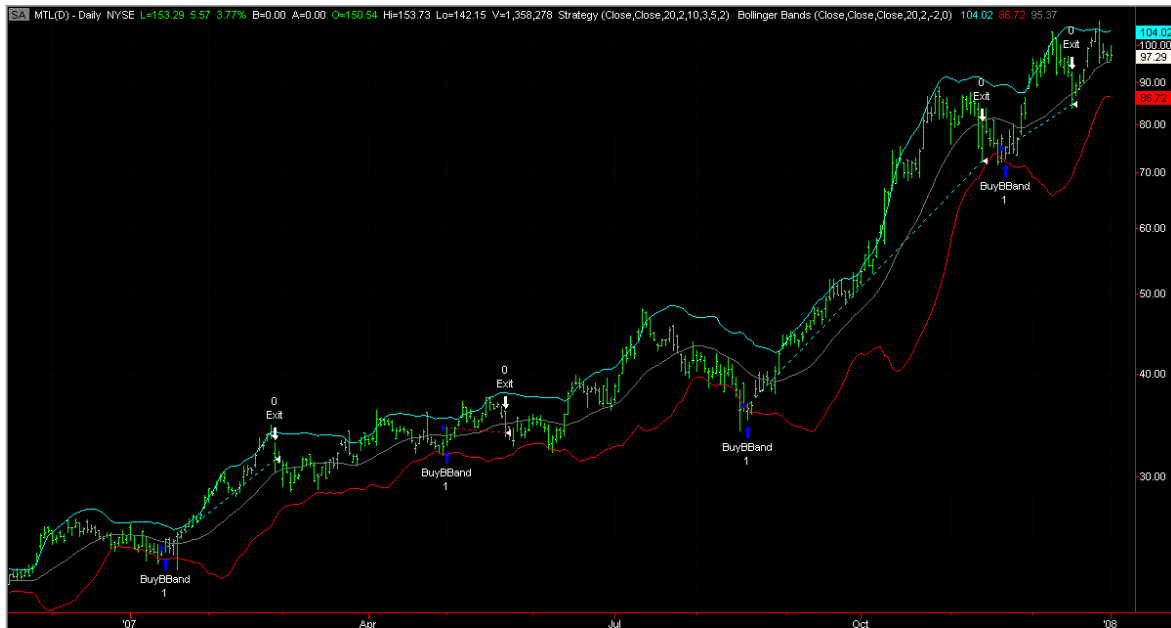
Figure 3 - Trades Generated by Bollinger Bands, MTL

6.1.4. RIMM: Research in Motion Limited (NASDAQ)
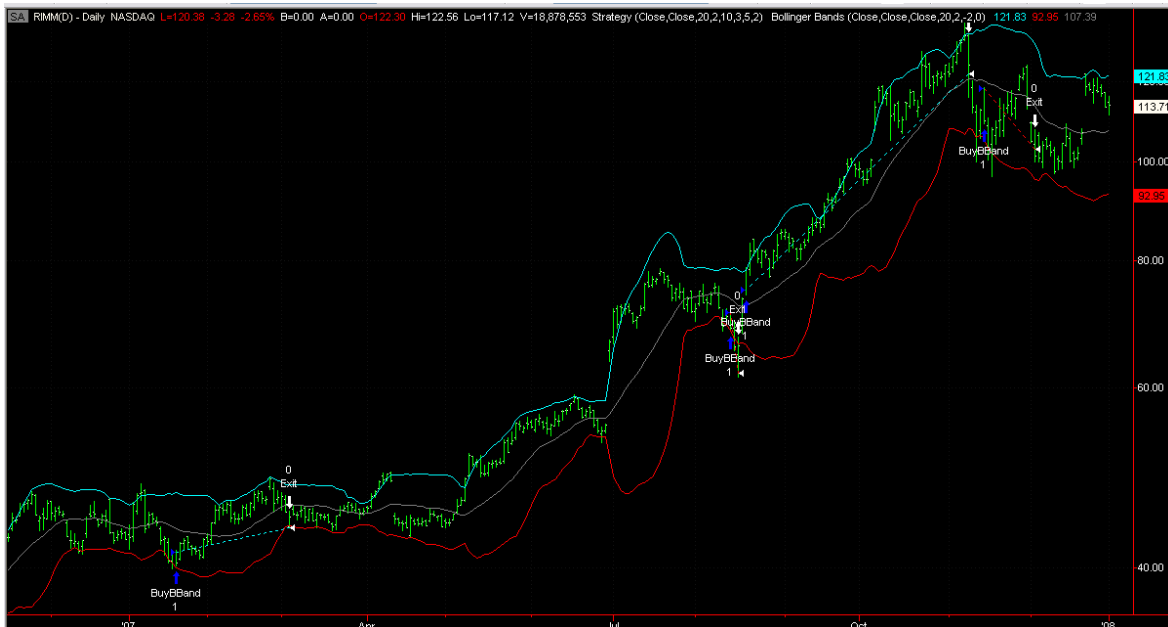
Figure 4 - Trades Generated by Bollinger Bands, RIMM

6.1.5. Equity Curve
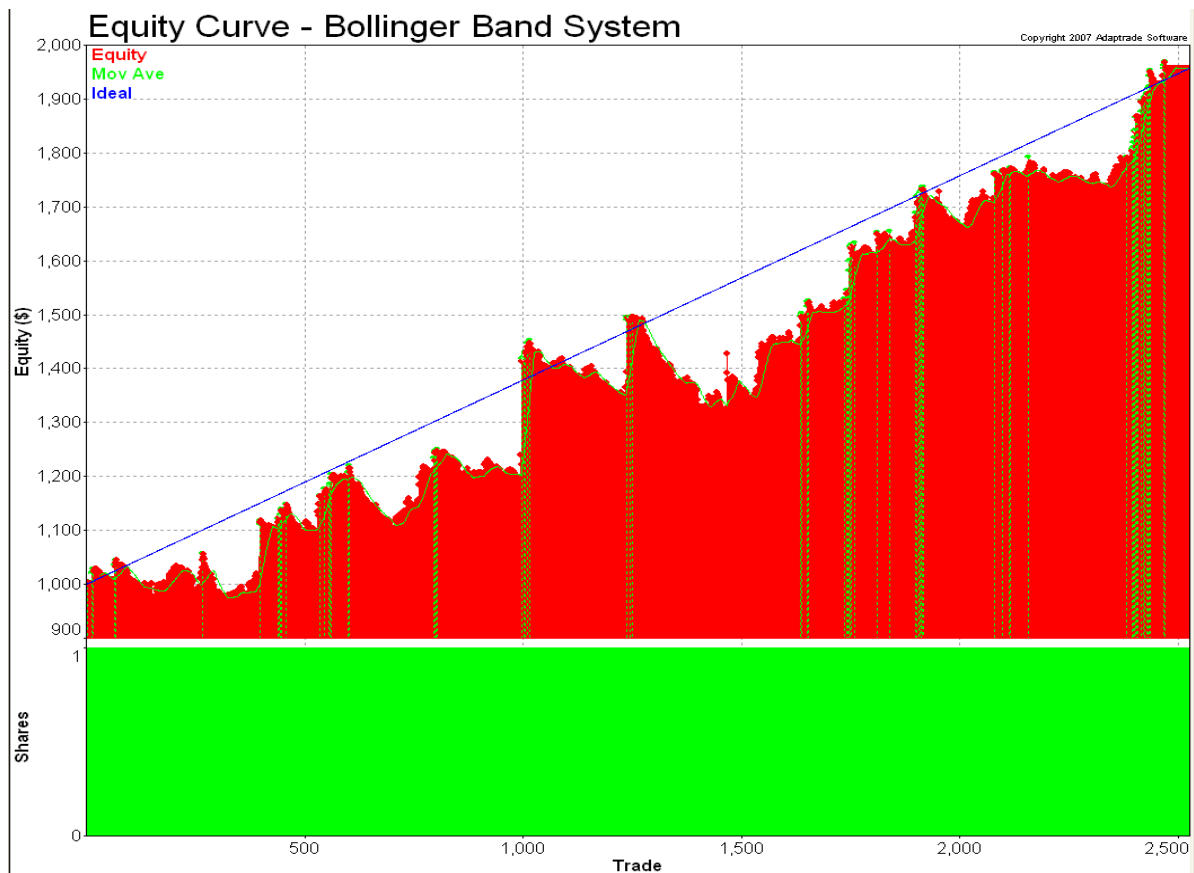
Figure 5 - Equity Curve Generated by Bollinger Bands

The Bollinger bands strategy generated 2749 trades for the 559 CAN SLIM stocks. The above equity curve based on all these trades shows the status of the trading account throughout the trading period. It can be observed that the Bollinger bands subjects the trader to huge drawdowns. Thus, the trader needs to be able to psychologically endure the pain associated with such losses in equity in order to trade this strategy.

6.1.6. Monte Carlo Simulation Results at a 95% Confidence

Monte Carlo Results at 95.00% Confidence _____

Total Net Profit: $957.00

Final Account Equity: $1,957.00

Return on Starting Equity: 95.70%

Profit Factor: 1.227

Largest Winning Trade: $196.87

Largest Winnning Trade (%): 11.02%

Average Winning Trade: $5.12

Average Winning Trade (%): 0.327%

Average Trade: $0.38

Average Trade (%): 0.0280%

Trade Standard Deviation: $8.00

Trade Standard Deviation (%): 0.664%

Worst Case Drawdown: ($283.16)

Worst Case Drawdown (%): 20.48%

Average Drawdown: ($23.52)

Average Drawdown (%): 1.654%

Max Number of Shares: 1

Minimum Number of Shares: 1

Average Number of Shares: 1

Largest Losing Trade: ($37.95)

Largest Losing Trade (%): -3.850%

Average Losing Trade: ($2.79)

Average Losing Trade (%): -0.229%

Win/Loss Ratio: 1.837

Win/Loss Ratio (%/%): 1.811

Return/Drawdown Ratio: 4.672

Modified Sharpe Ratio: 0.0433

Figure 6 - Monte Carlo Results of Bollinger Bands at a 95% Confidence

6.1.7. Raw System Quality Results

Complete Statistics	
Sum of R	**332.5405554**
Number of Trades	**2478**
Expected Value	0.386198547
Expectancy	0.134197157
Expectunity	332.5405554
Std Dev R	2.805904487
E / StdDev	0.047826702
Study Days	365
Opportunities	2478
System Quality	**118.514567**
Percentage of Winning Trades	0.407990315
Percentage of Losing Trades	0.591606134
Average Winning Trade	5.119604352
Average Losing Trade	2.877844475

Table 2- System Quality Results for Bollinger Bands

6.2.   Volume Breakout

6.2.1. TradeStation Settings

TradeStationChart Settings	
Interval	Daily
Start Date/Time	10/18/2006 16:00
End Date/Time	1/2/2008 16:00
TradeStation Strategies Applied	
Volume + ATR + MMS(On)	
TradeStation Strategy Inputs	
Description	Value
Volume + ATR + MMS - ATR Days Back	10
Volume + ATR + MMS – No. of ATRs	3
Volume + ATR + MMS – Initial Stop ATRs	10
Volume + ATR + MMS – Initial Stop ATR Days Back	3
Volume + ATR + MMS – Holding Period	5
Volume + ATR + MMS – Avg. Days Back	10
Volume + ATR + MMS – Breakout Percentage	50
TradeStation Strategy Settings	
Initial Capital	$100.00
Commission (per Trade)	$0.00
Slippage (per Trade)	$0.00
Interest Rate	0.00%

Table 3 - TradeStation Settings for Volume Breakout

6.2.2. AAPL: Apple Inc. (NASDAQ)
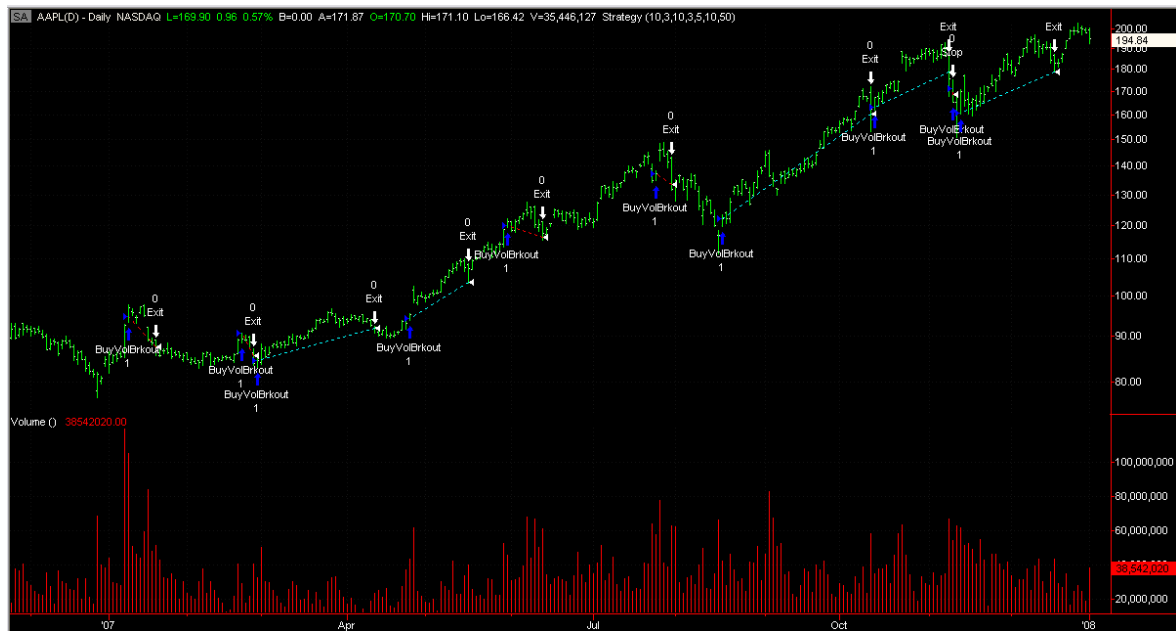
Figure 7 - Trades Generated by Volume Breakout, AAPL

The above figure shows the performance of the volume breakouts strategy on AAPL. The red bars on the bottom of the graph represent the volume activity for that day. You can see that the "BuyVolBrkout" labels correlate highly with the spikes in their respective volume bars. This strategy generates a lot of trades and catches almost all of the uptrend.

6.2.3. MTL: Mechel OAO (NYSE)
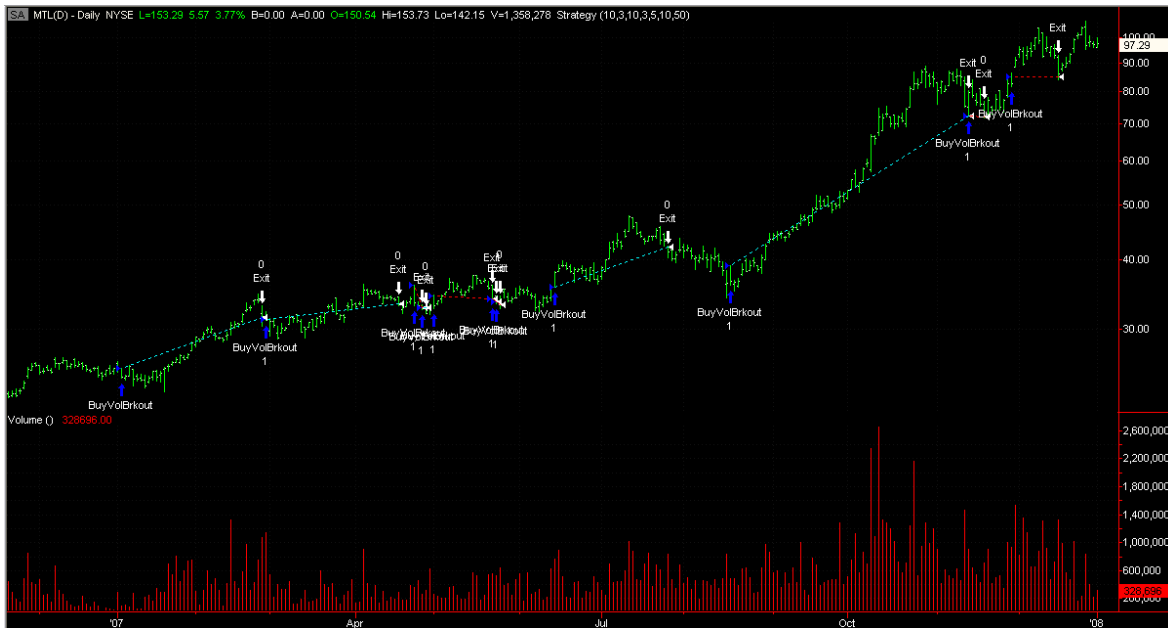

Figure 8 - Trades Generated by Volume Breakout, MTL

6.2.4. RIMM: Research in Motion Limited (NASDAQ)
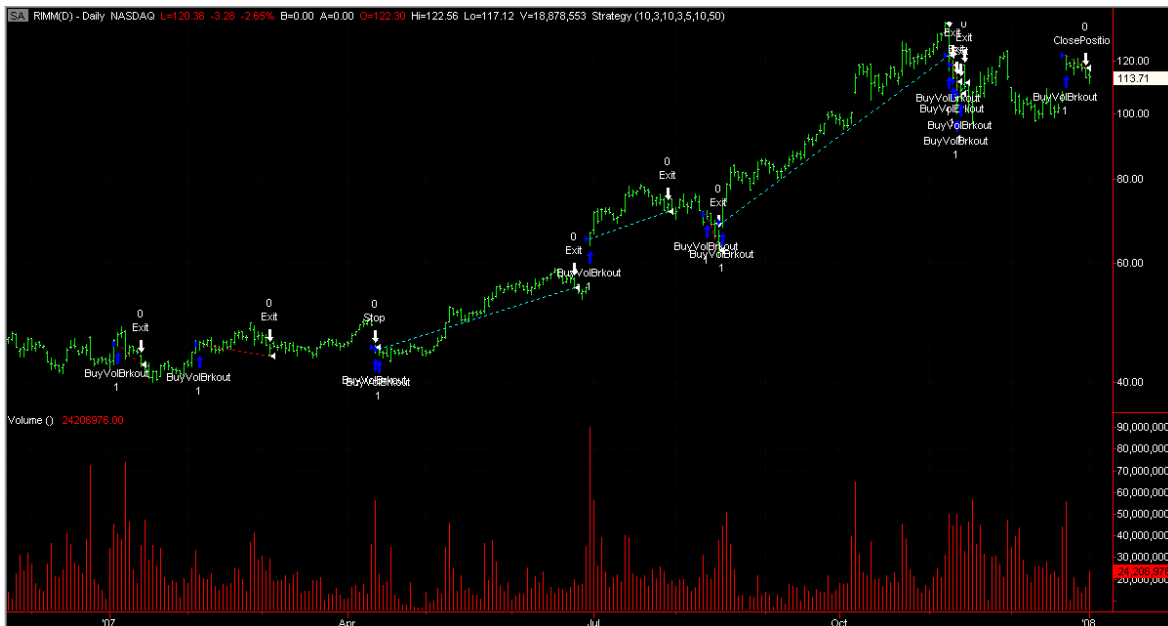
Figure 9 - Trades Generated by Volume Breakout, RIMM

6.2.5. Equity Curve
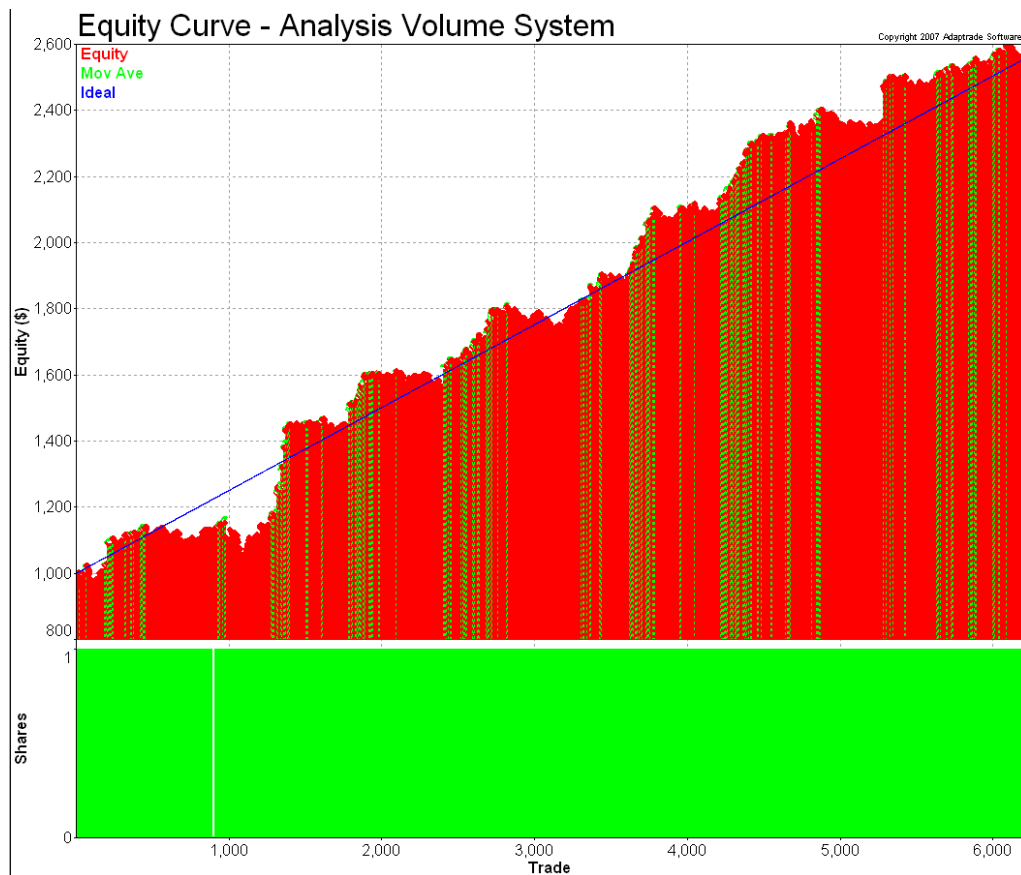
Figure 10 - Equity Curve Generated by Volume Breakout

As the equity curve shows, the volume breakout strategy is easy to psychologically trade as the trader does not have to undergo severe drawdowns.

6.2.6. Monte Carlo Simulation Results at a 95% Confidence

Monte Carlo Results at 95.00% Confidence _____

Total Net Profit: $1,316.00	Max Number of Shares: 1
Final Account Equity: $2,316.00	Minimum Number of Shares: 1
Return on Starting Equity: 131.6%	Average Number of Shares: 1
Profit Factor: 1.308	

Largest Winning Trade: $81.32	Largest Losing Trade: ($46.99)
Largest Winnning Trade (%): 4.454%	Largest Losing Trade (%): -4.050%
Average Winning Trade: $3.95	Average Losing Trade: ($2.20)
Average Winning Trade (%): 0.213%	Average Losing Trade (%): -0.145%

Average Trade: $0.39	Win/Loss Ratio: 1.839
Average Trade (%): 0.0253%	Win/Loss Ratio (%/%): 1.838
Trade Standard Deviation: $6.90	
Trade Standard Deviation (%): 0.426%	

Worst Case Drawdown: ($170.60)	Return/Drawdown Ratio: 13.05
Worst Case Drawdown (%): 11.53%	Modified Sharpe Ratio: 0.0660
Average Drawdown: ($12.65)	
Average Drawdown (%): 0.781%	

Figure 11 - Monte Carlo Simulations Results for Volume Breakout at a 95% Confidence

6.2.7. Raw System Quality Results

Complete Statistics	
Sum of R	1473.593967
Number of Trades	6200
Expected Value	0.067616218
Expectancy	0.237676446
Expectunity	1473.593967
Std Dev R	2.900757002
E / StdDev	0.081936007
Study Days	365
Opportunities	6200
System Quality	508.0032438
Percentage of Winning Trades	0.416612903
Percentage of Losing Trades	0.568870968
Average Winning Trade	4.396662795
Average Losing Trade	3.101037553

Table 4 - System Quality Results for Volume Breakout

6.3.   Moving Average Crossover

6.3.1. TradeStation Settings

TradeStationChart Settings	
Interval	Daily
Start Date/Time	10/18/2006 16:00
End Date/Time	1/2/2008 16:00
TradeStation Strategies Applied	
MAC + ATR(On)	
TradeStation Strategy Inputs	
Description	Value
MAC + ATR - Price	Close
MAC + ATR – Fast Days Back	9
MAC + ATR – Slow Days Back	18
MAC + ATR - Displace	0
MAC + ATR – ATR Days Back	10
MAC + ATR – No. ATRs	3
MAC + ATR – Initial Stop ATRs	10
MAC + ATR – Initial Stop ATR Back	3
TradeStation Strategy Settings	
Initial Capital	$100.00
Commission (per Trade)	$0.00
Slippage (per Trade)	$0.00
Interest Rate	0.00%

Table 5 TradeStation Settings for Moving Average Crossover

6.3.2. AAPL: Apple Inc. (NASDAQ)
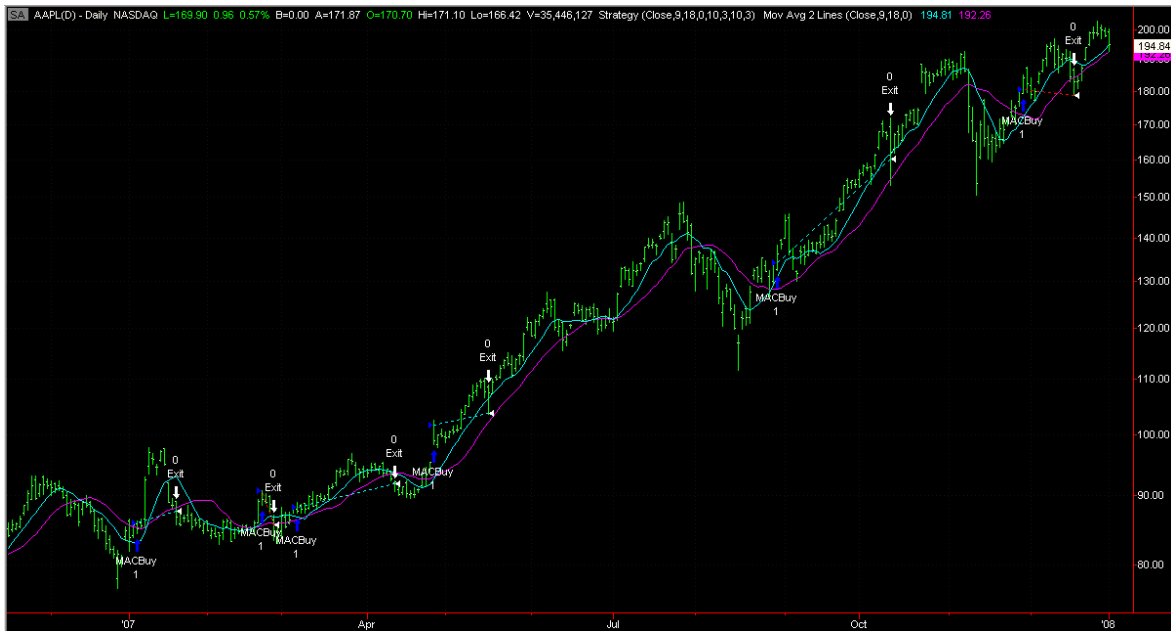
Figure 12 - Trades Generated by Moving Average Crossover, AAPL

The above graph shows the performance of the moving average crossover strategy on AAPL. The cyan line represents the fast moving average and the purple line represents the slow moving average. The strategy does not enter the market on every crossover due to the limitations imposed by the entry.

6.3.3. MTL: Mechel OAO (NYSE)
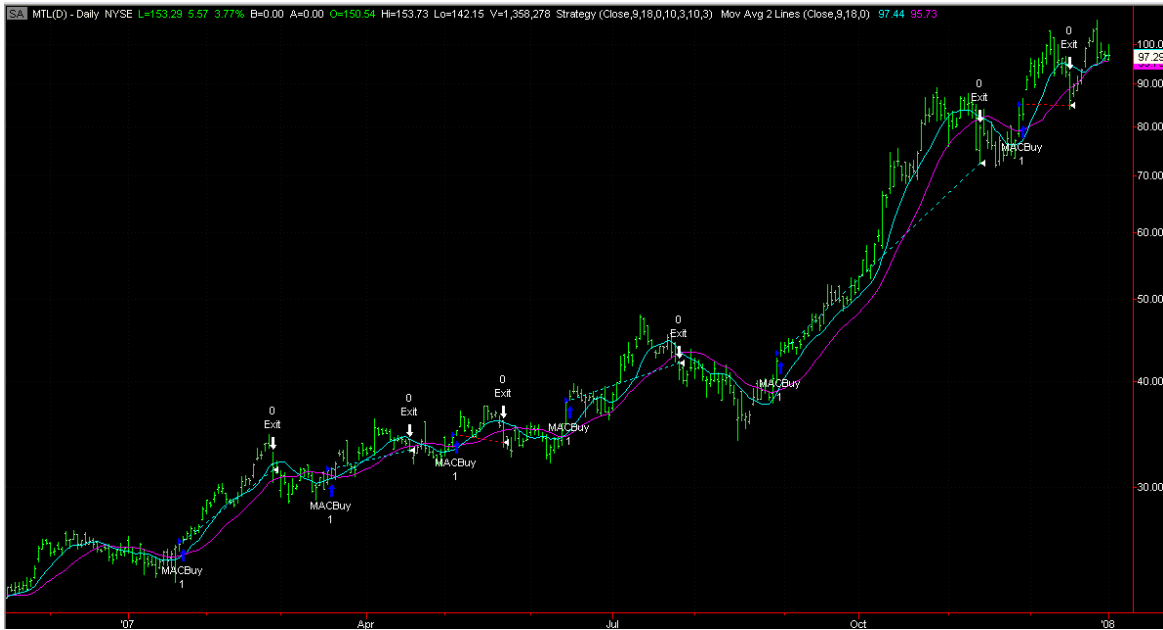
Figure 13 – Trades Generated by Moving Average Crossover, MTL

6.3.4. RIMM: Research in Motion Limited (NASDAQ)
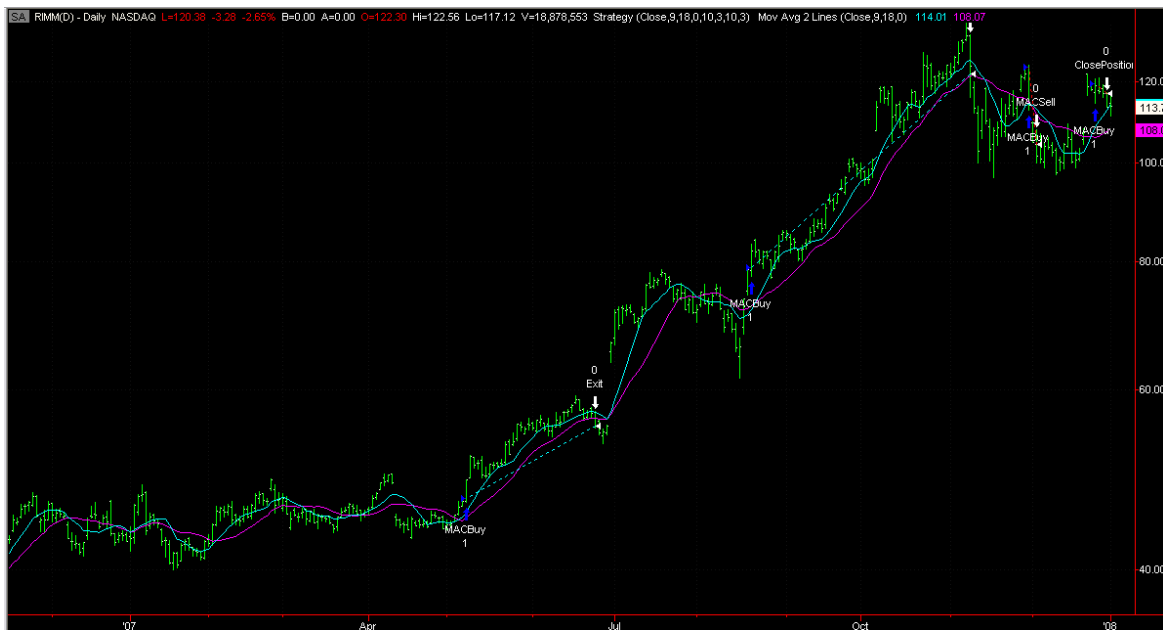
Figure 14 - Trades Generated by Moving Average Crossover, RIMM

6.3.5. Equity Curve
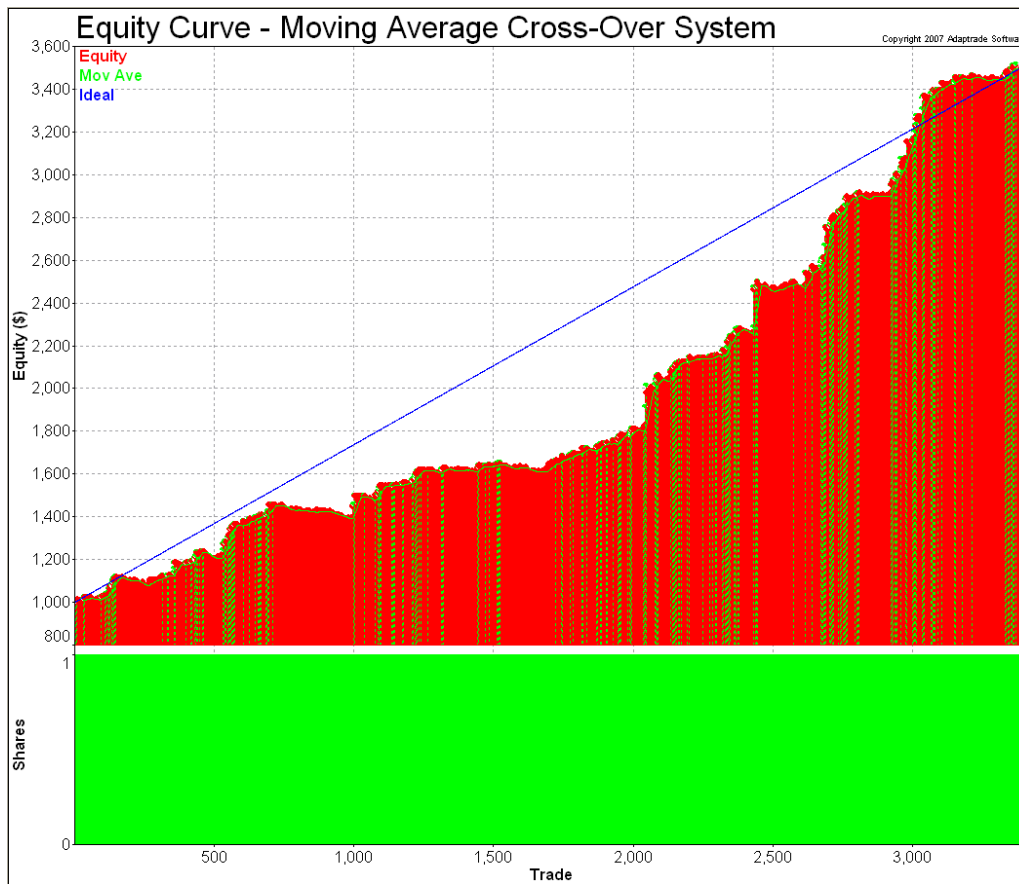
Figure 15 - Equity Curve Generated by Moving Average Crossover

The moving average crossover strategy generates 3414 trades throughout 2007, with an expected profit of $0.74 per trade. Traders who choose this strategy will experience a profit of 252%, however the equity curve shows us that this will not happen uniformly.

6.3.6. Monte Carlo Simulation Results at a 95% Confidence

Monte Carlo Results at 95.00% Confidence _____

Total Net Profit: $2,519.38	Max Number of Shares: 1
Final Account Equity: $3,519.38	Minimum Number of Shares: 1
Return on Starting Equity: 251.9%	Average Number of Shares: 1
Profit Factor: 1.663	

Largest Winning Trade: $184.69	Largest Losing Trade: ($36.95)
Largest Winnning Trade (%): 6.174%	Largest Losing Trade (%): -3.561%
Average Winning Trade: $4.72	Average Losing Trade: ($1.83)
Average Winning Trade (%): 0.224%	Average Losing Trade (%): -0.102%

Average Trade: $0.74	Win/Loss Ratio: 2.575
Average Trade (%): 0.0374%	Win/Loss Ratio (%/%): 2.487
Trade Standard Deviation: $6.79	
Trade Standard Deviation (%): 0.424%	

Worst Case Drawdown: ($121.43)	Return/Drawdown Ratio: 30.91
Worst Case Drawdown (%): 8.150%	Modified Sharpe Ratio: 0.0889
Average Drawdown: ($9.37)	
Average Drawdown (%): 0.483%	

Figure 16 - Monte Carlo Simulation Results for Moving Average Crossover at a 95% Confidence

6.3.7. Raw System Quality Results

Complete Statistics	
Sum R	**1361.049776**
Number of Trades	**3414**
Expected Value	0.737955477
Expectancy	0.398667187
Expectunity	1361.049776
Std Dev R	3.667327188
E / StdDev	0.108707832
Study Days	365
Opportunities	3414
System Quality	**371.1285375**
Percent Winning Trades	0.392501465
Percent Losing Trades	0.601640305
Average Winning Trade	4.7175
Average Losing Trade	1.851056475

Table 6 - System Quality Results for Moving Average Crossover

6.4. Keltner Channel

6.4.1. TradeStation Settings

TradeStationChart Settings	
Interval	Daily
Start Date/Time	10/18/2006 16:00
End Date/Time	1/2/2008 16:00
TradeStation Strategies Applied	
Keltner Buy + Sell(On)	
TradeStation Strategy Inputs	
Description	Value
Keltner Buy + Sell - Price	Close
Keltner Buy + Sell - Days Back	20
Keltner Buy + Sell - No. of ATRs Keltner	1.5
Keltner Buy + Sell - ATR Days Back	10
Keltner Buy + Sell - No. of ATRs	3
Keltner Buy + Sell - Initial Stop ATR Days Back	10
Keltner Buy + Sell - Initial Stop ATRs	3
TradeStation Strategy Settings	
Initial Capital (per Trade)	$100.00
Commission (per Trade)	$0.00
Slippage	$0.00
Interest Rate	0.00%

Table 7 - TradeStation Settings for Keltner Channel

6.4.2. AAPL: Apple Inc. (NASDAQ)
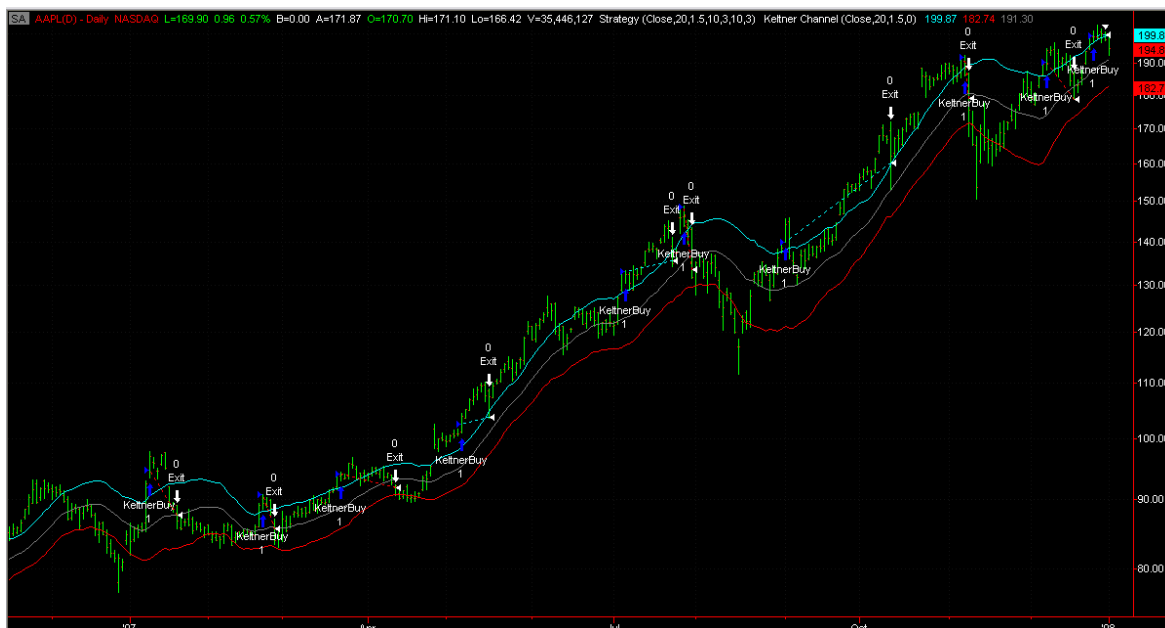
Figure 17 - Trades Generated by Keltner Channel, AAPL

The above figure shows the performance of the Keltner Channel strategy over the trading period. The blue line is the upper Keltner Channel, the gray line is the moving average and the red line is the lower Keltner Channel. The "KeltnerBuy" labels indicate when traders should take a long position in the market, whereas the "Exit" labels where the Keltners indicate a yield signal. Although the Keltner Channel strategy generates quite a few trades, we cannot exactly call it a successful strategy since it misses the majority of the breakouts. We receive false buy signals, but our exits are agile enough to get us out of the trade with minimum losses.

6.4.3. MTL: Mechel OAO (NYSE)
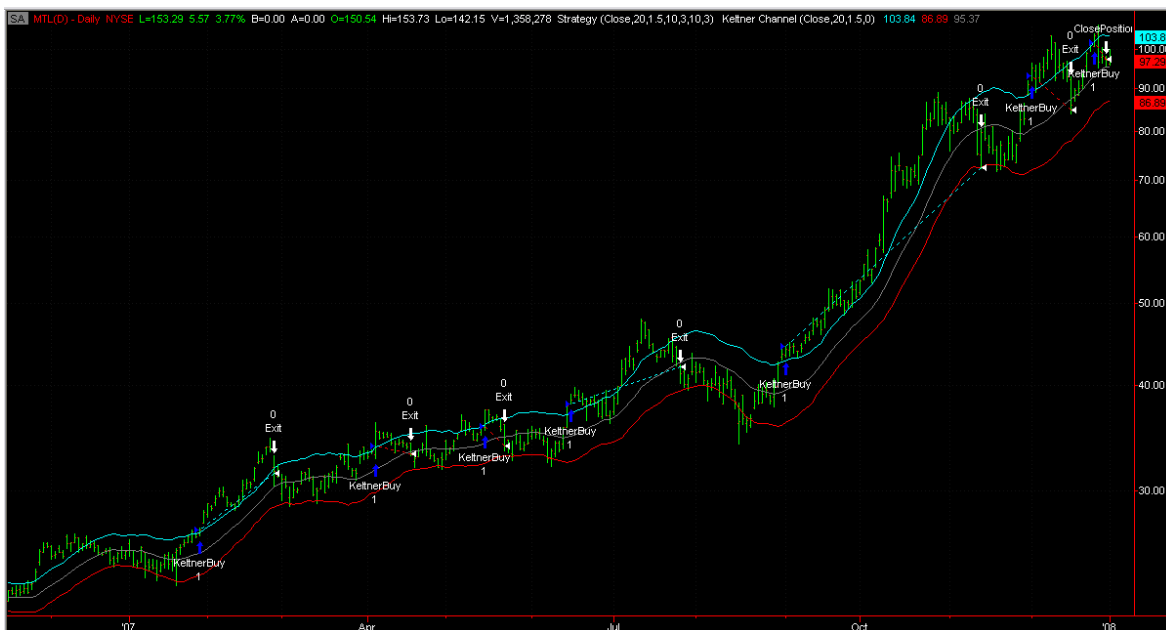
Figure 18 - Trades Generated by Keltner Channel, MTL

6.4.4. RIMM: Research in Motion Limited (NASDAQ)
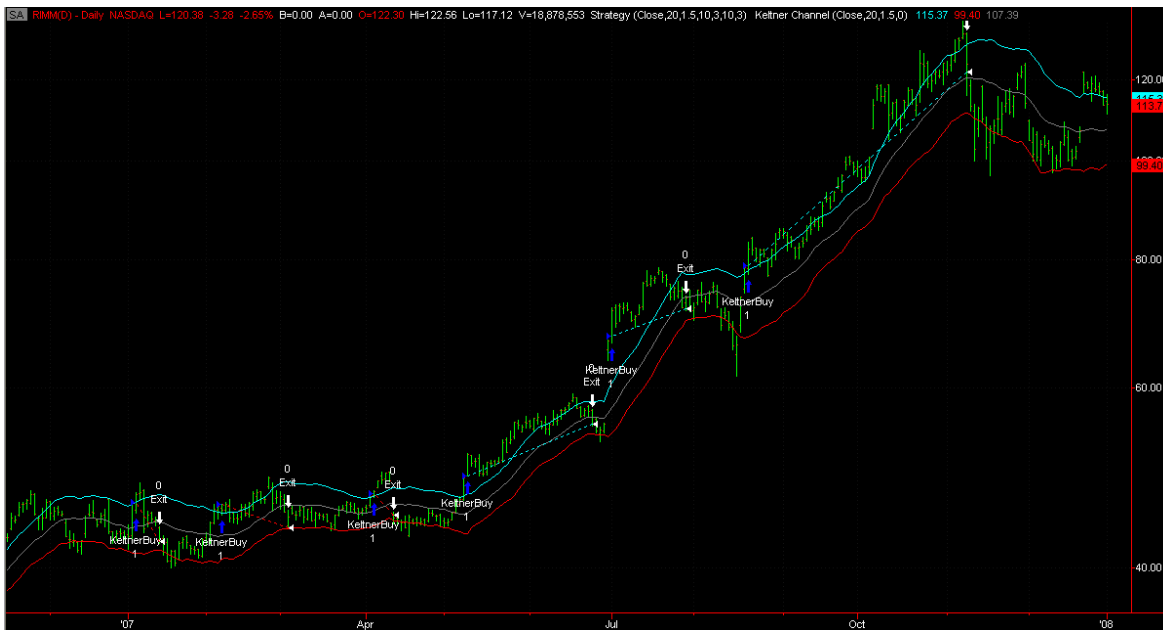
Figure 19 - Trades Generated by Keltner Channel, RIMM

6.4.5. Equity Curve
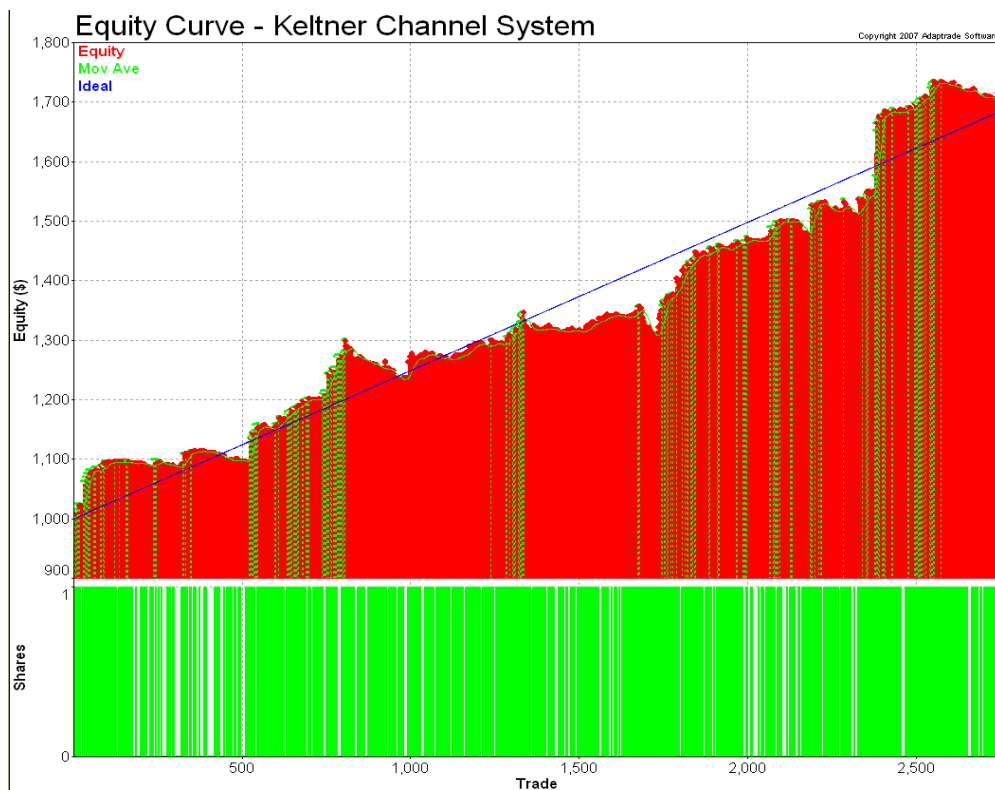
Figure 20 - Equity Curve Generated by Keltner Channel

The equity curve proves us that the Keltner Channel Strategy is relatively easy to trade. The trading account is very close, and mostly above the ideal equity, hence traders should not worry about large drawdowns in their account.

6.4.6. Monte Carlo Simulation Results at a 95% Confidence

Monte Carlo Results at 95.00% Confidence

Total Net Profit: $185.88	Max Number of Shares: 1
Final Account Equity: $1,185.88	Minimum Number of Shares: 1
Return on Starting Equity: 18.59%	Average Number of Shares: 1
Profit Factor: 1.180	
Largest Winning Trade: $30.09	Largest Losing Trade: ($59.59)
Largest Winnning Trade (%): 2.768%	Largest Losing Trade (%): -4.628%
Average Winning Trade: $3.46	Average Losing Trade: ($2.46)
Average Winning Trade (%): 0.300%	Average Losing Trade (%): -0.219%
Average Trade: $0.24	Win/Loss Ratio: 1.489
Average Trade (%): 0.0229%	Win/Loss Ratio (%/%): 1.497
Trade Standard Deviation: $8.02	
Trade Standard Deviation (%): 0.631%	
Worst Case Drawdown: ($124.86)	Return/Drawdown Ratio: 2.093
Worst Case Drawdown (%): 10.17%	Modified Sharpe Ratio: 0.0494
Average Drawdown: ($15.34)	
Average Drawdown (%): 1.347%	

Figure 21 - Monte Carlo Simulation Results for Keltner Channel at a 95% Confidence

6.4.7. Raw System Quality Results

Complete Stats	
Sum R	615.6322646
Number of Trades	2750
Expected Value	0.588741818
Expectancy	0.223866278
Expectunity	615.6322646
Std Dev R	2.825176056
E / StdDev	0.079239762
Study Days	365
Opportunities	2750
System Quality	217.9093453
Percent Winning Trades	0.444
Percent Losing Trades	0.553090909
Average Winning Trade	4.602039312
Average Losing Trade	2.629881657

Table 8 - System Quality Results for Keltner Channel

6.5.   Donchian Channel 20-day

6.5.1. TradeStation Settings

TradeStationChart Settings	
Interval	Daily
Start Date/Time	10/18/2006 16:00
End Date/Time	1/2/2008 16:00
TradeStation Strategies Applied	
Donchian Channel(On)	
TradeStation Strategy Inputs	
Description	Value
Donchian Channel - Days Back	20
Donchian Channel - ATR Days Back	10
Donchian Channel - No. of ATRs	3
Donchian Channel - Initial Stop ATRs	5
Donchian Channel - Initial Stop ATR Days Back	2
TradeStation Strategy Settings	
Initial Capital	$100,000.00
Commission (per Trade)	$0.00
Slippage (per Trade)	$0.00
Interest Rate	2.00%

Back-testing Resolution	
Look-Inside-Bar Back-Testing	Disabled
MaxBarsBack	60

Table 9 - TradeStation Settings for Donchian Channel 20-day

6.5.2. AAPL: Apple Inc. (NASDAQ)
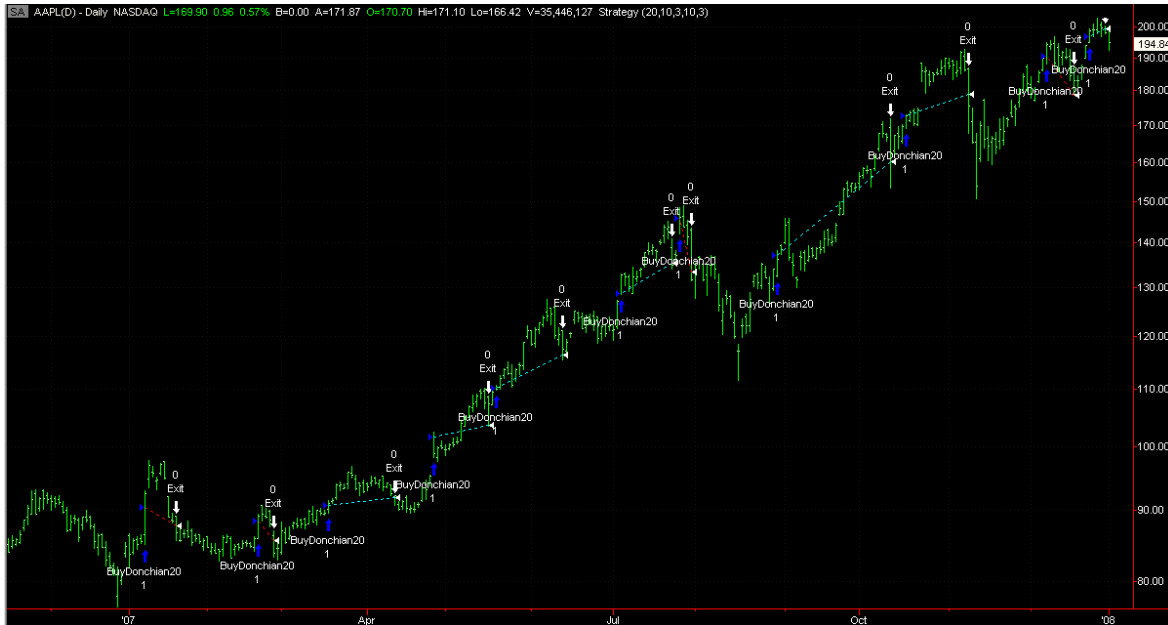
Figure 22- Trades Generated by Donchian Channel 20-Day, AAPL

The above graph shows the trading performance of the Donchian Channel 20-Day strategy on Apple. We can clearly see that the strategy catches the two major breakouts, in March and in late August. The exits are designed well, getting traders out of the position around the maturity of the breakout. The money management stops are very agile to react to the false buy signals.

6.5.3. MTL: Mechel OAO (NYSE)
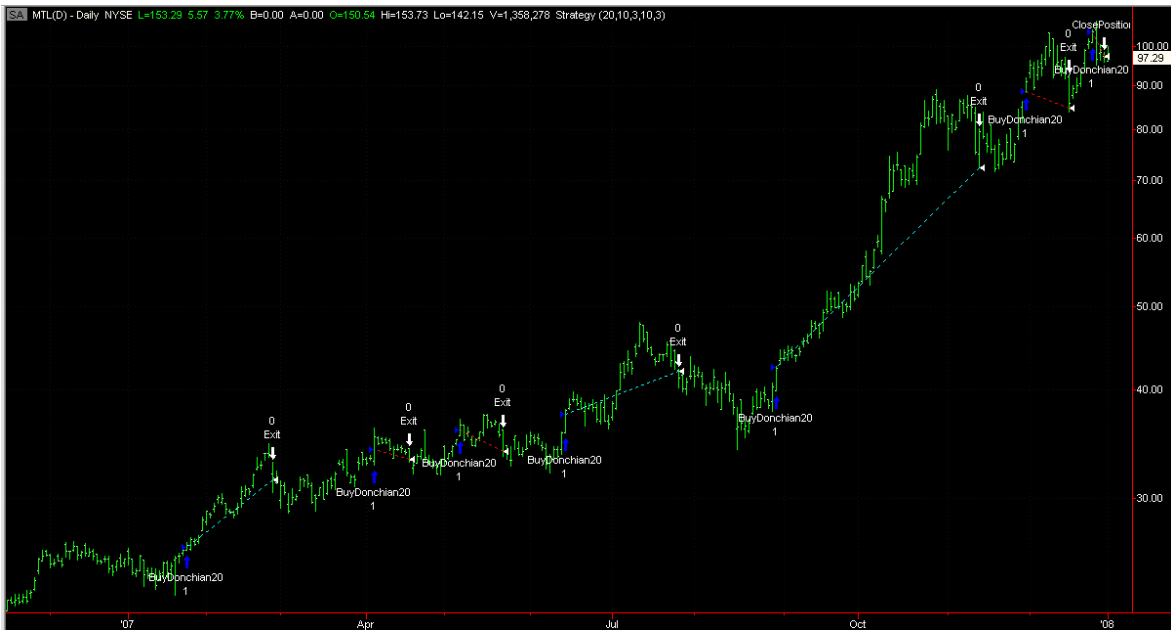
Figure 23 - Trades Generated by Donchian Channel 20-Day, MTL

6.5.4. RIMM: Research in Motion Limited (NASDAQ)
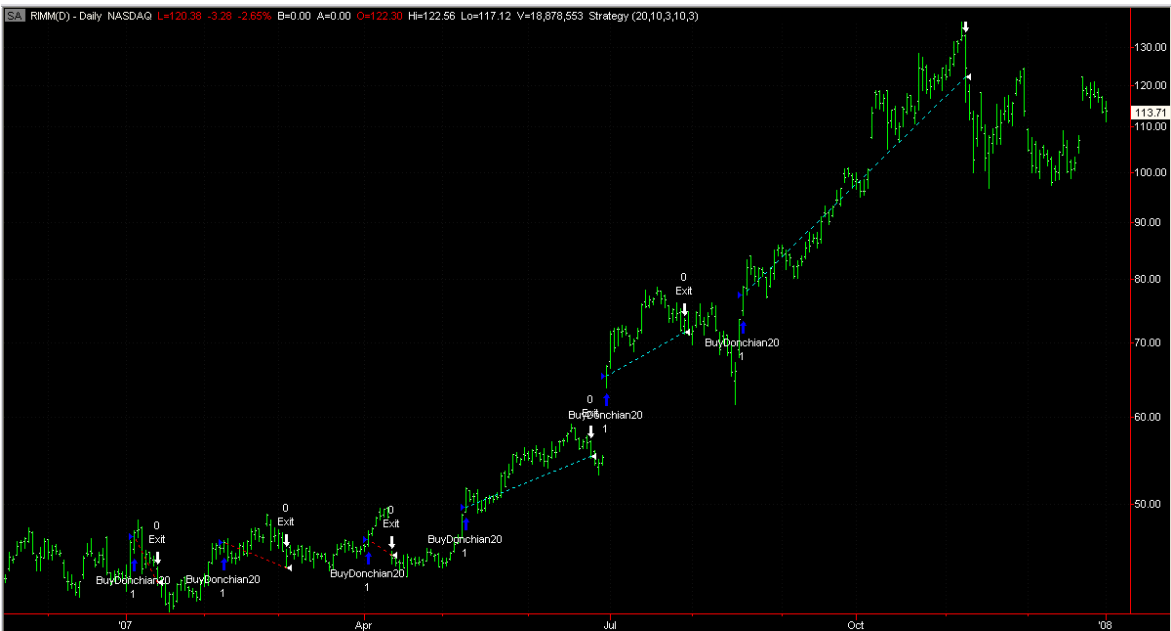
Figure 24 - Trades Generated by Donchian Channel 20-Day, RIMM

6.5.5. Equity Curve

Equity Curve Donchian Channel Breakout System - 20

Copyright 2007 Adaptrade Software
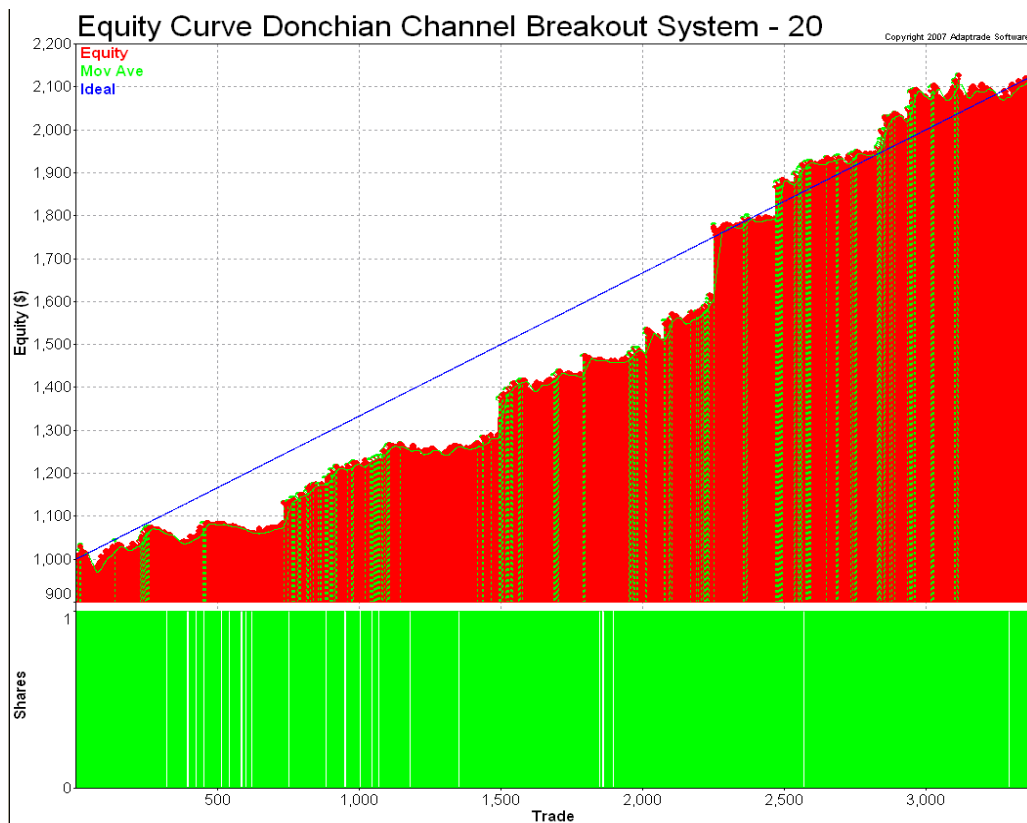
Figure 25 - Equity Curve Generated by Donchian Channel 20-Day

By looking at the Equity Curve we can tell that Donchian Channel 20-Day strategy does not encompass large drawdowns, hence traders should not worry about losing a large portion of their account before beginning to profit from the system. However although the system generates approximately a 110% profit, traders would not experience these until the last quarter of the trading period.

6.5.6. Monte Carlo Simulation Results at a 95% Confidence

Monte Carlo Results at 95.00% Confidence _____

Total Net Profit: $701.00   Max Number of Shares: 1

Final Account Equity: $1,701.00   Minimum Number of Shares: 1

Return on Starting Equity: 70.10%   Average Number of Shares: 1

Profit Factor: 1.321

Largest Winning Trade: $55.11   Largest Losing Trade: ($64.59)

Largest Winnning Trade (%): 4.160%   Largest Losing Trade (%): -5.215%

Average Winning Trade: $3.91   Average Losing Trade: ($2.51)

Average Winning Trade (%): 0.265%   Average Losing Trade (%): -0.190%

Average Trade: $0.43   Win/Loss Ratio: 1.627

Average Trade (%): 0.0337%   Win/Loss Ratio (%/%): 1.635

Trade Standard Deviation: $7.58

Trade Standard Deviation (%): 0.526%

Worst Case Drawdown: ($145.49)   Return/Drawdown Ratio: 7.804

Worst Case Drawdown (%): 10.35%   Modified Sharpe Ratio: 0.0751

Average Drawdown: ($12.73)

Average Drawdown (%): 0.932%

Figure 26 - Monte Carlo Simulation Results for Donchian Channel 20-Day at a 95% Confidence

6.5.7. Raw System Quality Results

Complete Statistics	
Sum R	892.3967751
Number of Trades	3371
Expected Value	0.675479086
Expectancy	0.264727611
Expectunity	892.3967751
Std Dev R	2.782940378
E / StdDev	0.095125146
Study Days	365
Opportunities	3371
System Quality	320.6668681
Percent Winning Trades	0.45179472
Percent Losing Trades	0.544942154
Average Winning Trade	4.572770847
Average Losing Trade	2.551600435

Table 10 - System Quality Results for Donchian Channel 20-Day

6.6.   Donchian Channel 55-days

6.6.1. TradeStation Settings

TradeStationChart Settings	
Interval	Daily
Start Date/Time	10/18/2006 16:00
End Date/Time	1/2/2008 16:00
TradeStation Strategies Applied	
Donchian Channel(On)	
TradeStation Strategy Inputs	
Description	Value
Donchian Channel - Days Back	55
Donchian Channel - ATR Days Back	10
Donchian Channel - No. of ATRs	3
Donchian Channel - Initial Stop ATRs	5
Donchian Channel - Initial Stop ATR Days Back	2
TradeStation Strategy Settings	
Initial Capital	$100,000.00
Commission (per Trade)	$0.00
Slippage (per Trade)	$0.00
Interest Rate	2.00%

Table 11 - TradeStation Settings for Donchian Channel 55-Day

6.6.2. AAPL: Apple Inc. (NASDAQ)
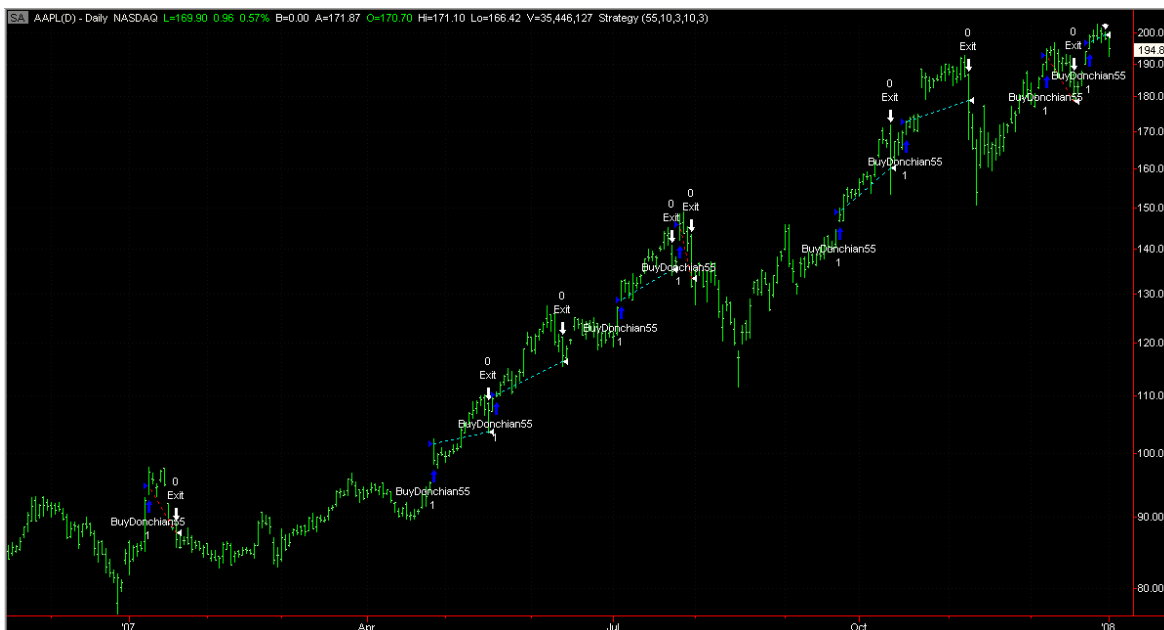
Figure 27 - Trades Generated by Donchian Channel 55-Day, AAPL

The Donchian Channel 55-Day strategy trades effectively throughout the year of 2007. The major breakouts are caught with minor delays; however this strategy has the least wrong buy signals, minimizing drawdowns.

6.6.3. MTL: Mechel OAO (NYSE)
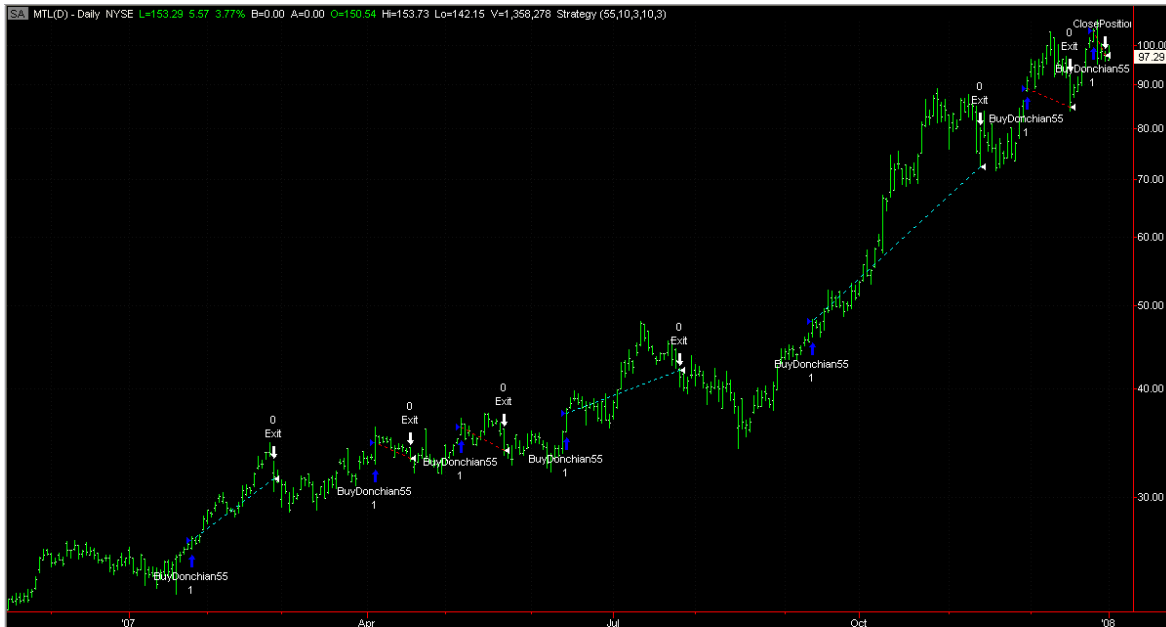
Figure 28 - Trades Generated by Donchian Channel 55-Day, MTL

6.6.4. RIMM: Research in Motion Limited (NASDAQ)
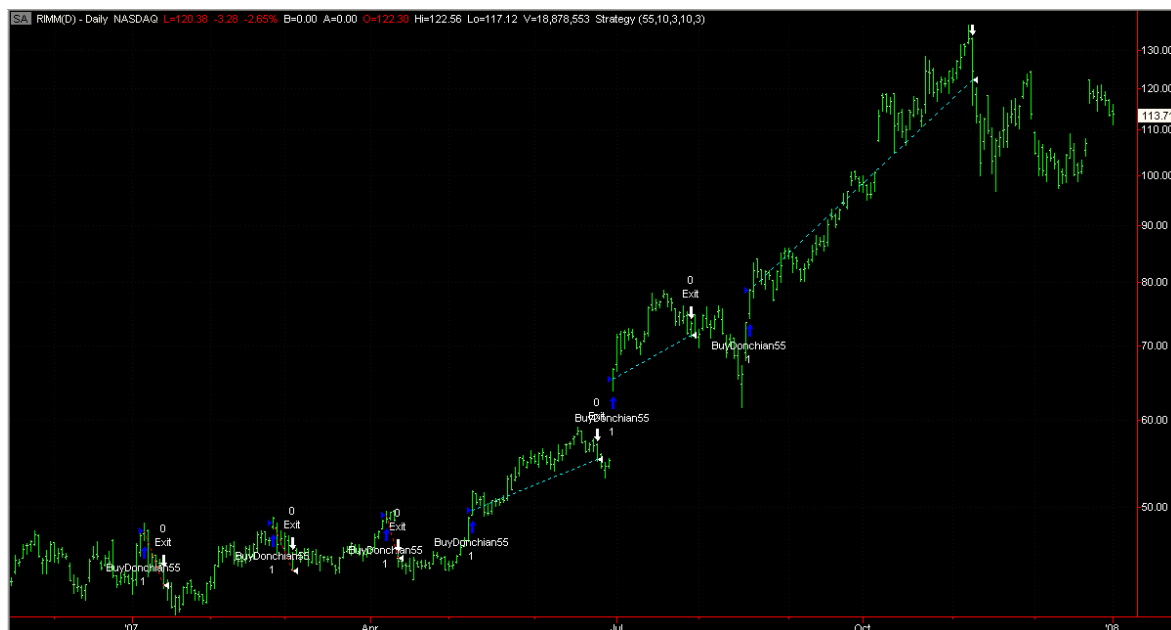
Figure 29 - Trades Generated by Donchian Channel 55-Day, RIMM

6.6.5. Equity Curve
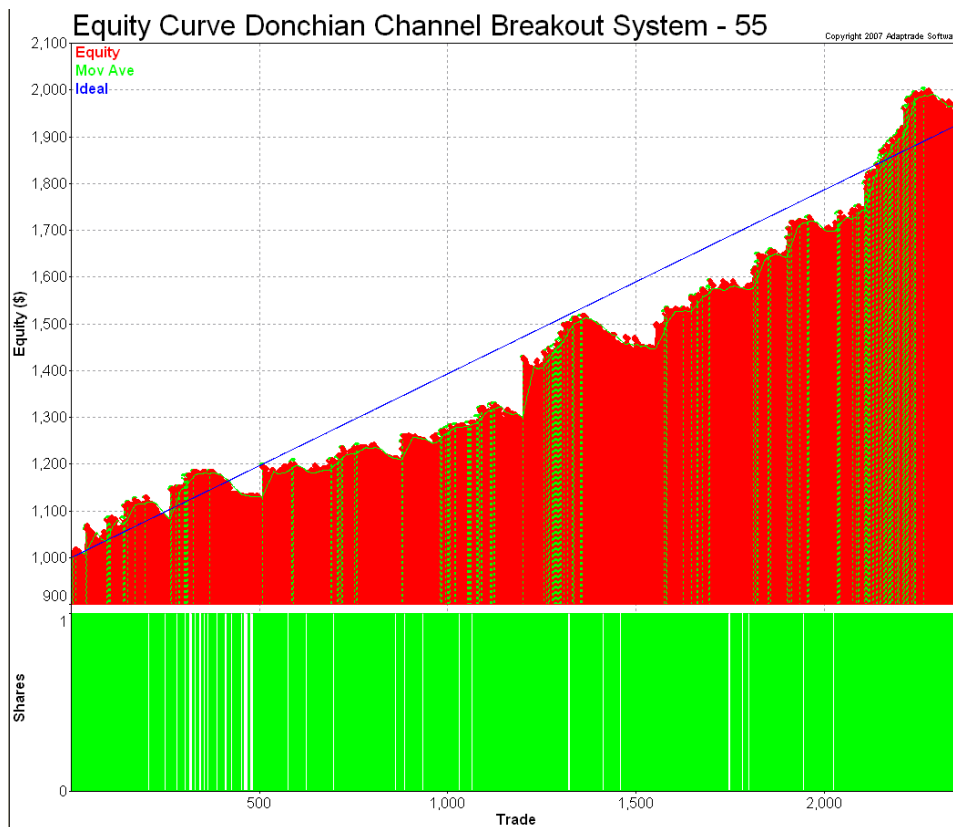
Figure 30 - Equity Curve Generated by Donchian Channel 55-Day

The equity curve for the Donchian Channel 55-Day Strategy is almost uniform, and has minimal drawdowns throughout the trading period. Although the strategy has relatively low returns, it is an easy-to-trade strategy since traders do not have to withstand big losses.

6.6.6. Monte Carlo Simulation Results at a 95% Confidence

Monte Carlo Results at 95.00% Confidence _____

Total Net Profit: $424.58

Final Account Equity: $1,424.58

Return on Starting Equity: 42.46%

Profit Factor: 1.233

Largest Winning Trade: $53.96

Largest Winnning Trade (%): 4.058%

Average Winning Trade: $4.01

Average Winning Trade (%): 0.302%

Average Trade: $0.33

Average Trade (%): 0.0285%

Trade Standard Deviation: $7.34

Trade Standard Deviation (%): 0.557%

Worst Case Drawdown: ($157.30)

Worst Case Drawdown (%): 11.70%

Average Drawdown: ($15.26)

Average Drawdown (%): 1.224%

Max Number of Shares: 1

Minimum Number of Shares: 1

Average Number of Shares: 1

Largest Losing Trade: ($64.60)

Largest Losing Trade (%): -5.708%

Average Losing Trade: ($2.61)

Average Losing Trade (%): -0.217%

Win/Loss Ratio: 1.589

Win/Loss Ratio (%/%): 1.602

Return/Drawdown Ratio: 4.207

Modified Sharpe Ratio: 0.0605

Figure 31 - Monte Carlo Simulation Results for Donchian Channel 55-Day at a 95% Confidence

6.6.7. Raw System Quality Results

Complete Statistics	
Sum R	522.753486
Number of Trades	2364
Expected Value	0.58427665
Expectancy	0.221130916
Expectunity	522.753486
Std Dev R	2.657478962
E / StdDev	0.083210787
Study Days	365
Opportunities	2364
System Quality	196.7103008
Percent Winning Trades	0.438663283
Percent Losing Trades	0.560067682
Average Winning Trade	4.705429122
Average Losing Trade	2.642220544

Table 12 - System Quality Results for Donchian Channel 55-Day

7. Comparison of the Strategies

7.1. System Quality Comparison

System Quality Comparison						
	Moving Average Crossover	**Bollinger Bands**	**Keltner Channel**	**Volume Breakout**	**Donchian 20 Day**	**Donchian 55 Day**
Number of Trades	3414	2478	2750	6200	3371	2364
Expected Value	0.74	0.39	0.59	0.07	0.68	0.58
Expectancy	0.40	0.13	0.22	0.24	0.26	0.22
Expectunity	1361.05	332.54	615.63	1473.59	892.40	522.75
System Quality	371.13	118.51	217.91	508.00	320.67	196.71

Table 13 - System Quality Results

The table above summarizes the most important aspects of the System Quality comparison for all six strategies.

The two systems that stand out are the Moving Average Crossover strategy and the Volume Breakout strategy. The former has the highest expected profit per trade of $0.74 and highest expectancy of $0.40, the profit per dollar risked, and the second-best expectunity value of 1361.05. The latter has the highest system quality value of 508.00 and the highest expectunity value of 1437.59. The highest expectunity value of the Volume Breakout reflects the largest number of trades executed by the strategy – 6200. It seems that the Volume Breakout strategy is the winner but we need to remember that our study does not consider slippage and commissioning costs. Keeping that in mind, we come to the conclusion that the Volume Breakout might not be the optimal strategy to trade with the CAN SLIM stocks.

The runner-up on the systems quality comparison is the Moving Average Crossover Strategy with a value of 371.13. We believe that the Moving Average Crossover strategy is the most practical strategy which provides CAN SLIM investors

with low risk and high returns, reflected in the highest expected value and expectancy of all the strategies we back-test.

7.2.   Monte Carlo Simulation Comparison

Monte Carlo Simulation Comparison at a 95.00% confidence						
	Moving Average Crossover	Bollinger Bands	Keltner Channel	Volume Breakout	Donchian 20 Day	Donchian 55 Day
Net Profit	$2,519.38	$957.00	$185.88	$1,316.00	$701.00	$424.58
Return on Starting Equity	251.90%	95.70%	18.59%	131.60%	70.01%	42.46%
Profit Factor	1.663	1.227	1.18	1.308	1.321	1.233
Avg. Win (%)	0.224%	0.327%	0.300%	0.213%	0.265%	0.302%
Avg. Loss (%)	0.102%	0.229%	0.219%	0.145%	0.190%	0.217%
Worst Case Drawdown (%)	8.150%	20.48%	10.17%	11.53%	10.35%	11.70%
Return/ Drawdown Ratio	30.91	4.672	2.093	13.05	7.804	4.207

Table 14 - Monte Carlo Simulation Results

We then perform Monte Carlo Simulation on all the strategies, which enable the minimization of the uncertainties involved with the various systems. The above table summarizes the data we extracted from the analysis that we deem most important. It can easily be noticed that the Moving Average Crossover system is the best performer. With a 95% confidence level, the simulation results tell us that the strategy will yield a profit of 251.9% over the trading period. It is also proved that the system is low risk and easy-to-trade, since the worst case drawdown is only 8.15%, meaning with any trade, the maximum amount the trader risks is 8.15% of their trading account. Another indicator of the systems "low risk-high return" characteristic is the return/drawdown ratio of 30.91.

8. Conclusion

Throughout this MQP we presented six trading strategies with alternating set-ups and all other aspects ceteris paribus. We back-tested these strategies for the 559 CAN SLIM Stocks of 2007 and analyzed their performances using two enhanced comparison techniques - system quality analysis and Monte Carlo simulation.

We combined the two schools of thought in trading. Technical analysis assumes that market prices at any given point in time reflect all known factors affecting supply and demand for a particular market. On the other hand, fundamental analysis is based on the study of factors external to the stock markets which affect the stock price direction (Covel).

After analyzing and interpreting the data, two strategies stood out – Volume Breakout and Moving Average Crossover. However, due to the large number of trades executed by the Volume Breakout strategy, we believe that the Moving Average Crossover strategy blends the best with the long term investment strategy of William O'Neal's CAN SLIM methodology. The Moving Average Crossover system's trend-following characteristics aim to take advantage of the long-term price moves of the CAN SLIM stocks, presenting traders with the opportunity to achieve high profits.

9. Further Work

Although our study is a comprehensive one, in the scope of our three-term long project, we were not able to cover all aspects of the matter. In this section we list the areas which need further research in order to build a fully functioning complete trading strategy. We suggest further work in the following areas:

- Position sizing and cash management is one of the most important aspects of a complete trading strategy that we were not able to utilize. It provides traders with a set of rules on how to diversify their portfolios and how much of their portfolio they should invest on any given position in the market.

- Commission and slippage costs should be taken into account in order to retrieve accurate, expected profit values. Although commission costs are very low these days due to the highly competitive direct access brokerages, we believe they should be further investigated. Slippage - the difference between estimated transaction costs and the amount actually paid – is another cost that could affect the strategy's overall performance.

- In the scope of our MQP, we only test the affect of the set-up on a complete trading strategy, leaving all other parts constant. We suggest that various combinations of the all aspects of a complete trading strategy be tested.

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11. Appendixes

11.1. Moving Average Crossover Strategy EasyLanguage Code

```
inputs:
        Price( Close),
        FastLength( 9),
        SlowLength( 18),
        Displace( 0),
        ATRLength( 10), NumATRs( 3), InitialStopATRs (5), InitialStopATRLength (2) ;
variables:
        FastAvg( 0 ),
        SlowAvg( 0 ),
        FileName("C:\MAC.csv "),
        tradeStr1(""),
   profit$(0),
   longOrShort(""),
   tt(0),
   ATRCalc( 0 ), MP( 0 ), PosHigh( 0 ), MMS(0);

FastAvg = xAverage( Price, FastLength ) ;
SlowAvg = xAverage( Price, SlowLength ) ;

ATRCalc = AvgTrueRange( ATRLength ) * NumATRs;
MP = MarketPosition ;

{Buy and Sell decisions based on the Moving Average Crossover}
if CurrentBar > 1 and FastAvg crosses over SlowAvg  then
Buy ( "BuyMAC" ) next bar at  High +1 stop ;

If Currentbar > 1 and FastAvg crosses below SlowAvg Then
Sell( "SellMAC" ) next bar at Low -1 stop;

{Initial MMS}
if MarketPosition <> 1 then
begin
        Sell ( "InitialStop" ) next bar at Close - AvgTrueRange( InitialStopATRLength ) *
InitialStopATRs stop;
        MMS = Close - AvgTrueRange( InitialStopATRLength ) * InitialStopATRs;
end;

{Calculation of a trailing ATR stop}
if MP = 1 then
        begin
        if MP[1] <> 1 or High > PosHigh then
                PosHigh = High ;
                Sell ( "Exit" ) next bar at PosHigh - ATRCalc stop ;
        end
else
        Sell ( "Exit-eb" ) next bar at High - ATRCalc stop ;

{Decision to close the position at the end of the period}
If Date >= 1071228 Then Begin
Sell ("ClosePosition") next bar at market;
end;

{Output of the strategy}
tt = TotalTrades;
```

```
if tt <> tt[1] then begin // a trade just completed
  if MarketPosition(1) > 0 then longOrShort = " 1" else longOrShort = " -1";
  profit$ = MarketPosition(1)*(ExitPrice(1) - EntryPrice(1)) * BigPointValue;
  tradeStr1 = symbol + "," + ELDateToString(EntryDate(1)) +
         "," + NumToStr(EntryPrice(1),2) + "," + ELDateToString(ExitDate(1)) + "," +
         NumToStr(ExitPrice(1),2) + "," + NumToStr(MMS,2) + "," + longOrShort +
         "," + NumToStr(profit$, 2) + "," + newline;
  FileAppend(FileName, tradestr1);
end;
```

11.2.   Donchian Channel Strategy EasyLanguage Code

```
inputs:  Length( 20 ), ATRLength( 10), NumATRs( 3), InitialStopATRs (5), InitialStopATRLength (2) ;

variables: FileName("C:\Stock Analysis_Donchian55.csv"),
  tradeStr1(""),
   profit$(0),
   longOrShort(""),
   tt(0),
   MP( 0 ), PosHigh( 0 ), MMS(0), ATRCalc(0);

ATRCalc = AvgTrueRange( ATRLength ) * NumATRs;
MP = MarketPosition ;

Buy ( "BuyDonchian55" ) next bar at HighestFC( High, Length ) + 1 point stop ;

{Initial MMS}
if MarketPosition <> 1 then
begin
        Sell ( "InitialStop" ) next bar at Close - AvgTrueRange( InitialStopATRLength ) *
InitialStopATRs stop;
        MMS = Close - AvgTrueRange( InitialStopATRLength ) * InitialStopATRs;
end;

{Calculation of a trailing ATR stop}
if MP = 1 then
        begin
        if MP[1] <> 1 or High > PosHigh then
                PosHigh = High ;
                Sell ( "Exit" ) next bar at PosHigh - ATRCalc stop ;
        end
else
        Sell ( "Stop" ) next bar at High - ATRCalc stop ;

{Decision to close the position at the end of the period}
If Date >= 1071228 Then Begin
Sell ("ClosePosition") next bar at market;
end;

{Output of the strategy}
tt = TotalTrades;
if tt <> tt[1] then begin // a trade just completed
  if MarketPosition(1) > 0 then longOrShort = " 1" else longOrShort = " -1";
  profit$ = MarketPosition(1)*(ExitPrice(1) - EntryPrice(1)) * BigPointValue;
  tradeStr1 = symbol + "," + ELDateToString(EntryDate(1)) +
         "," + NumToStr(EntryPrice(1),2) + "," + ELDateToString(ExitDate(1)) + "," +
         NumToStr(ExitPrice(1),2) + "," + NumToStr(MMS,2) + "," + longOrShort +
         "," + NumToStr(profit$, 2) + "," + newline;
  FileAppend(FileName, tradestr1);
```

```
end;
```

11.3.   Keltner Channel Strategy EasyLanguage Code

```
inputs: Price( Close), Length( 20), NumATRs( 1.5), ATRLength( 10), NumATRs( 3) ;
variables: Avg( 0 ), Shift( 0 ), UpperBand( 0 ), SetupBuy( false ), CrossingHigh( 0 ), LowerBand( 0 ),
        CrossingLow( 0 ), SetupSell( false ),
        FileName("C:\Keltner.csv"),
        tradeStr1(""),
  profit$(0),
  longOrShort(""),
  tt(0),
  ATRCalc( 0 ), MP( 0 ), PosHigh( 0 ), SellPrice (0);


Avg = AverageFC( Price, Length ) ;
Shift = NumATRs * AvgTrueRange( Length ) ;
UpperBand = Avg + Shift ;
LowerBand = Avg - Shift ;

if CurrentBar > 1 and Price crosses over UpperBand then
{ CB > 1 check used to avoid spurious cross confirmation at CB = 1 }
        begin
        SetUpBuy = true ;
        CrossingHigh = High ;
        end
else if SetupBuy and ( Price < Avg or High >= CrossingHigh + 1 point ) then
        SetupBuy = false ;

if SetupBuy then
        Buy ( "KeltnerBuy" ) next bar CrossingHigh + 1 point stop ;


if CurrentBar > 1 and Price crosses under LowerBand then
{ CB > 1 check used to avoid spurious cross confirmation at CB = 1 }
        begin
        SetUpSell = true ;
        CrossingLow = Low ;
        end
else if SetupSell and ( Price > Avg or Low <= CrossingLow - 1 point ) then
        SetupSell = false ;

if SetupSell then
        Sell ( "KeltnerSell" ) next bar at CrossingLow - 1 point stop ;


If Date >= 1071228 Then Begin
Sell ("ClosePosition") next bar at market;
end;

{Calculation of a trailing ATR stop}
if MP = 1 then
        begin
        if MP[1] <> 1 or High > PosHigh then
                PosHigh = High ;
        SellPrice = PosHigh - ATRCalc;
                Sell ( "Exit" ) next bar at SellPrice stop ;
        end
```

```
else
        Sell ( "Exit-eb" ) next bar at High - ATRCalc stop ;

tt = TotalTrades;
if tt <> tt[1] then begin // a trade just completed
  if MarketPosition(1) > 0 then longOrShort = " 1" else longOrShort = " -1";
  profit$ = MarketPosition(1)*(ExitPrice(1) - EntryPrice(1)) * BigPointValue;
  tradeStr1 = symbol + "," + ELDateToString(EntryDate(1)) +
        "," + NumToStr(EntryPrice(1),2) + "," + ELDateToString(ExitDate(1)) + "," +
        NumToStr(ExitPrice(1),2) + "," + NumToStr(SellPrice,2) + "," + longOrShort +
        "," + NumToStr(profit$, 2) + ","
        +  NumToStr(ATRCalc,2) + "," + newline;
  FileAppend(FileName, tradestr1);
end;
```

11.4.   Bollinger Bands Strategy EasyLanguage Code

```
inputs:
        BollingerPrice( Close ),
        TestPriceLBand( Close ), { cross of this price over LowerBand triggers placement
         of stop order at LowerBand }
        Length( 20 ),
        NumDevsDn( 2 ),
  ATRLength( 10), NumATRs( 3),
  InitialStopATRs (5), InitialStopATRLength (2);

variables:
        LowerBand( 0 ) ,
  FileName("C:\BBands.csv"),
        tradeStr1(""),
  profit$(0),
  longOrShort(""),
  tt(0),
  ATRCalc( 0 ), MP( 0 ), PosHigh( 0 ), SellPrice (0),MMS(0);


ATRCalc = AvgTrueRange( ATRLength ) * NumATRs;
MP = MarketPosition ;


LowerBand = BollingerBand( BollingerPrice, Length, -NumDevsDn ) ;

if CurrentBar > 1 and TestPriceLBand crosses over LowerBand then
{ CB > 1 check used to avoid spurious cross confirmation at CB = 1 }
        Buy ( "BuyBBand" ) next bar at LowerBand +1 stop ;

{Initial MMS}
if MarketPosition <> 1 then
begin
        Sell ( "InitialStop" ) next bar at Close - AvgTrueRange( InitialStopATRLength ) *
InitialStopATRs stop;
        MMS = Close - AvgTrueRange( InitialStopATRLength ) * InitialStopATRs;
end;

{Calculation of a trailing ATR stop}
if MP = 1 then
        begin
        if MP[1] <> 1 or High > PosHigh then
                PosHigh = High ;
```

```
                SellPrice = PosHigh - ATRCalc;
                        Sell ( "Exit" ) next bar at SellPrice stop ;
                end
        else
                Sell ( "Stop" ) next bar at High - ATRCalc stop ;


{Output of the strategy}
tt = TotalTrades;
if tt <> tt[1] then begin // a trade just completed
  if MarketPosition(1) > 0 then longOrShort = " 1" else longOrShort = " -1";
  profit$ = MarketPosition(1)*(ExitPrice(1) - EntryPrice(1)) * BigPointValue;
  tradeStr1 = symbol + "," + ELDateToString(EntryDate(1)) +
        "," + NumToStr(EntryPrice(1),2) + "," + ELDateToString(ExitDate(1)) + "," +
        NumToStr(ExitPrice(1),2) + "," + NumToStr(MMS,2) + "," + longOrShort +
        "," + NumToStr(profit$, 2) + "," + newline;
  FileAppend(FileName, tradestr1);
end;
```

11.5.   Volume Breakout Strategy EasyLanguage Code

```
inputs: ATRLength( 10), NumATRs( 3), InitialStopATRs (10), InitialStopATRLength (3) ;
variables:
        FileName("C:\Volume.csv"),
        tradeStr1(""),
  profit$(0),
  longOrShort(""),
  tt(0),
  ATRCalc( 0 ), MP( 0 ), PosHigh( 0 ), MMS(0);


ATRCalc = AvgTrueRange( ATRLength ) * NumATRs;
MP = MarketPosition ;


inputs: HoldingPeriod(5), AvgLength( 10 ), BrkOutPct( 50 ) ;
variables: BrkOutFactor( 1 + BrkOutPct * .01 ) ;

if Volume >= Average( Volume, AvgLength)*BrkOutFactor then
        Buy ("BuyVolBrkout") next bar at +1 stop;

{Initial MMS}
if MarketPosition <> 1 then
begin
        Sell ( "InitialStop" ) next bar at Close - AvgTrueRange( InitialStopATRLength ) *
InitialStopATRs stop;
        MMS = Close - AvgTrueRange( InitialStopATRLength ) * InitialStopATRs;
end;

{Calculation of a trailing ATR stop}
if MP = 1 then
        begin
        if MP[1] <> 1 or High > PosHigh then
                PosHigh = High ;
                Sell ( "Exit" ) next bar at PosHigh - ATRCalc stop ;
        end
else
        Sell ( "Stop" ) next bar at High - ATRCalc stop ;
```

```
{Decision to close the position at the end of the period}
If Date >= 1071228 Then Begin
Sell ("ClosePosition") next bar at market;
end;

{Output of the strategy}
tt = TotalTrades;
if tt <> tt[1] then begin // a trade just completed
  if MarketPosition(1) > 0 then longOrShort = " 1" else longOrShort = " -1";
  profit$ = MarketPosition(1)*(ExitPrice(1) - EntryPrice(1)) * BigPointValue;
  tradeStr1 = symbol + "," + ELDateToString(EntryDate(1)) +
        "," + NumToStr(EntryPrice(1),2) + "," + ELDateToString(ExitDate(1)) + "," +
        NumToStr(ExitPrice(1),2) + "," + NumToStr(MMS,2) + "," + longOrShort +
        "," + NumToStr(profit$, 2) + "," + newline;
  FileAppend(FileName, tradestr1);
end;
```

11.6.   CAN SLIM Stock Selection Indicator EasyLanguage Code

```
{Defining inputs}
inputs:
        PriceMin( 15.00) ;
{Defining all the variables , e.g. EPS0 is the current quarterly EPS and is set to 0,
EPS1 is the quarter before that, and so on}
variables:
        EPS0( 0 ),
        oEPS0Err( 0 ),
        EPS1( 0 ),
        oEPS1Err( 0 ),
        EPS2( 0 ),
        oEPS2Err( 0 ),
        EPS3( 0 ),
        oEPS3Err( 0 ),
        EPS4( 0 ),
        oEPS4Err( 0 ),
        EPS5( 0 ),
        oEPS5Err( 0 ),
        EPS6( 0 ),
        oEPS6Err( 0 ),
        EPS7( 0 ),
        oEPS7Err( 0 ),
        EPS8( 0 ),
        oEPS8Err( 0 ),
        EPS9( 0 ),
        oEPS9Err( 0 ),
        EPS10( 0 ),
        oEPS10Err( 0 ),
        EPS11( 0 ),
        oEPS11Err( 0 ),
        EPS12( 0 ),
        oEPS12Err( 0 ),
        EPS13( 0 ),
        oEPS13Err( 0 ),
        EPS14( 0 ),
        oEPS14Err( 0 ),
        EPS15( 0 ),
        oEPS15Err( 0 ),
```

```
            NI0( 0 ),
            oNI0Err( 0 ),
            NI1( 0 ),
            oNI1Err( 0 ),
            NI2( 0 ),
            oNI2Err( 0 ),
            NI3( 0 ),
            oNI3Err( 0 ),
            SE0( 0 ),
            oSE0Err( 0 ),
            SE1( 0 ),
            oSE1Err( 0 ),
            SE2( 0 ),
            oSE2Err( 0 ),
            SE3( 0 ),
            oSE3Err( 0 ),
            ROE ( 0 ),
{The following variables will hold the EPS % Change from quarter to quarter and from year to year}
    EPSPctChgYr0( 0 ),
            EPSPctChgYr1( 0 ),
            EPSPctChgYr2( 0 ),
            EPSPctChgQrt0( 0 ),
            EPSPctChgQrt1( 0 ),
            EPSPctChgQrt2( 0 ),
            EPSPctChgQrt3( 0 ),
            counterQrt( 0 ),
            counterYr( 0 ),
            AvgClose( 0 );
{The following commands assign fundamental values to the variables,
e.g. EPS0 is assigned the EPS value for the current quarter}
EPS0 = FundValue( "SDBF", 0, oEPS0Err ) ;
EPS1 = FundValue( "SDBF", 1, oEPS1Err ) ;
EPS2 = FundValue( "SDBF", 2, oEPS2Err ) ;
EPS3 = FundValue( "SDBF", 3, oEPS3Err ) ;
EPS4 = FundValue( "SDBF", 4, oEPS4Err ) ;
EPS5 = FundValue( "SDBF", 5, oEPS5Err ) ;
EPS6 = FundValue( "SDBF", 6, oEPS6Err ) ;
EPS7 = FundValue( "SDBF", 7, oEPS7Err ) ;
EPS8 = FundValue( "SDBF", 8, oEPS8Err ) ;
EPS9 = FundValue( "SDBF", 9, oEPS9Err ) ;
EPS10 = FundValue( "SDBF", 10, oEPS10Err ) ;
EPS11 = FundValue( "SDBF", 11, oEPS11Err ) ;
EPS12 = FundValue( "SDBF", 12, oEPS12Err ) ;
EPS13 = FundValue( "SDBF", 13, oEPS13Err ) ;
EPS14 = FundValue( "SDBF", 14, oEPS14Err ) ;
EPS15 = FundValue( "SDBF", 15, oEPS15Err ) ;
NI0 = FundValue( "NINC", 0, oNI0Err ) ;
NI1 = FundValue( "NINC", 1, oNI1Err ) ;
NI2 = FundValue( "NINC", 2, oNI2Err ) ;
NI3 = FundValue( "NINC", 3, oNI3Err ) ;
SE0 = FundValue( "QTLE", 0, oSE0Err ) ;
SE1 = FundValue( "QTLE", 1, oSE1Err ) ;
SE2 = FundValue( "QTLE", 2, oSE2Err ) ;
SE3 = FundValue( "QTLE", 3, oSE3Err ) ;
{The following calculates the average closing price and checks if is higher than PriceMin}
AvgClose = ( close[1] + close[92] + close[183] + close[280] + close[365] )/5;
if AvgClose > PriceMin
            then
            begin
{The following checks if there is any error retrieving the values}
            if oEPS0Err = fdrOk
```

and oEPS1Err = fdrOk
and oEPS2Err = fdrOk
and oEPS3Err = fdrOk
and oEPS4Err = fdrOk
and oEPS5Err = fdrOk
and oEPS6Err = fdrOk
and oEPS7Err = fdrOk
and oEPS8Err = fdrOk
and oEPS9Err = fdrOk
and oEPS10Err = fdrOk
and oEPS11Err = fdrOk
{and oEPS12Err = fdrOk
and oEPS13Err = fdrOk
and oEPS14Err = fdrOk
and oEPS15Err = fdrOk}
and oNI0Err = fdrOk
and oNI1Err = fdrOk
and oNI2Err = fdrOk
and oNI3Err = fdrOk
and oSE0Err = fdrOk
and oSE1Err = fdrOk
and oSE2Err = fdrOk
and oSE3Err = fdrOk
{The following checks if the EPS, NI and SE are greater than 0}
{and EPS0 > 0
and EPS1 > 0
and EPS2 > 0
and EPS3 > 0
and EPS4 > 0
and EPS5 > 0
and EPS6 > 0
and EPS7 > 0
and EPS9 > 0
and EPS10 > 0
and EPS11 > 0
and EPS12 > 0
and EPS13 > 0
and EPS14 > 0
and EPS15 > 0
and NI0 > 0
and NI1 > 0
and NI2 > 0
and NI3 > 0
and SE0 > 0
and SE1 > 0
and SE2 > 0
and SE3 > 0}
then
{The following commands calculate the quarterly and annual EPS Growth, and the ROE}
begin
ROE = 100* ((NI0 + NI1 + NI2 + NI3) / ((SE0 + SE1 + SE2 + SE3)/4));
EPSPctChgYr0 = 100 * ((EPS0 + EPS1 + EPS2 + EPS3) - (EPS4 + EPS5 + EPS6 + EPS7))
/(EPS4 + EPS5 + EPS6 + EPS7);
if (EPSPctChgYr0 > 20)
then counterYr = counterYr + 1;
EPSPctChgYr1 = 100 * ((EPS4 + EPS5 + EPS6 + EPS7) - (EPS8 + EPS9 +
EPS10 + EPS11)) /(EPS8 + EPS9 + EPS10 + EPS11);
if (EPSPctChgYr1 > 20)
then counterYr = counterYr + 1;
EPSPctChgYr2 = 100 * ((EPS8 + EPS9 + EPS10 + EPS11) - (EPS12 + EPS13 +
EPS14 + EPS15)) /(EPS12 + EPS13 + EPS14 + EPS15);

```
                    if ( EPSPctChgYr2 > 20 )
                            then counterYr = counterYr + 1;
                    EPSPctChgQrt0 = 100 * ( EPS0 - EPS4 ) / EPS4 ;
                    if ( EPSPctChgQrt0 > 25 )
                            then counterQrt = counterQrt + 1;
                    EPSPctChgQrt1 = 100 * ( EPS1 - EPS5 ) / EPS5 ;
                    if ( EPSPctChgQrt1 > 25 )
                            then counterQrt = counterQrt + 1;
                    EPSPctChgQrt2 = 100 * ( EPS2 - EPS6 ) / EPS6 ;
                    if ( EPSPctChgQrt2 > 25 )
                            then counterQrt = counterQrt + 1;
                    EPSPctChgQrt3 = 100 * ( EPS3 - EPS7 ) / EPS7 ;
                    if ( EPSPctChgQrt3 > 25 )
                            then counterQrt = counterQrt + 1;
        {The counters are used to determine whether there are at least 2 quarters in the last year with
EPS growth of
        at least 25% and whether the annual EPS growth for the last 3 years is more than 20%}
                            if counterQrt >=2 and counterYr >=2 and ROE > 17
                            then
                                    begin
        {The following commands display the values in columns in RadarScreen
                            if EPSPctChgYr0 > 0 then
                                    begin
                                    Plot1( EPSPctChgYr0, "AEG Now", Green ) ;
                            end
                            else
                                    begin
                                    Plot1( EPSPctChgYr0, "AEG Now", Red ) ;
                                    end;
                            if EPSPctChgYr1 > 0 then
                                    begin
                                    Plot2( EPSPctChgYr1, "AEG -1", Green ) ;
                                    end
                            else
                                    begin
                                    Plot2( EPSPctChgYr1, "AEG -1", Red ) ;
                                    end;
                            if EPSPctChgYr2 > 0 then
                                    begin
                                    Plot3( EPSPctChgYr2, "AEG -1", Green ) ;
                                    end
                            else
                                    begin
                                    Plot3( EPSPctChgYr2, "AEG -1", Red ) ;
                                    end;
                            if EPSPctChgQrt0 > 0 then
                                    begin
                                    Plot4( EPSPctChgQrt0, "EPS Chg Now", Green ) ; ;
                                    end
                            else
                                    begin
                                    Plot4( EPSPctChgQrt0, "EPS Chg Now", Red ) ;
                                    end;
                            if EPSPctChgQrt1 > 0 then
                                    begin
                                    Plot5( EPSPctChgQrt1, "EPS Chg Now", Green ) ; ;
                                    end
                            else
                                    begin
                                    Plot5( EPSPctChgQrt1, "EPS Chg Now", Red ) ;
                                    end;
```

```
                                    if EPSPctChgQrt2 > 0 then
                                            begin
                                            Plot6( EPSPctChgQrt2, "EPS Chg Now", Green ) ; ;
                                            end
                                    else
                                            begin
                                            Plot6( EPSPctChgQrt2, "EPS Chg Now", Red ) ;
                                            end;
                                    if EPSPctChgQrt3 > 0 then
                                            begin
                                            Plot7( EPSPctChgQrt3, "EPS Chg Now", Green ) ; ;
                                            end
                                    else
                                            begin
                                            Plot7( EPSPctChgQrt3, "EPS Chg Now", Red ) ;
                                            end;
                            Plot8( ROE, "ROE" ) ;
                            Plot9(AvgClose, "Stock Price", Green);
                            end
                            else
            {If the stock does not qualify for our critera, the following is displayed}
                                    Plot10( "No Match", "Error", Red ) ;
                    end
    {If there is not enough data, the following is displayed}
            else
                            Plot10( "Data N/A", "Error", Red ) ;

end
else

            Plot10( "No Match", "Error", Red);
```

11.7.   CAN SLIM Stock Selection (Symbols)

A	ALB	ATRI	BIDU	CBI
AAON	AMAT	ATRO	BIG	CE
AAPL	AME	ATW	BKC	CEO
AAWW	AMG	AVTR	BKE	CF
ABB	AMGN	AWC	BLKB	CG
ABI	AMN	AXA	BLL	CHKE
ABR	AMPH	AXE	BLUD	CHL
ABT	AMX	AYI	BMC	CHRW
ACAP	AMZN	AZ	BMY	CHTT
ACAS	ANDE	AZZ	BOLT	CL
ACGL	ANR	B	BOOM	CLB
ACGY	ANST	BA	BRLI	CLHB
ACH	APD	BAP	BRY	CLP
ACL	APH	BAX	BT	CM
ACN	APOG	BBNK	BUCY	CMC
ADI	APOL	BBV	BVN	CMTL
ADM	ARA	BBY	BW	CNC
ADSK	ARGN	BCPC	BXP	CNI
AEO	ARKR	BCR	BYD	CNP
AEPI	ARO	BCS	CACC	CNQ
AET	ARP	BDK	CADA	CNX
AFAM	ARTW	BDX	CAE	COH
AHL	ASFI	BEC	CAG	COKE
AIRM	ASML	BEN	CALM	COL
AIT	ATI	BGC	CAM	CPA
AIZ	ATK	BHI	CB	CPL
AJG	ATLS	BHP	CBE	CRDN
AKS	ATNI	BID	CBG	CRS

CRVL	FRGB	HURC	MGM	ORCL
CS	FRO	HURN	MHP	ORH
CSCO	FRX	HXM	MICC	OSK
CSL	FSTR	ICE	MIDD	OXPS
CTBK	FTI	IDCC	MITSY	OXY
CTRP	FTK	IFF	MKC	OYOG
CTSH	FTO	IIVI	MLAB	PBR
CTV	FWLT	IMKTA	MLHR	PCLN
CUZ	GD	INFA	MLI	PCP
CVD	GDI	INFY	MLM	PCR
CVH	GEF	ING	MMM	PCU
CX	GEOY	ININ	MNT	PCZ
CY	GES	INTC	MORN	PDE
D	GFIG	IP	MOS	PEG
DAL	GGP	IRE	MRH	PENN
DB	GHL	ISRG	MSFT	PEP
DDMX	GIGM	ITMN	MSM	PETM
DE	GIL	ITT	MT	PHG
DECK	GILD	ITY	MTD	PHLY
DHIL	GLBL	JBHT	MTL	PKG
DIOD	GLF	JBX	MTW	PKOH
DISH	GLNG	JCG	MUR	PKX
DKS	GLW	JCOM	MVL	PLD
DLB	GM	JEC	MW	PMTC
DLLR	GMT	JLL	MXGL	POT
DLX	GOOG	JOSB	NATH	PPG
DNA	GPOR	JWN	NATI	PTEN
DNEX	GR	KALU	NATL	PTNR
DNR	GRMN	KCI	NCIT	PTR
DO	GRP	KEX	NDAQ	PUK
DPL	GS	KMB	NE	PVH
DRQ	GT	KR	NEU	PX
DST	GWW	KSS	NFG	PXP
DSW	GYMB	KTC	NGG	PZZA
DSX	HAL	KTII	NHI	QCOM
DVA	HANS	LABL	NHP	QDEL
DVN	HAR	LCAV	NIHD	QSII
DWSN	HAS	LDSH	NILE	RBA
DXPE	HAYN	LECO	NJR	RDC
E	HBC	LEH	NKE	REP
EAT	HCC	LH	NMX	RIG
EBIX	HES	LHCG	NNDS	RIMM
EGN	HIBB	LIFC	NOK	RIO
EL	HITT	LLY	NOV	RLI
ELS	HLF	LMT	NRGP	ROK
ENL	HLX	LOGI	NSR	ROLL
EPAX	HME	LPHI	NTG	ROST
ERIC	HNP	LRCX	NTRI	RPT
ERIE	HNZ	LTD	NTY	RS
ESI	HOC	LTRE	NU	RSH
ESRX	HON	LUFK	NVDA	RTI
ESV	HOT	LUX	NVEC	RTN
EXC	HP	MA	NVO	RTP
EXM	HPQ	MAN	NVT	RUK
FCSX	HPY	MBT	NVTL	RY
FCX	HRBN	MCHP	NWL	RYAAY
FDO	HRS	MCRI	OC	RYN
FDS	HSC	MDR	OII	SAN
FLIR	HSII	MDU	OMCL	SAY
FLR	HUBG	MEOH	OMG	SCHW
FLS	HUM	MET	OPY	SEE

SEPR	TRN
SGP	TROW
SHOO	TRV
SI	TS
SID	TSO
SIGM	TSS
SII	TTC
SILC	TUP
SIMO	TV
SIVB	TWGP
SJR	TWIN
SKM	TXT
SLAB	UA
SLB	UBS
SLG	UGI
SM	UL
SNDA	UN
SNHY	UNH
SNP	URBN
SOHU	USNA
SPN	UTHR
SPTN	VCP
SRCL	VDSI
SSL	VE
STAN	VIP
STJ	VIVO
STLD	VLCM
STO	VLO
STRA	VMC
STX	VMI
SUN	VSEA
SUNH	VSEC
SURW	VSNT
SWSI	WAB
SYK	WAT
SYNA	WBD
SYNL	WBK
SYNT	WCC
TBSI	WCG
TCK	WDC
TCO	WDR
TD	WFR
TDW	WGOV
TDY	WHG
TE	WHQ
TECH	WHR
TEF	WINN
TEX	WPPGY
TIE	WST
TIF	WXS
TISI	XRAY
TKC	YZC
TKG	ZU
TLK	
TMX	
TNB	
TNP	
TOC	
TOT	
TPX	
TRMD	