

April 2010

Trading the 30 Minute Opening Range Breakout

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Trading System Development: Trading the Opening Range Breakouts

A Inter Qualifying Project

Submitted to the Faculty

of

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the

Degree of Bachelor of Science



by

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April 29, 2010

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Abstract

The goal of this project is to identify various set-ups and exit strategies that could be used for trading the 30-minute Opening Range breakouts. The project team created a technical trading system using the TradeStation platform and backtested it over 250 stocks from different industry sectors. Twenty two stocks were identified that performed significantly well and details about their performances with various conditions were provided.

Acknowledgements

We would like to extend our thanks to Professor Michael J. Radzicki for his continuous support and help throughout this project. We also would like to thank Geoff Bysshe for sharing his knowledge about the Opening Range in his book “Trading the 10 O’clock Bulls” which helped us develop an Opening Range Breakout Strategy.

1 Introduction

This project is primarily focused on a popular trading principle called the Opening Range (OR). In his book “Trading the 10 O’clock Bulls” (Bysshe, Trading the 10 O’clock Bulls, 2004) which is referred to numerous times throughout this project, Geoff Bysshe defines the Opening Range as the first X number of minutes of a trading day. The number of minutes used to define the Opening Range is up to the trader. In this project, the Opening Range is defined as the first 30 minutes of the trading day.

What makes the 30-minute Opening Range a powerful concept in trading is that it is the period during which traders act in response to recent news and observe the initial price movements of a particular stock with respect to the analysis they have done since the close of the prior day. The fact that important economic reports are often announced at 10:00 am contributes to the significance of this period and makes it informationally rich.

Geoff Bysshe also claims that about 35% of the time, the high and the low prices for the day occur within the first 30 minutes. This means that it is very likely that a stock will continue trading within the Opening Range and if its price breaks out it will continue to move in the direction of the breakout.

Even though the OR is used very frequently by traders and acknowledged as a powerful concept, there is no widely available information regarding how to create an automated Opening Range Breakout strategy. The majority of the literature and studies on trading the Opening Range breakouts give suggestions with very few real examples and are better suited for manual trading.

The purpose of this project is to identify possible set of set-ups and exits that are suitable for trading the 30-minute Opening Range breakouts. Using the TradeStation trading platform, the project team tested 4 different set-ups and 4 profit making exits as well as 2 money management stops on 250 stocks from various industry sectors. The set-ups tested include “Buy easier & Sell easier day, the inside bar, simple and exponential moving average, and volume. Profit making exits tested consist of “the End of the Day exit, Percent trailing exit, ATR Ratchet, and RSI Overbought/Oversold exit” Each set-up was first backtested with the most universal of the 4 exits mentioned above, the end of the day exit, over 5 years (4/21/2005 to 4/21/210). The combination of Buy easier & Sell easier day and volume indicator was identified to yield the best results compared to the other set-ups tested. This set-up was then tested with the other exit strategies over the same time period. The results obtained showed that the End of the Day exit generated higher profits due to significant price movements occurring in the last hours of the trading day.

The next sections will introduce you to the concept of the 30-minute Opening Range and components of complete trading strategies. Subsequently, entry and exit strategies tested will be explained and results will be shown.

2 Background

2.1 Fundamental Analysis

There are two main stock trading methodologies used by traders. Fundamental analysis is an analytical approach which attempts to determine a stock's intrinsic (real) value by examining revenue, earnings, expenses, assets, liabilities and other financial aspects of a company. The overall state of the economy, competition, effectiveness of the management and other factors that could affect a company's business are also investigated by fundamentalists to determine whether an investment opportunity exists.

Fundamental analysis is based on the theory that the market price of a stock will eventually gravitate towards its intrinsic value. Therefore, if the intrinsic value of a stock is higher than its market price, fundamental analysts believe that it is a good opportunity to buy. In contrast, if the intrinsic value of a stock is below its market price, it is recommended that investors should short it. While typically used to determine the value of a company's stock, fundamental analysis can also be applied to other securities such as bonds and currency. It should also be noted that determining the real value of a stock is not always as easy as it sounds. Oftentimes professionals do not agree on the real value of a company's stock.

Listed below are some of the measurements used by fundamental analysts regarding value investing:

- Earnings per Share (EPS)
- Price to Earnings Ratio (P/E)
- Price to Sales Ratio (P/S)
- Price to Book Ratio (P/B)
- Projected Earnings Growth (PEG)

- Dividend Yield
- Return on Equity (ROE)

The major indicators used for value investing is the perspective of a company to grow, even if the price seems overbought with respect to the value investing style.

2.1.1 Problems with Fundamental Analysis

Even though it could be of great value in determining the intrinsic value of a stock as well as identifying long term investment opportunities, fundamental analysis has several drawbacks. (Costa)

1. In addition to the company statistics mentioned in the previous section, there are many other economical, social and political factors that could affect the value of a stock and it is very difficult to give proper weightings to those factors.
2. The data examined by the analysts can be at least 6 months out of date.
3. Too many economic indicators can be confusing to investors.
4. Earnings reported by companies can be unreliable due to creative accounting.
5. Even if an investor can correctly determine the real value of a stock:
 - a. The market may not agree with the assessment of the investor for a very long time.
 - b. It does not tell anything about when to buy or sell the stock. For example, the investor could correctly determine that a stock is undervalued but the stock could well continue to fall.

2.2 Technical Analysis

Unlike fundamental analysis which attempts to determine a security's intrinsic value by examining the financial aspects of a company, technical analysis examines past price movements

to anticipate future price changes of a stock. Technical analysts (also called technicians) use a variety of charts and modeling techniques to identify price patterns that can suggest future activity. A technical analyst believes that “a stock’s price is driven by fear, greed, supply, demand and economic value” (Bysshe, Trading the 10 O’clock Bulls, 2004) and all available information is contained in the stock’s price. Technical analysis can be applied to stocks, bonds, indices, futures, commodities or any other tradable instrument the price of which whose is influenced by the forces of supply and demand. It is also applicable to several time frames such as intraday (1-minute, 5-minute, 10-minutes, 15-minutes, 30-minutes or hourly), daily, weekly, monthly or yearly. (Technical Analysis)

Some technical traders base their analysis on chart patterns; others rely on indicators and oscillators. Most technical traders use a combination of the two. However, the use of historical price and volume data is common to all technical traders. It is, in fact, what separates them from their fundamental counterparts. Technical analysts are not concerned whether a security is under/overvalued. What actually matters for technical analysts is a security’s past movements and what information these movements can provide about the security’s future movements. In general, technical analysis is based on the following three assumptions (Cory, Chad, & Casey):

1. *Market action discounts everything:* Technical analysts believe that all the factors (e.g. fundamental factors, overall state of the economy, social or political factors) that influence companies are already reflected by the stocks’ prices, thus making it redundant to analyze all these factors separately.
2. *Prices move in trends:* Technical analysis assumes that prices move in trends. The trend could be up, down or sideways. Technical analysts also acknowledge the fact that there are

periods when the prices are random and do not trend. Once the trend is established, it is more likely that the stock will follow the trend rather than move against it.

3. *History tends to repeat itself*: Technical analysts believe that investors will make similar decisions in the future as they did in the past, causing the price movements to repeat themselves.

Technical analysis is a broad concept, and there are numerous methods used by technical analysts. The next section will cover some of the principles that are relevant to the Opening Range trading approach.

2.2.1 Reading Charts

Reading charts is one of the most important components of technical analysis. A chart is a graphical representation of a security's price movement over a certain time frame. The time frame could range from seconds to months, depending on what type of a trader you are or how much information you want to examine. The shorter the frame, the more detailed the chart becomes. Some of the most popular chart types are bar charts, candlestick charts, and line charts. Throughout this project, the project team used 5-minute bar charts.

2.2.1.1 Bar Chart

Perhaps the most widely used chart type, the bar chart consists of individual bars that include the open, close, low and high prices of the time frame chosen. Figure 1 is a 5-min bar chart of Google, Inc. Each individual bar on the chart is made up of a vertical line, an opening foot and a closing foot. The open is the first price and the close is the last price traded during each 5-minute interval. Similarly, the high is the highest price and the low is the lowest price traded during each bar. The high and the low are represented by the top and the bottom of

individual bars, respectively. Bar charts can also indicate the range and the direction of a time frame (e.g. 5-minute). The range of a bar is calculated by subtracting the low from the high. If the closing foot is above the opening foot, the bar is an upward bar. If the opening foot is above the closing foot, the bar is defined as downward bar. (Milton)



Figure 1: The Bar Chart

2.2.2 Price vs. Volume Relationship

“Price and volume should always be looked together”. According to Geoff Bysshe (Bysshe, *Trading the 10 O'clock Bulls*, 2004), one of the most common mistakes made by the novice traders is their tendency to ignore volume and focus only on the price movements in a chart. Volume, the number of shares of a particular stock being traded at a given time, is very important for trading that many technical analysts believe that it actually precedes price. So why is volume important? The primary reason is that high volume is an indication of high commitment to a position. A higher than normal volume indicates that traders are willing to put

real money into a stock. Therefore, if the rise in a stock's price is accompanied by an increase in volume, the traders might anticipate that the stock's price will continue to go higher (Bysshe, Trading the 10 O'clock Bulls, 2004). Oftentimes the increase in price on low volume suggests that the movement will not be sustained and is likely to retrace.



Figure 2: Price vs. Volume Relationship (Bysshe, Trading the 10 O'clock Bulls, 2004)

As seen in Figure 2, the surges in volume drove the price of the stock higher whereas the price faced a decline on lighter volume. Later in this paper, the project team will explain the role of volume in trading the opening range breakouts.

2.2.3 Support and Resistance

Support is the price level that attracts buyers and prevents the stock price from being pushed downward whereas resistance is the price level that attracts sellers and prevents the stock price from moving upward. Support and resistance should be considered as areas rather than points. If prices break through one of these areas, support and resistance reverses roles: When a

stock rises above its resistance level, the old resistance now becomes the new support. Some of the factors used for determining how significant a support or a resistance level will be are as follows: The amount of time that the stock spends at that level, the number of times that the stock trades at that level, how recently that level was formed and the relative volume at that level. Support and resistance levels are crucial for trading the 10 o'clock bulls as the high and the low of the opening range often act resistance and support, respectively, and breakouts occur once the stock price breaks through these levels.

It should also be noted that charts may not have clear patterns or support and resistance levels all the time. Traders should avoid overanalyzing charts.

2.3 The Opening Range

The Opening Range is defined in terms of two components – time and price. The time component is the length counted from the beginning of the current market day and is usually the first half an hour of trading activity ending at 10:00 am, although some variations exist. The OR is usually regarded as the first 30 minutes of trading activity because oftentimes important economic news is announced at 10 o'clock which can influence the market significantly.

The price component of the OR is defined as the highest price and the lowest price during the time span of the Opening Range. The following is a sample graph representing the OR by the given description. The yellow dashed lines represent the OR High and Low.



Figure 3: The Opening Range

2.3.1 Principles of the Opening Range

To analyze the Opening Range it is essential to understand the underlying principles behind it - it is defined on the premise that it is the price discovery period of the day. Geoff Bysshe (Bysshe, Trading the 10 O'clock Bulls, 2004, p. 23) claims that it is emotionally charged because the traders and the investors had time to analyze the previous trading day's price movements and news and now have the first opportunity to trade on this information. This makes the OR emotionally charged as well as informationally rich because it gives the trader clues of the stock price behavior for the day. Due to his personal experience, Geoff Bysshe claims that in 35% of the cases the opening range high and low points are the high and low for the day. He further suggests that once the price breaks out from the Opening Range, it is highly probable that the stock will make a significant move in the same direction. This information gives the basic ideas and guidelines for a trading strategy that utilizes those characteristics of the Opening Range and can bring significant profits on the daily fluctuations of stock prices.

2.3.2 Breakouts & Breakdowns

Breakouts and breakdowns occur when the stock's close crosses above or below the OR high and low, respectively. Breakouts and breakdowns are commonly traded patterns and their significance comes from the fact that once the stock price breaks the support or resistance level, it is expected to make a significant move in the same direction. In the case of the Opening Range, the high and the low act as a support and resistance for the stock price and are therefore the beginning of a trend for the day which can be traded.

2.3.2.1 *Buying the initial breakout*

Buying the initial breakout means initiating a trade the first time the price of the stock closes above the OR high or below the OR low and is considered a bullish or a bearish signal accordingly. It is usually combined with other indicators which should verify that it really is a trend in the stock's price and not a price fluctuation. This is a very aggressive approach since it tries to catch the trend as early as possible without waiting for a second breakout confirmation. The benefit is that if the trend is predicted correctly, we can catch the lowest price and thus make the largest profit.

2.3.2.2 *Buying the retracement to the breakout*

The instance when the price breaks out of the Opening Range and afterwards retraces back to the OR high or low is called a retracement. This serves as confirmation for our assumption for the price movement since once the stock retraces, for example back to the Opening Range high, this becomes the new support level and the price is likely to continue moving in the direction of the breakout. Figure 4 is an example of a retracement Google (GOOG) makes around the middle of the trading day. We can see how once it retraces to the OR

high, which now serves as support, the stock continues to move in the direction of the initial breakout. The advantage of trading this pattern is that it gives more evidence that we have correctly predicted the stock movement. The drawback is that not all breakouts retrace; therefore, waiting for the retracement may cause an OR breakout strategy to miss big moves.



Figure 4: Retracement Example

2.3.2.3 Buying the second breakout

The second breakout is the instance when a stock breaks out of its Opening Range, for example the OR high, and then subsequently goes below this level and breaks out again. Initiating a position after the stock breaks out of its Opening Range confirms our initial assumption of the price move. However; similar to waiting for the stock to retrace back to its

Opening Range, waiting for a second breakout may cause the strategy to miss the day's biggest move.

2.3.3 Fading the Opening Range

“Fading”, which is taking position against the current price move, is another way to take advantage of the Opening Range, especially if there is no confirmed breakout or breakdown throughout the day. When a stock doesn't break out of its OR, it will most likely fluctuate between the OR high and low. Fading the Opening Range means to buy near the OR low and sell near the OR high (for long positions) or sell near the OR high and buy to cover near the OR low (for short positions).

2.4 What have others done?

The Opening Range is a very popular concept that was first introduced by Toby Crabel in his book “Day trading with short term price patterns and opening range breakout” (Crabel). It has since been further developed in a variety of ways in the literature by Geoff Bysshe, Mark Fisher (Fisher, 2002) and others. While all sources agree that the OR is a powerful concept, there is no unified method to properly identify the price trends and the correct conditions to properly utilize them. Most of what is written on the topic consists of guidelines and suggestions with a few examples, but very few real performances or solid rules were introduced on how to create a successful OR strategy. With this project we intend to take some ideas, develop them and show how they affect the OR trades and in a sense fill some of the gap between suggestions and tested results. Another important contribution the project makes is that it backtests, structures and analyzes various ideas.

2.5 Profile of a Complete Trading Strategy

In his book “Trading as a Business”, a guru of trading, Charlie Wright, lists 5 steps required in developing a successful trading strategy (Wright, 1998). According to Wright, a common mistake made by many traders is their tendency to discard an idea entirely and move on to something else when the idea does not initially work to their satisfaction. Wright points out that the discarding of an idea such as the use of a particular indicator is usually a mistake because indicators represent only one half of the strategy development puzzle. He explains that ‘any’ indicator can be profitable if used properly with other components of the strategy. This section will walk you through the steps explained in Charlie Wright’s book.

2.5.1 Set-up

The set-up is a condition or set of conditions that need to be met prior to placing an order in the market. The set-up could consist of a single indicator or a filter as well as a group of indicators and/or filters depending on the type of strategy that the trader wants to develop. It should be noted that the set-up does not get you in the market. It only warns the trader that the conditions are right for taking a position in the market. The set-ups differ from one strategy to another. A trend following strategy would typically use a different indicator than a support and resistance strategy unless the trader is using an indicator in a unique way so that it works well with both of those strategies.

Examples of set-ups include:

- A fast moving average (e.g. 20 day) crossing above a slow moving average (e.g. 50 day)
- The Relative Strength Index (RSI) going into its overbought or oversold level
- Price moving above the Opening Range High or below the Opening Range Low

There is a number of ways to take a position in the market. Combining the set-up with the right entry as opposed to trading the setups only leads to a more accurate and profitable strategy (Wright, 1998).

2.5.2 Entry

Entry is the signal that gets you in the market once the necessary conditions for the set-up are present. The Entry should stick to the following two principles:

1. The Entry rule should confirm that the prices are moving in the direction suggested by the set-up.
2. The Entry should catch all trading opportunities that the strategy was designed for.

The first principle explains that the price move should be in agreement with the expected move indicated by the set-up. For example, if a long position is to be taken, the prices should be going up so that we can enter a long position comfortably.

The second principle states that the entry should get in the market at every opportunity that it was designed to capture. Thus, the entry is flawed if it misses opportunities such as big moves. (Wright, 1998)

Examples of entries include:

- A buy stop order one tick above the Opening Range High
- A buy stop order above the high of the current bar
- Buy at market after a close above the previous bar's high

As the examples above indicate, orders are an important part of the Entry rules. The first two examples consist of “stop” orders whereas the third example uses a “market” order. Stop orders

get you in the market once the market passes through a pre-selected price. The strategy will not take a position unless the prices move above (long positions) or below (short positions) that pre-determined threshold value. Stop orders satisfy both of the principles explained earlier in this section. On the contrary, market orders take a position in the market without any restrictions on the price of the stock. Market orders violate the first Entry principle. In order for the first principle to be met, a condition needs to be attached to the market order. For example, for a short entry, a condition such as “buy next bar at market if the open of the next bar is smaller than the close of the current bar” could be used.

2.5.3 Exit with Profit

Exits are a significant part of trading strategies. They are important because they determine the size of profits, size of losses, amount of risk, and the total return. Exiting positions with profit is something that every trader wants to achieve. After all, it is the reason why people trade. However, getting out of the market with profits is not that easy. A guru of trading who is often referred to as Mr. Exit, Chuck Lebeau (LeBeau), explains exits as follows: “For most traders, exits are more difficult than entries because people have unrealistic expectations. We expect to sell at tops and buy to cover at bottoms. We can enter trades on our own terms but we must exit trades on terms set by the market.”

The goal of an “exit with profit” strategy, as the name suggests, is to increase profits. Therefore, it is crucial to have a good exit strategy or group of strategies that will maximize profits while in the market. These types of exit strategies are not used to protect the initial capital. It is the role of a money management stop to limit the amount of loss in losing trades. (Wright, 1998)

Examples of exits with profit include:

- Exit when the profit reaches 2% of the entry price.
- A trailing exit strategy taking you out of the market once the price has retraced a specified dollar amount of the position's highest profit value.

2.5.4 Money Management Stop (Exit with Loss)

Even though traders expect the market to move in their favor after placing an order, it is quite common to find that the market reverses its direction and moves against them. In such cases, it is a good idea to have a sound money management stop to get you out of the market. A money management stop is simply a protective stop order used for protecting your initial capital. It could also be defined as the maximum amount that a trader is willing to risk on a given trade. It is placed a pre-determined or calculated amount below the entry price for a long trade and above the entry price for a short trade.

Even though a money management stop prevents huge losses, it may also prevent the system from making profits if placed too close to the entry price. In his book "Trading as a Business", Charlie Wright recommends that money management stops not be hit more than 10% of the time (Wright, 1998).

Examples of money management stops include:

- Dollar stop: risking a pre-determined amount per trade
- Percentage Stop (e.g. 2% of the account balance)
- Exiting at OR Low and OR High for a long and short position, respectively

2.5.5 Position Sizing

The final component of a complete trading strategy is position sizing. One of the most important but often overlooked components of trading strategies, position sizing refers to the amount of capital a trader places on each trade. In other words, position sizing determines how many shares that a trader should trade per position for his account size. Placing most of your capital into one single trade is not a wise decision. Breaking up the capital into small pieces helps spread the risk across various trades. Position sizing also determines how the account size is split among various investments products within the trader's portfolio. Position sizing changes depending on account size and the type of product traded.

2.6 System Testing

2.6.1 Backtesting

Backtesting is the process of testing a strategy or analysis technique over historical data to observe its performance, or said in another way – see how accurately the technique or analysis would predict the actual results. Depending on the strategy, backtesting can be performed on different stocks or over the same stock for different time periods.

The importance of backtesting is that previous performance is the best indicator about future performance. One of the most important purposes of backtesting is to verify the logic and basic assumptions of the strategy. If it underperforms or does not meet expectations, the underlying assumption might need reconsideration or even change. Backtesting should be also combined with optimization to improve or adjust the parameters to different financial instruments or time periods such as to maximize the profits.

2.6.2 Optimization

Optimization is the process of searching for the best values for the underlying parameter set which will give the strategy the highest value for its objective function. An example might be optimizing the length of the Opening Range in order to maximize profits. In TradeStation, the user can specify a start and a stop value for the parameter needed to be optimized. An increment which is also selected by the user is used for increasing the value of the input.

TradeStation has two optimization options. Exhaustive optimization calculates all possible combinations of all strategy parameters in the range specified and displays the results in a chart with one to one correspondence between the parameter and the resultant profit. Genetic optimization approximates the optimal value using mathematical rules. Genetic optimization is preferred when exhaustive optimization is too time consuming.

One of the most important issues regarding optimization is to avoid curve fitting. Walk Forward analysis is one of the techniques used by traders to perform optimizations while avoiding curve fitting. “Walk-forward optimization is that you optimize the parameter values on a past segment of market data, then test the system forward in time on data following the optimization segment. You evaluate the system based on how well it performs on the test data, not the data it was optimized on.” (Makarov, 2004)

2.7 Tradestation

TradeStation is a platform created for rule-based traders with variety of tools to test and execute their ideas. It utilizes historical data and many preexisting standardized functions and strategies, as well as different types of studies. It was especially suitable for our project because

it utilizes Easy Language, TradeStation's native programming language, which allowed us to program and test our ideas.

3 Creating the Actual OR Strategy

Having explained the components of complete technical trading strategies, we will now provide a detailed overview of the set-ups and exits tested in this project. This section will walk you through individual indicators/filters used as part of different set-ups as well as various exit strategies each of which were backtested with our final entry strategy. First, we will go over the first Opening Range Breakout strategy that we started with. Subsequently, we will explain how this basic strategy can be improved with certain filters and exit strategies. The results of backtesting will be shown in section 4.

3.1 Basic Opening Range Breakout Strategy

The Basic Opening Range Breakout Strategy refers to initiating a position right after a breakout above or below the Opening Range takes place after the first 30 minutes of the trading day is completed. This strategy generates a buy order if a 5-minute bar closes above the OR high. Similarly, a short order is placed if the close of a 5-minute bar closes below the OR low. This strategy uses market orders and does not wait for any confirmation. Following are the conditions necessary for this strategy to place an order:

- Time > 10:00 am
- Enter next bar at market if
 - Close > Range High (long orders) or
 - Close < Range Low (short orders)

- Exit at the end of the day

Figure 5 demonstrates a long order placed right after the day's first breakout above the OR high takes place. Initiating a long position as soon as the stock breaks its OR high was advantageous in this case since the stock traded in the direction of the breakout, allowing us to make more than 3\$ profit on a 75\$ dollar stock. Additionally, buying the initial breakout provided us the least expensive entry point.



Figure 5: Basic OR Strategy Example

Figure 6 is an example of the case where the trend reverses indicating that simply buying the stock when it breaks its Opening Range could lead to a significant loss of money. These are

the trades that should be avoided. Figure 6 can be a good example of fading the OR which, however, requires additional conditions to be met.



Figure 6: Basic OR Strategy Example

The major characteristic of this very basic Opening Range Breakout strategy is that it generates high number of trades and has inconsistent results. While some stocks can perform well with this strategy, many others perform poorly and lose money. The fact that the number of trades is very high also results in high commission costs which may affect the performance of an intraday strategy considerably.

Figure 7 illustrates that Bank of America (BAC) performed reasonably well with this very simple strategy although the stock itself lost almost 50% of its value. The graph illustrates the equity curve line (shows the net profit after each trade) for 1 share of BAC over the last 2 years.

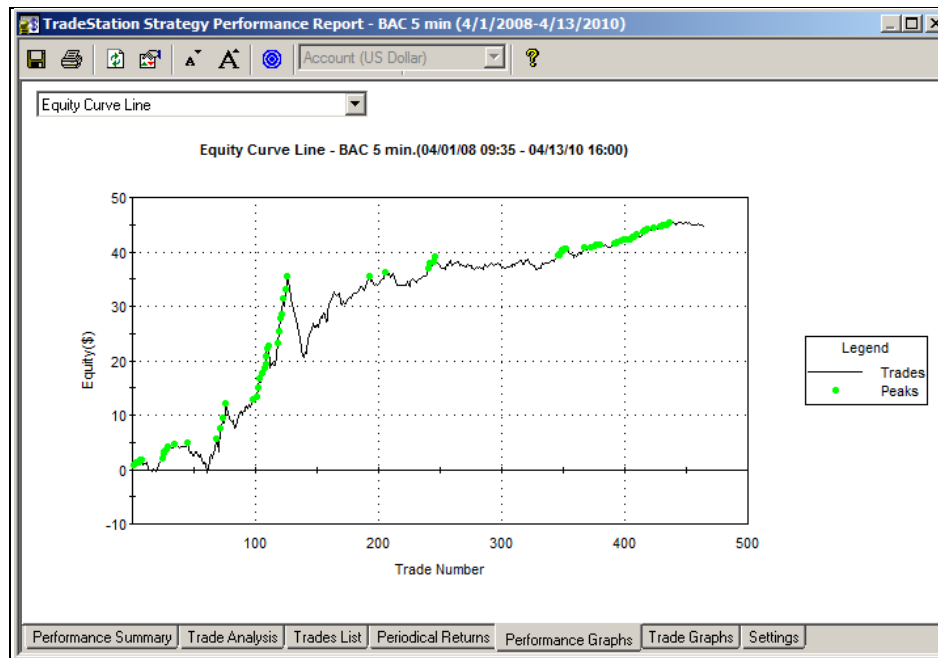


Figure 7: Basic OR Breakout Strategy Performance Report for BAC

The inconsistency with these results can be shown in the following example. The stock price of Duke Energy Corporation (DUK) went down about 10% in the last 2 years while trading

DUK with the Basic Opening Range Breakout Strategy would have yielded even worse results.

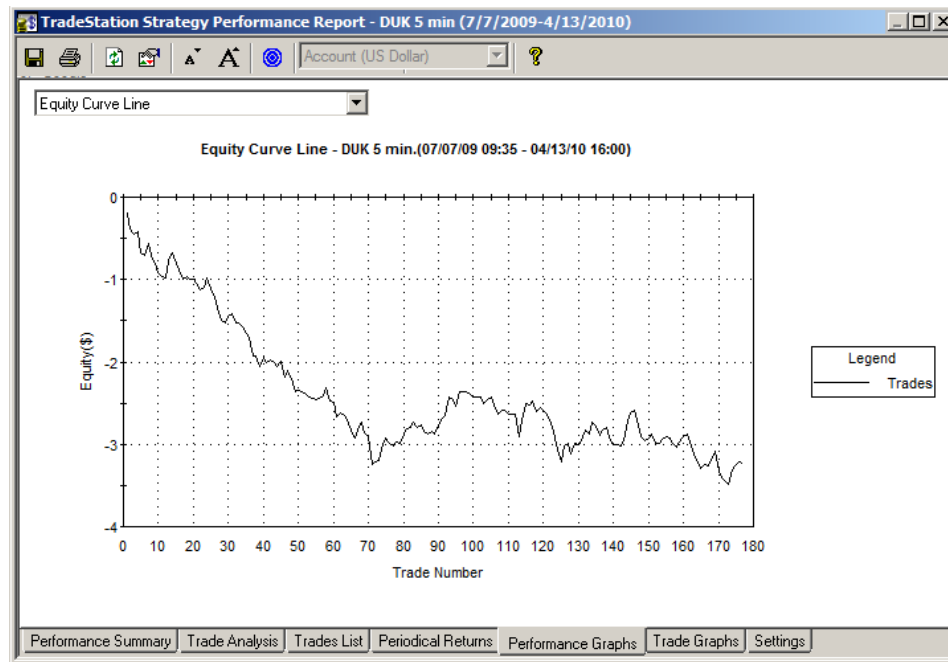


Figure 8: Performance of the Basic OR Strategy on DUK

3.2 Entry Strategy: Set-ups & Triggers

Many traders know that the process of creating a trading system can be endless. There are many different types of set-ups that can be used for different markets and time frames. Finding the best combination of indicators could be never-ending. Throughout this project, the project team tested a number of different entry strategies consisting of various indicators and triggers. In this section, we will go over four filters/indicators that we believe can be used as part of set-ups for trading the Opening Range breakouts. In section 4, we will show how each filter and indicator improves the Basic Opening Range Breakout strategy.

3.2.1 Yesterday's Values: Buy Easier Day & Sell Easier Day

Yesterday's data are key price points for many traders. Since Opening Range Breakout systems are examples of intraday trading, the project team has decided that yesterday's data might have an influence on the performance of a 30-minute OR strategy.

The advantage of using yesterday's data is that we are allowing the most recent data to guide our expectations of what is likely to happen today. Instead of trying to predict the market, we compare yesterday's prices with today's and make a strategic decision on whether to go long or short.

How do we use yesterday's price data to trade the Opening Range breakouts? First, we define yesterday's average price as the average of yesterday's high, low and close. If close is smaller than the average of yesterday, we feel that it is more likely that today there will be a breakout above the OR high. On the other hand, if close is greater than or equal to yesterday's average price, we feel that a breakdown below the OR low may take place. (George Pruitt, 2003)

3.2.2 Simple & Exponential Moving Average

Simple moving average and exponential moving average are technical indicators that compute the average price of a security over a certain period of time. They smooth data points and make it easier for traders to spot market trends. While moving averages are usually calculated by using the closing price, they can also be created from the open, the high or the low price of a security. Simple and exponential moving averages are similar to one another except that simple moving average gives equal weight to all data points whereas exponential moving average gives more weight to recent prices relative to older prices. Exponential moving averages are usually used for reducing the lag in simple moving averages.

How could the moving averages be used as a part of an entry strategy for trading the Opening Range breakouts? Oftentimes the breakouts are not strong enough and retrace back to the level from which the stock initially broke out. It is also very common to observe stocks breaking out of their OR high or low and immediately going below (long positions) or above (short positions) these levels. To help prevent an Opening Range breakout strategy from taking a position in the market due to false breakouts, simple and exponential moving averages could be utilized along with other components of an entry strategy. Since moving averages smooth data series, moving average line usually falls below the OR high (or above the OR low for shorts) when a false breakout takes place. Therefore, waiting for the moving average line to cross “above” the OR High (for long positions) or “below” OR low (for short positions) and stay above or below these levels help confirm that the trends is up or down. Thus more accurate trades are generated. The disadvantage of waiting for the moving average line to cross OR levels and build bullish or bearish patterns is that it may cause the system to be late to take a position and thus miss big opportunities given the fact that not all breakouts retrace.



Figure 9: False Breakouts (FedEx Corp)

Figure 9 is an example showing how a 12-period exponential moving average can prevent the strategy from getting caught buying a stock that fails immediately after it breaks above its OR high and below its OR low. The stock breaks out below its OR low at 10:20 am but starts rising again and breaks out above its OR high at 11:20 am with big volume. Nevertheless neither of the breakouts was strong enough and the stock closed the day within the range. The exponential moving average remained within the OR range throughout the whole day preventing the system from taking a trade.

Figure 10 is an example of how Google retraces after the first breakout and goes below its OR High level. The 9-period simple moving average remains under the OR high level and breaks out once the stock price starts rising. A long position is initiated at \$327 and the system exits the position at the end of the day, making about \$9 profit per share.



Figure 10: SMA Example (Google Inc)

Even though both simple and exponential averages serve the similar purpose in this project, we will be using an exponential moving average during backtesting due to the fact that it reacts faster to price movements and is less likely than a simple moving average to miss big opportunities. Below is the Easy Language code for the exponential average condition used in our strategy:

```

Inputs: Price(Close), ExpoLength(12);
Var: ExpAvg(0);
ExpAvg= xAverage(Price, ExpoLength);
ExpAvg > RangeH ///Long Condition///
ExpAvg < RangeL ///Short Condition///

```

3.2.3 The Inside Bar

An inside bar is a bar that is completely within the range of the bar that precedes it. In other words, an inside bar has a lower high and higher low than the preceding bar. What makes an inside bar important is that it is a sign of indecision or consolidation. An inside bar indicates that there was not enough interest in the stock at a given time to move it higher or lower. It is usually assumed to be a consolidation prior to a breakout. Introduced to the idea of trading the inside bar by Prof. Michael J. Radzicki, the project team decided to test whether inside bars could improve the performance of a 30-min OR Breakout strategy.

During our research we have found out that inside bars are more frequently used as a part of long term trading strategies. Even though intraday and day trading strategies differ from one another on many grounds, they share many similarities as well and many features could be used in both strategies with certain modifications. This led us to examine the effects of inside bars on 30-minute OR breakout strategies.

Along with other filters we have covered so far in this section, we made use of the inside bar methodology after the first half hour of the trading day as a guide showing us which breakouts may be stronger than the others. During our study, we have recognized that breakouts that occur after inside bars are often more promising and more profitable. To put it differently, if there is an inside bar after the initial breakout takes place, there is a good chance that the stock may continue its rise. It is important to note that our goal in using the inside bar is not to predict price moves but rather to take the advantage of a pattern that we observed occurring very frequently. Inside bar technique is more useful when used along with other indicators. Below is the Easy Language code for the inside bar:

$$H[1] > H \text{ and } L[1] < L$$



Figure 11: Inside Bar Example (Precision Castparts)

Figure 11 illustrates an example of a long entry taking place after an inside bar. Precision Castparts (PCP) breaks out above its OR high at 10:05 am, goes below this level in the next minutes and starts rising again. An inside bar shown as a yellow dot takes place at 10.30am and the stock starts to rally. Note that there is another inside bar occurring earlier in the morning just below the OR high. The second inside bar acts as a confirmation that the stock price's break above the resistance level (OR high) will continue.

3.2.4 Volume

As explained earlier in the background section, volume is one of the most common indicators used by traders. Big volume is an indication of interest in the stock. In his book "Trading the 10 o'clock Bulls", Geoff Bysshe (Bysshe, Trading the 10 O'clock Bulls, 2004) puts great emphasis on price-volume relationship and explains that breakouts on big volume are more

likely to be successful. What is not stated in this e-book is what is meant by big volume: Is that a single huge volume bar near one of the OR levels or a group of consistently high volume bars or something else?

Even though volume serves as a confirmation of the price action, what we have recognized throughout this project is that volume does not always show clear patterns near OR levels. To put it differently, successful breakouts may occur with a single huge volume bar (or skyscrapers, as we would call them) or they may occur after consistently high volume bars. There are also occasions when an excellent breakout takes place on light volume followed by an increasing volume trend.

Writing an easy language code that would spot skyscrapers and trade only when the volume of current bar is much greater (e.g. 150%) than the volume of previous bar will miss other opportunities. Taking a position only when there is certain number of high volume bars right after one another may also create similar problems. For instance, we observed that taking a long position above the OR high only after three consecutive high volume bars have occurred works very well for Google but not for many other stocks.

We believe that it may be more beneficial to use volume differently for different stocks. If your entry strategy is giving a buy signal at OR levels and you also have huge volume on top of that, it is certainly a plus. We believe that how volume is defined is up to the trader. In this project, we created a more universal volume condition which we can apply to more stocks. Our volume condition is as follows: Take a position above the OR high or low only if the current volume is at least 30% greater than the average volume of the last 10 bars. Below is the Easy Language code for this condition:

```

Input: AvgLength(10), BrkOutPct(30);

Vars: BrkOutFactor(0);

BrkOutFactor= 1 + (BrkOutPct * 0.01);

//Condition//

Volume>= (AverageFC(Volume, AvgLength))*BrkOutFactor;

```

Another way of using volume in OR breakout strategies could be to observe the volume within the first 30 minutes and determine if it is unusually high. We define high or low by comparing the average volume of the first 6 volume bars on a 5-minute chart (from 9:30 to 10:00) to the average volume of the last 20 days. 20-day volume average gives us an approximation of the typical volume of a stock on a given day. If a stock normally trades X shares a day and the average volume of the OR is 2X today, then there is an unusual interest in that stock today which “could” make the stock a good candidate for a breakout.

In addition to entries, we also use volume to identify support and resistance points. (A similar idea is originally developed by Scott Landers from DataView, LLC. His methodology called V-box breaks the trading day into three segments and identifies the highest volume bar within each segment. The high and the low of the candlestick bar that corresponds to the highest volume bar in each of these segments are used as possible support and resistance.) These points will later be used as part of our protective stop strategy. Basically, we identify the highest volume bar within the first 30 minutes of the trading day and record the high and the low of its correlated price. We will call this volume bar “OR high volume bar” throughout the rest of this paper. These price points are then used as possible support and resistance levels throughout the rest of the day. Figure 12 illustrates examples of support and resistance points identified by volume. The price bar between the red and cyan arrows is the price level at which the highest

volume has occurred within the first 30 minutes. Since high of this bar is the highest price of the Opening Range, the upper line also represents the Opening Range high. The purple dashed line represents the Opening Range low.

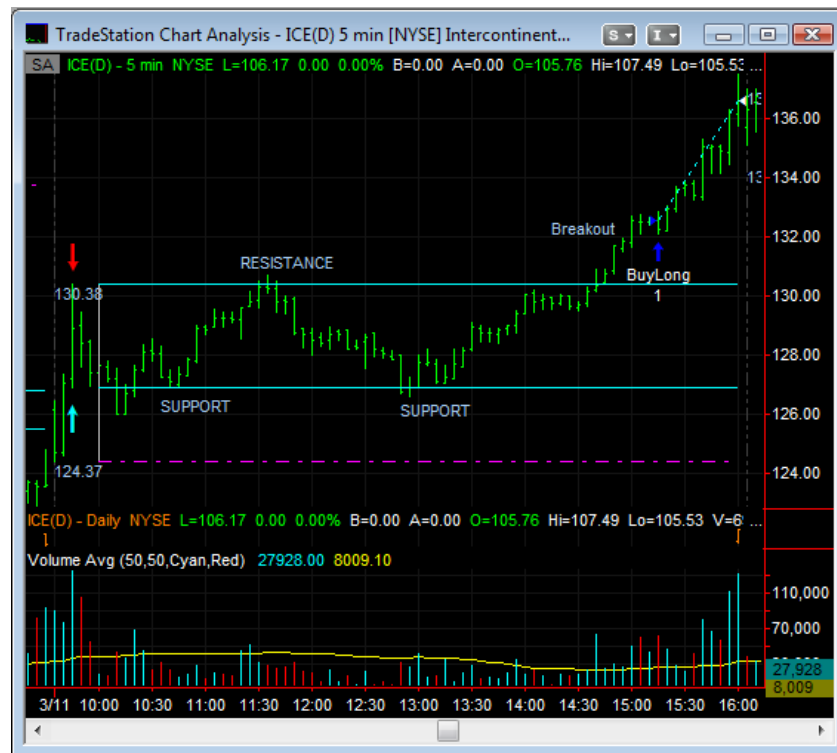


Figure 12: Identifying Support & Resistance using Volume

Note that the cyan lines act as support and resistance throughout the day and a long position is initiated after the stock breaks out above the upper line. If the price goes a certain amount below the support line showed above after a long position is initiated, a protective stop order could be placed below the support line.



Figure 13: Identifying Support & Resistance using Volume

Figure 13 illustrates how the same logic could be used for short positions. Note that price starts going up right after the order is placed. The lower cyan line acts as resistance and the price starts going down again. A protective stop order could be placed certain amount above the lower cyan line.

3.3 Exits

This section consists of 4 profit-maximizing and 2 stop loss exit strategies. The following subsections will walk you through each of these exit strategies. In section 4, we will show backtesting results for each of these exit strategies and compare the performance of each profit maximizing exits as well as show how each stop loss performs when combined with profit exits.

3.3.1 End of the Day Exit

The first exit strategy tested by the project team is the “End of the Day” exit. End of the day exit dictates that a position will be exited at the end of the day. This stop is one that traders use if they don’t like holding positions over night because of the significant price movements that might occur over night or as the day opens over some news. In this project, end of day exit will have two important roles. First, it will serve as a simple exit to limit the trading strategy within the given day. Second, it will be used for testing different entry conditions.

Except for limiting the position, end of day exit has also another characteristic that makes it attractive. Throughout the project, we observed that prices very frequently experience a significant change in the last hour of the trading day which makes it beneficial to use end of the day exit for trading the 10 o’clock bulls and bears. Oftentimes, the stock may retrace or even fall below its OR high level after a long position is generated. (The reverse is true for short positions- the price may go above the OR low level) Instead of exiting the position, it may be much more profitable to hold the position till the end of the day as the stock might still recover and close the day with gains. Figure 14 illustrates that SPG rises dramatically in the last hour of the trading day and holding the position till 4:00 pm generates around 2\$ profit per share.



Figure 14: Dramatic Rise in Price in the Last 1.5 Hours followed by End of the Day Exit

3.3.2 Percentage Trailing

The goal of the percentage trailing exit is to let the trade profit grow as long as the conditions are right and exit when the trend changes and the stock starts losing profits. This exit is based on percentages rather than on a fixed dollar amount since the percentages can be applied to any stock. In other words, percentage works same on a \$1 stock or a \$100 stock. Our percentage based exit consists of two conditions: First, the position has to make a profit equal to at least 2% of the entry price before the exit condition can be activated. Second, if the first condition is met, an exit order will be generated if 20% of the position profit is lost. We allow 20% loss of profit to prevent premature exits due to the fluctuations occurring during the trading day. This logic gives the trade a reasonable amount of room to grow and become profitable. Below is the Easy Language code for this percentage trailing exit:

```
Vars: mp(0), Input: longtrailingperc(20);
```

```
MP=marketposition;  
If mp=1 and positionprofit>= entryprice*0.02 then  
SetPercentTrailing(positionprofit,longtrailingperc);
```

3.3.3 ATR Ratchet

The Average True Range (ATR) is a technical indicator that measures a security's price volatility. J. Welles Wilder (Welles, 1978), the developer of the ATR, defines the true range as the greatest of the following:

- The 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 Average True Range is then calculated by taking the average of the true range over a particular time period. The value returned shows how much a stock moved either up or down on average over the specified period. High values indicate that a stock is experiencing high levels of volatility whereas low values are an indication that the price of the stock is staying relatively constant.

ATR Ratchet is a profit taking exit strategy developed by Chuck LeBeau. ATR Ratchet “progressively ratchets up an increment of average true range multiplied by the amount of time added to the lowest low in the trade.” (Ripe Trade) Therefore, the stop gets closer and closer to the current price as time goes by. The same logic is also true for short positions. Chuck LeBeau explains this logic as: “We have a rising stop that is being accelerated by both time and price.” (LeBeau) The Easy Language code for ATR Ratchet- Long and Short Exits can be found in Appendix 8.6 and 8.7.

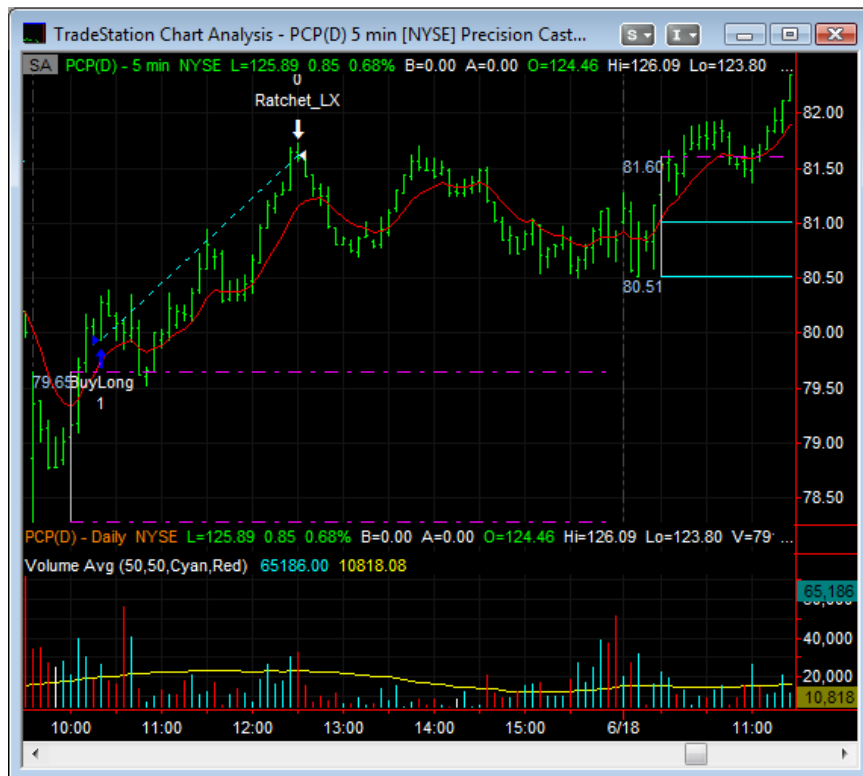


Figure 15: ATR Ratchet- Short Exit (Precision CastParts)

3.3.4 RSI Overbought & Oversold

The Relative Strength Index (RSI) (Welles, 1978) is a technical indicator that helps measure the strength of a security's price relative to its past moves. The RSI compares a security's recent up moves to its recent down moves and helps indicate whether the security has seen more buying or selling pressure over the trading period. The RSI is plotted as an oscillator between a range of 0 to 100 where 100 is the highest overbought level and 0 is the highest oversold level. (Investopedia) Overbought and oversold levels are typically set at 70 and 30, respectively, although different combinations such as 80 and 20 are highly popular among traders. When the RSI crosses above 70, the stock is seen as overbought and a pullback is likely to occur whereas readings lower than 30 signal an oversold condition indicating that the stock is likely to become undervalued.

Calculation

$$RSI = 100 - \frac{100}{1 + RS}$$

$$RS = \frac{(\text{Sum of the closing prices of up days}/n)}{(\text{Sum of the closing prices of down days}/n)}$$

n = trading periods

(Investopedia)

A common use of the RSI is to generate buy and sell signals for entry strategies. One way is to generate a buy signal when the RSI value crosses the oversold level in upward direction. Similarly, a short entry could be generated when the RSI value crosses below the overbought level.

In this project, we used the RSI indicator as “an exit with profit” strategy. If we are in a long position, we exit when the RSI crosses above the overbought level. Similarly, if we are in a short position, an exit order is generated when the RSI crosses below the oversold level. We chose 80 and 20 as our overbought and oversold levels, respectively, as opposed to 70 and 30 in order to give the trades a reasonable amount of time to grow and become profitable.



Figure 11: RSI Exit Example (Google Inc)

Figure 16 is an illustration of an exit order generated after the RSI goes below its oversold level.

3.3.5 Money Management Stop 1: Opening Range High & Low

Throughout this project, the project team tested several stop loss strategies. Stop loss is an important concept in trading as it protects your capital and “keeps you from falling asleep” (LeBeau). A stop strategy we utilized is one connected to the OR high and low by using them as support and resistance for the price movement. For example, whenever we take a long position on the OR high breakout and the price reaches the OR low we use it as a signal that we might have caught the wrong trend and should minimize our loss by exiting the position once stock goes below this price level. What we observed is that sometimes when the range is smaller the OR low might act as support and the price might breakout from the OR high again and make profit. Similarly, for short positions, OR High often acts as resistance and the stock goes back

below the OR low level if the resistance cannot be broken. After we implemented this stop loss strategy, we recognized that it cut a significant portion of our profits.

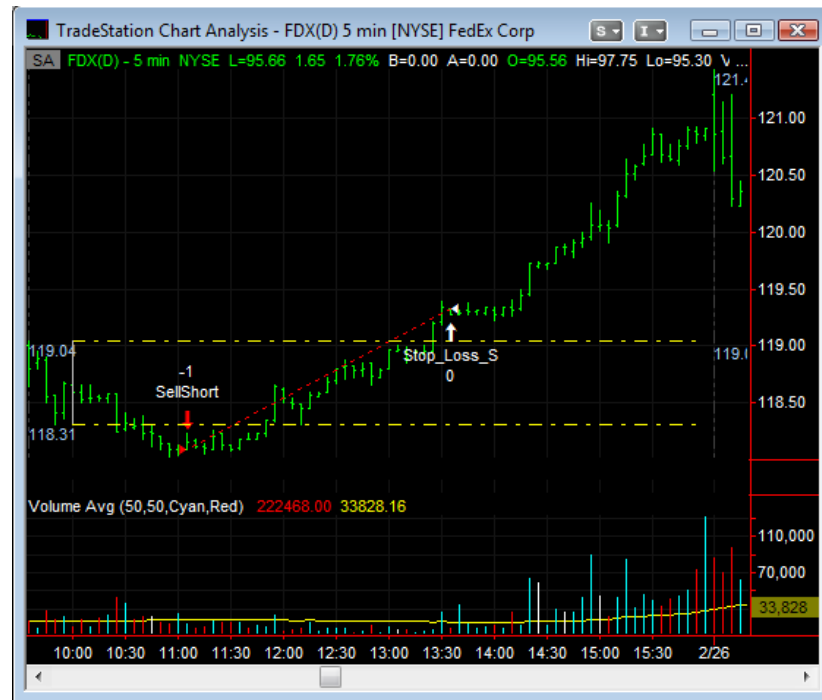


Figure 17: Stop Loss using OR High (FedEx)

Figure 17 is an example of a stop loss order created using the OR high. A short order is initiated; however, the trend changes its direction and price starts rising. The stock breaks above the OR low, making the OR low new support and the OR high new resistance. Once the stock breaks above the OR high level, we exit the position. For long positions, we wait until the high of a bar gets below the OR low. Similarly, for short positions, we wait until the low of a bar gets above the OR high. Below is the Easy Language code for using the OR High and OR low to generate stop loss orders:

```
Vars: MP(0);
```

```
MP= MarketPosition;
```

```
if mp=1 and H<RangeL then sell ("Stop_Loss_Long") i shares shares next bar at market;
```

if $MP = -1$ and $L > RangeH$ then buy to cover ("Stop_Loss_Short") 1 share shares next bar at market;



Figure 18: Stop Loss preventing the Strategy from making Profit

Figure 18 shows a stop loss example taking place after the price breaks above the OR high when the position is short. The position is exited at OR high to stop additional losses; however, OR high acts as support and price goes below its OR low again and closes the day 2 dollars below it. We recommend treating OR high and OR low as price areas rather than price points. Therefore, instead of exiting the position right after the price closes above or below opening range levels, it is better to exit the position only after the price closes a certain amount (e.g. 1 dollar or 2 ticks) above OR high or below OR low or after there are certain number of consecutive closes beyond these levels.

As explained earlier in Entries section, one way we used volume in this project was to identify possible support and resistance levels. As a reminder, we identify the highest volume bar (OR high volume bar) within the first 30 minutes of a trading day and record the high and the low of its correlated price. These price points are then used as possible support and resistance levels throughout the rest of the day. If a long position is initiated and the high of the current bar gets below the high price level created by the OR high volume bar, we exit the position to stop our losses.



Similarly, if a short position is initiated and the low of the current bar gets above the low price level created by the OR high volume bar, we terminate the trade next bar at market. It should be noted that some days the high and the low price levels created by the OR high volume bar could be the same as OR High and OR Low because of the fact that all these levels are

formed during the first half hour. In such cases, Range high and Range low will be used as the primary stop loss levels.

Figure 19 is an example of a stop loss order initiated when the low of a bar gets above the resistance level (lower cyan line). The price of the stock starts rising right after a short position is placed. Once the stock breaks above the OR low level (purple dashed line) this level becomes support and the lower cyan line acts as resistance. The stock remains between these levels from 13.00 pm till 13.35 at which the resistance is broken and the price closes the day even above its OR high level. Below is the Easy Language code for creating stop loss orders using the OR High volume bar:

```
Vars: MP(0), NewVolumeBarH(0), NewVolumeBarL(0),  
if Date<>Date[1] then  
begin  
    NewVolumeBarL = L; NewVolumeBarH = H; NewVol=volume;  
if time < OpenRangeTime and volume > NewVol then  
begin  
    NewVolumeBarL = L;  
    NewVolumeBarH = H;  
    NewVol = volume;  
end;  
MP=MarketPosition;  
/// Long Stop ///
```

```
if MP=1 and High<NewVolumeBarH  
then sell("protective stop_L") ishares shares next bar at market;
```

```
/// Short Stop ///
```

```
if MP=-1 and low>NewVolumeBarL
```

```
    then buy to cover("protective stop_S") next bar at market;}
```

4 Back Testing and Results

Throughout this project, we backtested our strategy with 250 stocks from different industry sectors and identified 22 stocks that perform well with our complete OR strategy. In the following subsections, we will first show how the Basic Opening Range strategy performs on these 22 stocks. Subsequently, we will demonstrate how the performance of the Basic strategy improves with the addition of the filters covered in section 3. In section 4.3 and 4.4, we will compare the performance of different exit strategies. Finally, we will show how our final OR strategy performs on these 22 stocks. For backtesting, our trade size is \$25,000 per trade. We also assumed on \$8 commission per trade.

4.1 Results for the Basic Opening Range Breakout Strategy

Table 1 summarizes the results produced by the Basic Opening Range Breakout strategy.

				Performance Summary							
	Net Profit			Profit Factor			Number of Trades		%	Buy &	ROI
Symbol	All	Long	Short	All	Long	Short	Winning	Losing	Profitable	Hold	
PSA	\$11,781.64	\$29,915.01	\$18,133.37	1.06	1.39	0.83	579	555	51.06%	51.28%	11.78%
GOOG	(\$55.15)	(\$3,203.34)	\$3,148.19	1.00	0.95	1.04	567	567	50.00%	88.84%	-0.22%
SPG	\$19,671.77	\$52,800.96	(\$33,129.19)	1.10	1.74	0.75	605	549	52.43%	16.22%	78.69%
COF	(\$2,951.62)	\$10,146.31	(\$13,097.93)	0.99	1.09	0.90	550	584	48.50%	-43.99%	-11.81%
V	\$5,706.07	\$5,088.59	\$617.48	1.07	1.11	1.01	236	241	49.48%	7.25%	22.82%
MA	(\$12,388.05)	\$9,346.11	(\$21,734.16)	0.93	1.13	0.77	414	470	46.83%	17.85%	-49.55%
AMG	\$38,976.13	\$33,769.01	\$5,207.12	1.20	1.39	1.05	592	584	50.34%	21.11%	155.90%
AAPL	\$2,692.54	(\$145.79)	\$2,838.33	1.02	1.00	1.03	579	573	50.26%	569.80%	10.77%
ICE	\$21,792.06	\$24,854.22	(\$3,062.16)	1.09	1.24	0.98	515	478	51.86%	105.95%	87.17%
GS	\$32.31	\$6,757.69	(\$6,725.38)	1.00	1.07	0.93	609	588	50.88%	54.73%	0.13%
BIDU	\$8,453.97	(\$11,857.84)	\$20,311.81	1.04	0.90	1.19	508	523	49.27%	674.34%	33.82%
BAC	\$33,388.77	\$12,573.94	\$20,814.83	1.17	1.13	1.22	534	599	47.13%	-58.94%	133.56%
BEN	\$127.60	\$21,891.11	(\$21,763.51)	1.00	1.29	0.81	563	607	48.12%	61.43%	0.51%
RIMM	(\$4,116.15)	\$10,550.62	(\$14,666.77)	0.98	1.11	0.88	572	571	50.04%	194.65%	-16.46%
AVB	\$17,999.10	\$41,101.80	(\$23,102.70)	1.09	1.56	0.82	582	562	50.87%	19.72%	72.00%
RYN	(\$21,624.13)	\$11,021.48	(\$32,645.61)	0.89	1.13	0.70	559	614	47.66%	34.24%	-86.50%
X	\$12,920.79	\$7,818.40	\$5,102.39	1.05	1.07	1.04	606	559	52.02%	68.14%	51.68%
SCHW	(\$12,326.15)	\$7,740.18	(\$20,066.33)	0.94	1.08	0.80	536	578	48.11%	70.02%	-49.30%
AFL	\$5,037.48	\$5,481.33	(\$443.85)	1.03	1.07	0.99	510	606	45.70%	24.29%	20.15%
SIRI	\$16,798.43	(\$7,742.17)	\$24,540.59	1.07	0.93	1.20	518	565	47.83%	-82.86%	67.19%
WFC	\$6,183.91	\$14,502.07	(\$8,318.16)	1.03	1.16	0.91	551	627	46.77%	9.70%	24.74%
AKAM	\$6,511.45	\$22,532.43	\$16,020.98	1.03	1.27	0.87	560	571	49.51%	140.14%	26.05%
AVERAGE:	\$7,027.85	\$13,861.01	-\$3,728.21	1.04	1.17	0.94	538	553	49.30%	92.91%	26.50%

Table 1: Results produced by the Basic Opening Range Breakout Strategy

The results show that 15 out of 22 stocks are profitable over the last 5 year trading period.

Number of winning trades is almost equal to the number of losing trades. However;

- The profit factors (total profit divided by total loss) are very low for most of the stocks listed.
- Average Buy & Hold return (92.19%) highly exceeds the strategy's average Return on Investment (26.50%). Therefore, except for some of these stocks such as BAC, AMG or SIRI which have very high ROIs, there is no incentive for the traders to trade many of these 22 stocks using the very basic OR Breakout strategy.
- The strategy generates too many trades (almost every day). Even though large number of trades is not necessarily an indication of a poor strategy, the basic strategy cannot distinguish between successful and false breakouts which in turn increases the amount lost as well as commission costs.

- Short trades yield losses for 13 of the stocks. The average profit factor for short trades is only 0.94 which indicate that the amount made is 94% of the amount lost. Long trades are relatively more successful.

4.2 Testing Entries

4.2.1 Results for Buy Easier & Sell Easier Day Filter

The first entry rule backtested was Buy Easier & Sell Easier Day filter. Table 2 shows the performance of this filter on 10 of the 22 stocks shown in the previous section over the last 5 years. The first half of every column shows the performance of the basic strategy (shown as Basic S.) Highlighted columns indicate the performance of the strategy after the filter is added to the basic OR strategy.

Symbol	Total Net Profit		Long Profit		Short Profit		Prof. Factor		Long Porf. Factor		Short Porf. Factor		Number of Trades	
	Basic S.	After	Basic S.	After	Basic S.	After	Basic S.	After	Basic S.	After	Basic S.	After	Basic S.	After
ICE	\$21,992	\$43,710	\$23,032	\$37,662	-\$1,039	\$6,047	1.10	1.37	1.25	1.76	0.99	1.09	958	577
GOOG	-\$2,617	\$16,916	-\$7,204	\$5,761	\$4,586	\$11,154	0.98	1.26	0.89	1.15	1.07	1.39	1110	642
SPG	\$33,176	\$63,058	\$55,798	\$49,732	-\$22,622	\$13,326	1.17	1.68	1.81	2.23	0.82	1.25	1109	668
COF	-\$4,031	\$37,817	\$7,965	\$25,310	-\$11,997	\$12,506	0.98	1.31	1.07	1.43	0.91	1.19	1098	656
AFL	\$5,037	\$14,564	\$5,481	\$7,420	-\$443	\$7,144	1.03	1.17	1.07	1.18	0.99	1.17	1116	657
WFC	\$2,861	\$26,303	\$12,341	\$24,474	-\$9,480	\$1,829	1.02	1.27	1.14	1.55	0.9	1.03	1137	709
AAPL	\$8,626	\$11,371	\$970	\$4,194	\$7,655	\$7,177	1.05	1.13	1.01	1.08	1.09	1.18	1110	682
X	\$9,405	\$16,269	\$5,958	\$9,660	\$3,447	\$6,608	1.04	1.13	1.05	1.16	1.03	1.11	1127	669
GS	-\$198	\$6,335	\$6,055	\$1,477	-\$6,253	\$4,858	1.00	1.06	1.07	1.03	0.93	1.1	1144	693
BIDU	\$10,963	\$19,807	-\$1,753	\$2,214	\$12,716	\$17,593	1.05	1.20	0.98	1.04	1.13	1.38	1012	560
Average	\$8,521	\$25,615	\$10,864	\$16,790	-\$2,343	\$8,824	1.04	1.26	1.13	1.36	0.99	1.19	1092	651

Table 2: Basic OR Strategy plus Buy Easier & Sell Easier Day Filter

As seen in Table 2, the total net profit increases substantially for each stock listed (200.60% on average). Similarly, the profit factors (total, long and short) improves considerably with the addition of the filter. The total profit factor increases from 1.05 to 1.26. A profit factor of 1.2 is believed to be a good profit factor by traders.

The addition of the filter makes extraordinary improvements for most of the stocks listed in Table 2. For example, the total net profit for Capital Financial (COF) jumped from \$-4,031 to \$37,817 and the profit factor for the same stock increased from 0.98 to 1.31. It is important to note that all these improvements took place with almost half as many trades. (The average number of trades taken decreased by 40.36%). The modified system is much more selective and profitable compared to the basic strategy.

Buy easier & Sell easier day filter is going to be our major filter and each one of the following filters/indicators will be tested along with it.

4.2.2 Results for the Inside Bar Filter

The second filter backtested was the Inside Bar. It should be noted that this filter is used only for long trades.

Symbol	Total Net Profit		Long Profit		Long Porf. Factor		Number of Long Trades		Avg. Long Trade Net Profit		% Total Net Long Profit Change
	Before	After	Before	After	Before	After	Before	After	Before	After	
ICE	\$43,710	\$31,837	\$37,662	\$25,789	1.76	1.63	267	231	\$141.06	\$111.64	-31.53%
GOOG	\$16,916	\$18,784	\$5,761	\$7,629	1.15	1.29	317	266	\$18.18	\$28.68	32.42%
SPG	\$63,058	\$60,149	\$49,732	\$46,822	2.23	2.90	315	249	\$157.88	\$188.04	-5.85%
COF	\$37,817	\$30,068	\$25,310	\$17,561	1.43	1.39	328	255	\$77.17	\$68.87	-30.62%
AFL	\$14,564	\$22,223	\$7,420	\$15,080	1.18	1.72	317	223	\$23.41	\$67.62	103.23%
WFC	\$26,303	\$28,135	\$24,474	\$26,306	1.55	1.99	354	258	\$69.00	\$101.96	7.49%
AAPL	\$11,371	\$15,234	\$4,194	\$8,056	1.08	1.25	324	258	\$12.94	\$31.23	92.08%
X	\$16,629	\$21,484	\$9,660	\$14,876	1.16	1.41	317	258	\$30.48	\$57.66	54.00%
GS	\$6,335	\$12,089	\$1,477	\$7,231	1.03	1.19	332	269	\$4.45	\$26.88	389.57%
BIDU	\$19,807	\$24,459	\$2,214	\$6,866	1.04	1.20	257	214	\$8.62	\$32.09	210.12%
Average	\$25,651	\$26,446	\$16,790	\$17,622	1.36	1.60	313	248	\$54.32	\$71.47	82.09%

Table 3: Results for the Inside Bar approach

Table 3 summarizes the results acquired by adding the inside bar filter to the OR strategy. Out of the ten stocks listed, seven show improvement in long profits. (As well as in total net profits). The average improvement for long profits is 82.09%. The profit factor for long trades also increased from 1.36 to 1.60, indicating that the amount made increased in relation to the

amount lost. The strategy becomes even pickier compared to the previous strategy. The number of long trades decreased by 20%.

Even though 7 out of 10 stocks show improvement in total profits, two stocks, ICE and COF, experience significant drops in profits. Intercontinental Exchange, Inc. (ICE) loses \$11,874 and Capital One Financial loses \$7,749. The primary reason behind this is that using the inside bar sometimes causes the system to be late to take a position in the market or not to take any position at all even though there might be an excellent trading opportunity. This is one of the drawbacks of using the inside bar approach in trading.



Figure 20: Inside Bar - Missing the Big Move (Master Card)

Figure 20 is an example of a missed opportunity due to using the inside bar condition for long trades. Master Card breaks its OR high around 12.30 pm and continues its rise till the end of the day. The red arrow shows the point at which the strategy described in section 4.2.1 would initiate a long position. However, adding the inside bar condition to the strategy prevents the system from taking an early position. The strategy waits until an inside bar appears on the chart

and initiates a position at \$174.75 instead of at \$163, missing an \$11.75 dollar profit opportunity per share.

4.2.3 Results for Exponential Moving Average Indicator

Symbol	Net Profit		Long Profit		Short Profit		Prof. Factor		Long Porf. Factor		Short Porf. Factor		Number of Trades		% Net Profit Change
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	
ICE	\$31,837	\$35,146	\$25,789	\$19,124	\$6,048	\$16,022	1.29	1.47	1.63	1.59	1.09	1.38	541	424	10.39%
GOOG	\$18,784	\$16,573	\$7,629	\$9,926	\$11,154	\$6,646	1.34	1.45	1.29	1.57	1.39	1.34	591	470	-11.77%
SPG	\$60,149	\$59,104	\$46,822	\$41,625	\$13,326	\$17,479	1.77	1.52	2.9	3.18	1.25	1.52	602	505	-1.74%
COF	\$30,068	\$31,435	\$17,561	\$20,733	\$12,506	\$10,702	1.27	1.39	1.39	1.64	1.19	1.23	583	481	4.55%
AFL	\$14,564	\$15,397	\$7,420	\$6,049	\$7,144	\$9,348	1.17	1.34	1.18	1.33	1.17	1.34	657	445	5.72%
WFC	\$28,135	\$28,680	\$26,306	\$21,137	\$1,829	\$7,543	1.35	1.52	1.99	1.95	1.03	1.23	613	493	1.94%
AAPL	\$15,234	\$12,893	\$8,056	\$6,219	\$7,177	\$6,673	1.21	1.24	1.25	1.25	1.18	1.24	616	511	-15.37%
X	\$21,484	\$20,416	\$14,876	\$8,524	\$6,608	\$11,892	1.22	1.3	1.41	1.27	1.11	1.33	610	496	-4.97%
GS	\$12,089	\$9,277	\$7,231	\$7,062	\$4,858	\$2,215	1.14	1.14	1.19	1.24	1.1	1.06	630	511	-23.26%
BIDU	\$24,459	\$18,997	\$6,866	\$5,947	\$17,593	\$13,050	1.3	1.31	1.2	1.21	1.38	1.4	517	419	-22.33%
Average	\$25,680	\$24,792	\$16,856	\$14,635	\$8,824	\$10,157	1.31	1.37	1.54	1.62	1.19	1.31	596	476	-6%

Table 4: Results for Exponential Moving Avg. Strategy

Having seen that the inside bar condition may lead to missed opportunities, we backtested the exponential moving average filter both with and without the inside bar. Table 4 summarizes the results acquired by adding an exponential moving average condition for both long and short trades and testing it along with the inside bar condition.

Table 4 shows that only four (ICE, COF, AFL and WFC) out of ten stocks show improvement in profits after the new condition is added to the strategy. Overall, there is a 6% decrease in net profits from the previous strategy. The average profit factors for both long and short trades are better than before; nevertheless, the change is not significant. Table X in Appendix 8.4 shows the results obtained after testing the exponential moving average indicator without the inside bar. In that case, the total profit factor increases from 1.31 to 1.37 whereas there is a 14% decrease in overall net profit.

The results for both the inside bar and the exponential moving average indicator point out that the strategy becomes more selective after adding these filters and that the profit factors on average increase; however, the strategy misses strong breakouts, resulting in less profit.

4.2.4 Results for Volume Indicator

Symbol	Total Net Profit		Long Profit		Short Profit		Prof. Factor		Long Porf. Factor		Short Porf. Factor		Number of Trades		% Net Profit Change
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	
ICE	\$43,710	\$52,102	\$37,662	\$33,094	\$6,047	\$19,007	1.37	1.57	1.76	1.73	1.09	1.41	577	522	19.20%
GOOG	\$16,916	\$19,549	\$5,761	\$6,873	\$11,154	\$12,676	1.26	1.36	1.15	1.21	1.39	1.60	642	584	15.57%
SPG	\$63,058	\$66,673	\$49,732	\$46,799	\$13,326	\$19,874	1.68	1.97	2.23	2.46	1.25	1.54	668	592	5.73%
COF	\$37,817	\$40,629	\$25,310	\$25,233	\$12,506	\$15,395	1.31	1.42	1.43	1.51	1.19	1.32	656	589	7.44%
AFL	\$14,564	\$28,910	\$7,420	\$18,359	\$7,144	\$10,551	1.17	1.51	1.18	1.71	1.17	1.35	657	566	98.50%
WFC	\$26,303	\$31,977	\$24,474	\$24,483	\$1,829	\$7,494	1.27	1.44	1.55	1.68	1.03	1.20	709	632	21.57%
AAPL	\$11,371	\$12,688	\$4,194	\$7,734	\$7,177	\$4,954	1.13	1.18	1.08	1.21	1.18	1.15	682	616	11.58%
X	\$16,629	\$33,435	\$9,660	\$21,926	\$6,608	\$11,508	1.13	1.41	1.16	1.55	1.11	1.27	669	582	101.06%
GS	\$6,335	\$12,162	\$1,477	\$2,069	\$4,858	\$10,094	1.06	1.15	1.03	1.04	1.10	1.30	693	617	91.98%
BIDU	\$19,807	\$21,083	\$2,214	\$4,368	\$17,593	\$16,715	1.20	1.26	1.04	1.10	1.38	1.45	560	513	6.44%
Average	\$25,651	\$31,921	\$16,790	\$19,094	\$8,824	\$12,827	1.26	1.43	1.36	1.52	1.19	1.36	651	581	37.91%

Table 5: Results for Volume Indicator

Table 5 summarizes the results obtained by combining the volume indicator with the buy easier & sell easier day filter. Compared to the inside bar and the exponential moving average, the volume indicator produces better results and yields the highest amount of return for the stocks listed above. (as well as for the other stocks shown in Table 1)

The total net profit for all stocks goes up by an average of 37.91%. The addition of the volume indicator results in substantial increases for certain stocks such as AFL (Aflac Inc), GS (Goldman Sachs Group) and X (U.S. Steel Corporation) the total net profits of which increase 98.50, 91.98% and 101.06%, respectively.

What can also be recognized from the table is that while profits and profit factors increase significantly, the number of trades decreases by around 10.75%. This means that the trades that were excluded are mostly the losing ones and the indicator does a good job excluding those while keeping the profitable and allowing them to realize profits. The decrease

in the number of trades with an increase in the profits indicates a significant decrease in the unprofitable trades.

4.3 Determining the Final Set-up

The results shown in section 4.2 indicate that the set-up created by combining the buy easier & sell easier day filter with the volume indicator is highly selective and more profitable than the other set-ups tested. In the next two subsections, we will be using this set-up to compare the performance of profit making exits and money management stops.

4.4 Testing Profit-Making Exits

This section compares the performance of different profit making exit strategies covered in section 3.3.1. Each exit strategy was added to the final entry set-up one by one and tested over the last 5 years (4/21/2005 – 4/21/2010). The results are acquired by trading 1 share of each of the 22 stocks shown in Table 1 over the specified time period.

Table 6 shows the performance of SPG (Simon Property Group) with various exits over the last 5 years. Table 7 illustrates the averages for all of the 22 stocks over the same time period.

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$184	\$116	\$68	1.93	2.21	1.67	58.95%	1.10	0.82
Percent Trailing	\$121	\$67	\$54	1.64	1.74	1.55	60.00%	0.88	0.80
ATR Ratchet	\$119	\$87	\$32	1.67	1.94	1.38	65.93%	0.76	0.88
RSI Overbought&Oversold	\$145	\$85	\$60	1.74	1.9	1.59	60.34%	0.96	0.84

Table 6: Performance of Profit Making Exit Strategies on Simon Property Group (SPG)

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning	Avg. Losing
End of the Day	\$128	\$64	\$64	1.57	1.66	1.52	54.36%	\$1.21	\$0.95
Percent Trailing	\$102	\$45	\$57	1.44	1.49	1.46	55.73%	\$1.07	\$0.94
ATR Ratchet	\$84	\$47	\$37	1.42	1.52	1.33	59.65%	\$0.91	\$1.01
RSI Overbought&Oversold	\$106	\$47	\$59	1.49	1.54	1.48	55.55%	\$1.09	\$0.96

Table 7: Average Results for all Profit Making Exit Strategies

It can be observed from both Table 6 and 7 that the End of the Day Exit performs better compared to the other exit strategies. It has the highest overall profitability, largest profit factor for both long and short trades, and largest difference between average winning trades and average losing trades. It should also be noted that the End of the Day Exit has the lowest percent profitable; however, it still accumulates more profit due to the fact that the profits are significantly larger than the losses.

The reverse can be observed in the ATR Ratchet exit. While this exit produces the highest number of profitable trades, it also produces on average the highest difference between losing trades and winning trades as losing being \$0.10 more than the winning. This is due to the fact that ATR exit gets us out of the market earlier than the other exit strategies thus causing premature exits.

Figure 19 shows how the Percent Trailing exit cuts a significant profit of around \$1 per share. The End of the day exit would generate an additional 1\$ profit in the same situation.



Figure 21: Percent Trailing Exit (ICE)

The average return of the same 10 stocks over the same time period calculated using a buy and hold strategy is \$108 or 58% while trading with the Opening Range strategy using end of the day exit is \$151 or 85%.

4.5 Testing Money Management Stops

Having shown the performance of different profit making exit strategies in section 4, we will now be showing how the performance of our OR breakout strategy changes with the addition of money management stops.

We tested each money management stop along with each profit making exit covered in the previous section. Table 8 and 9 summarizes the results acquired by adding the OR High & Low and V-Box money management stops, respectively, to our strategy. Table 10 which summarizes

the performance of profit making exits without any money management stop is also included in this section for comparison reasons. Table 10 is the same as Table 7 shown in section 4.4.

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$120	\$56	\$63	1.52	1.57	1.50	53.47%	\$1.21	\$0.96
Percent Trailing	\$95	\$39	\$56	1.41	1.42	1.44	54.79%	\$1.08	\$0.95
ATR Ratchet	\$75	\$38	\$38	1.36	1.42	1.32	59.66%	\$0.93	\$1.04
RSI Overbought&Oversold	\$99	\$40	\$59	1.45	1.46	1.47	55.05%	\$1.09	\$0.96

Table 8: Results for OR High & OR Low Stop Loss

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$116	\$60	\$57	1.49	1.56	1.45	49.51%	\$1.23	\$0.77
Percent Trailing	\$95	\$46	\$50	1.37	1.39	1.38	51.17%	\$1.06	\$0.75
ATR Ratchet	\$73	\$43	\$30	1.34	1.42	1.28	55.57%	\$0.90	\$0.85
RSI Overbought&Oversold	\$96	\$43	\$52	1.42	1.44	1.43	51.10%	\$1.09	\$0.82

Table 9: Results for V-Box Stop Loss

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof. Factor	Short Prof. Factor	Percent Profitable	Avg. Winning	Avg. Losing
End of the Day	\$128	\$64	\$64	1.57	1.66	1.52	54.36%	\$1.21	\$0.95
Percent Trailing	\$102	\$45	\$57	1.44	1.49	1.46	55.73%	\$1.07	\$0.94
ATR Ratchet	\$84	\$47	\$37	1.42	1.52	1.33	59.65%	\$0.91	\$1.01
RSI Overbought&Oversold	\$106	\$47	\$59	1.49	1.54	1.48	55.55%	\$1.09	\$0.96

Table 10: Results without Money Management Stops

Tables 8, 9 and 10 show that the average net profit made by each profit making exit decreases after money management stops are added to the strategy. For example, the average net profit made by the End of the Day exit was 128\$ before money management stops were implemented. Once the OR High & Low stop was implemented in the strategy, the net profit made by the End of the Day exit went down to 120\$. The implementation of the V-Box stop decreased the profits even more and the profit made by the End of the exit fell to 116\$. The same consequences apply to other profit making exits. The average percentage decrease in average net profit made by all of the profit making exits decreased by 7.63% after the OR High & Low stop was implemented. In the case of V-Box stop, the decrease is 9.71%.

The implementation of money management stops also decreased the profit factors for both long and short trades. The only improvement made is that the average loss per trade decreased after the V-Box stop was implemented. This was actually our goal in implementing the money management stops: to stop losses if the trend changes. However, even though V-Box decreases the average loss, the fact that the percentage of winning trades goes down decreases our net profits. It should be noted that the results are shown for 1 share only; therefore, if the trade size is increased, the decrease in total net profits will be much more significant.

Although money management stops are a part of complete trading strategies, the results shown in this section indicate that the 2 money management stops tested by the project team result in decreased profits, making it questionable whether these money management stops should be used along with all 22 stocks shown earlier. Even though these stops perform well on some occasions, the overall performance is not as profitable as the case where no money management stop was implemented in the strategy. For example, it can be observed from Table 11 and 12 that the performance of ICE improves after V-Box money management stop is implemented. Net profits and profit factors go up and the average loss per trade decreases for all four profit making exit strategies.

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Prof. Factor	Prof. Factor	Profitable	Winning Trade	Losing Trade
End of the Day	\$231	\$116	\$115	1.65	1.61	1.69	57.61%	\$1.97	1.62
Percent Trailing	\$130	\$57	\$73	1.38	1.3	1.47	59.15%	\$1.55	1.63
ATR Ratchet	\$98	\$58	\$40	1.29	1.31	1.27	62.81%	\$1.33	1.74
RSI Overbought&Oversold	\$167	\$77	\$90	1.48	1.42	1.55	58.96%	\$1.69	1.64

Table 11: Results for Intercontinental Exchange (ICE) without Money Management Stops

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning	Avg. Losing
End of the Day	\$254	\$143	\$111	1.79	1.92	1.67	53.69%	\$2.03	\$1.31
Percent Trailing	\$149	\$82	\$67	1.48	1.53	1.43	55.20%	\$1.58	\$1.32
ATR Ratchet	\$120	\$84	\$36	1.4	1.54	1.25	58.79%	\$1.34	\$1.37
RSI Overbought&Oversold	\$188	\$104	\$84	1.6	1.69	1.52	55.01%	\$1.72	\$1.31

Table 12: Results for Intercontinental Exchange with V-Box Stop Loss

We suggest that each money management stop covered in this section should be used on certain stocks rather than on all stocks traded with an OR breakout strategy due to the fact that these stops work differently on different stocks.

4.6 Final Strategy & Overall Results

In the previous subsections, we showed that the set-up created by combining the buy easier & sell easier day filter with the volume indicator was the most profitable set-up tested in this project. In addition, we showed that the End of the Day exit yielded more profits than the other 3 profit making exits did. Below is the summary of the rules that make up the final OR strategy.

Set-up:

- Time > 10:00 am
- Close > OR High (Long trades) , Close < OR Low (Short trades)
- Buy easier & Sell easier Day condition is met
- Current volume is at least 30% greater than the average volume of the last 10 volume bars

Trigger:

- Buy at OR High +1 points
- Sell short at OR Low -1 points

Exit:

- End of the Day

Table 13 summarizes the results produced by our final Opening Range Breakout strategy. As a reminder, our trade size for backtesting is 25,000\$ and we assume on 8\$ commission per trade. The strategy is tested on 22 stocks over the past 5 years. (4/21/2005 – 4/21/2010)

Symbol				Performance Summary							
	Net Profit			Profit Factor			Number of Trades		% Profitable	Buy & Hold	ROI
	All	Long	Short	All	Long	Short	Winning	Losing			
PSA	\$50,384.76	\$35,522.48	\$14,862.28	1.73	2.16	1.39	340	289	54.05%	51.28%	201.54%
GOOG	\$19,733.71	\$7,519.37	\$12,214.34	1.36	1.23	1.55	311	291	51.66%	88.84%	78.93%
SPG	\$67,849.91	\$48,347.52	\$19,502.39	1.98	2.50	1.53	346	255	57.57%	16.22%	271.40%
COF	\$39,163.97	\$25,290.87	\$13,873.10	1.39	1.50	1.28	313	291	51.82%	-43.99%	156.66%
V	\$10,332.07	\$5,263.75	\$5,068.32	1.32	1.27	1.41	225	115	66.18%	7.25%	41.33%
MA	\$25,189.94	\$12,901.49	\$12,288.45	1.39	1.38	1.39	237	224	51.41%	17.85%	100.76%
AMG	\$37,009.91	\$30,333.02	\$6,676.89	1.47	1.87	1.15	319	293	52.12%	21.11%	148.04%
AAPL	\$12,250.20	\$8,053.60	\$4,196.60	1.17	1.21	1.13	319	315	50.32%	569.80%	49.00%
ICE	\$52,904.39	\$33,050.87	\$19,853.52	1.58	1.71	1.44	291	238	55.01%	105.95%	211.62%
GS	\$13,125.59	\$3,078.00	\$10,047.59	1.16	1.06	1.29	332	300	52.53%	54.73%	52.50%
BIDU	\$19,344.55	\$3,148.09	\$16,196.46	1.23	1.07	1.42	262	261	50.10%	674.34%	77.38%
BAC	\$39,250.10	\$20,887.80	\$18,362.30	1.52	1.48	1.57	300	328	47.77%	-58.94%	157.00%
BEN	\$20,354.45	\$16,482.45	\$3,872.00	1.24	1.44	1.08	316	320	49.69%	61.43%	81.42%
RIMM	\$29,774.77	\$18,307.61	\$11,467.16	1.39	1.43	1.33	329	278	54.20%	194.65%	119.10%
AVB	\$56,032.68	\$39,422.97	\$16,609.71	1.77	2.33	1.38	346	279	55.36%	19.72%	224.13%
RYN	\$43,221.04	\$36,189.44	\$7,031.60	1.64	2.20	1.19	322	305	51.36%	34.24%	172.88%
X	\$34,218.88	\$22,771.68	\$11,447.20	1.42	1.57	1.27	311	281	52.53%	68.14%	136.88%
SCHW	\$31,784.43	\$20,430.22	\$11,354.21	1.44	1.52	1.34	316	299	51.38%	70.02%	127.14%
AFL	\$28,973.01	\$18,627.44	\$10,345.57	1.51	1.71	1.34	276	285	49.20%	24.29%	115.89%
SIRI	\$32,703.56	\$18,828.88	\$13,874.69	1.39	1.48	1.31	261	264	49.71%	-82.86%	130.81%
WFC	\$32,029.52	\$24,560.35	\$7,469.17	1.44	1.68	1.21	312	318	49.52%	9.70%	128.12%
AKAM	\$29,832.58	\$22,184.77	\$7,647.81	1.40	1.63	1.19	297	286	50.94%	140.14%	119.33%
AVERAGE:	\$32,975.64	\$21,418.30	\$11,557.33	1.45	1.61	1.33	304	278	52.47%	92.91%	131.90%

Table 13: Results produced by the Final OR Breakout Strategy

As can be seen from Table 13, the Final strategy shows significant improvements in all of the performance measures listed above:

- All of the 22 stocks yield profits with an average profit factor of 1.45.
- The overall average net profit increased from 7027.85\$ to 32,975.64\$ (369% increase)
 - Average long trade net profit increased from 13,861.01 to 21,418.30 (54.52% increase)
 - Average short trade net profit increased from -3,728.21\$ to \$11,557.33\$
- The overall profit factor went up by 0.41 points. (from 1.04 to 1.145)

- Long and short trades for all 22 stocks are profitable even though 13 out of 22 stocks traded with the Basic Strategy had negative profits for short trades.
- The average Return on Investment for the Final strategy is 131.90% whereas the average Buy & Hold return for the same 22 stocks listed above is 92.91% over the last 5 years. This is a significant difference that might give investors an incentive to trade it.

5 Conclusion

Throughout this project, the project team tested 4 different set-ups, 4 profit making exits and 2 money management stops. Backtesting was performed on 250 stocks from various industry groups over the last five years (4/21/2005 – 4/21/2010). The project team identified 22 stocks that perform well with the Opening Range Breakout strategy explained in section 4.6. The most profitable strategy was created by combining the Buy Easier & Sell Easier Day filter and the volume indicator with the End of the Day exit.

It was observed that oftentimes the stock prices experienced significant changes in the last hours of the trading day which in turn resulted in huge profits if the End of the Day exit was being used. The other 3 profit making exits, namely Percentage Trailing exit, ATR Ratchet, RSI Overbought & Oversold exit, were observed to cause premature exits due to the price fluctuations taking place during the trading day.

The two money management stops, namely OR High & Low and the V-Box, helped decrease the average losses per trade for certain stocks. Nevertheless, the average total net profit of the 22 stocks decreased considerably after the money management stops were implemented in the strategy. We recommend that these stops should be tailored towards specific stocks rather than all of the 22 stocks in order to help generate more profits and cut the losses.

The final Opening Range Breakout strategy yielded a 131.90% return on investment for the above-mentioned 22 stocks. The average buy & hold return for the same group of stocks was 92.91% over the 5 year backtesting period. For certain stocks such as Simon Property Group (SPG), Public Storage (PSA) and Intercontinental Exchange (ICE), the final strategy's ROI was 271.40%, 201.54% and 211.62%, respectively.

As the results indicate, the Opening Range is a powerful concept and yields significant profits when traded with the right stock. The investors should carefully analyze the stock behavior and identify certain stocks that are suitable to be traded with an Opening Range Breakout strategy.

6 Next Steps

There are many directions which can be taken for further development of this project. Optimizing parameters such as the RSI overbought and oversold levels, length of the Opening Range and the percent trailing exit constraints can make a large difference, especially when customizing the strategy for individual stocks. Similar optimizations can be done by selecting the best entries and exits for certain groups of stocks.

New ideas that existed but were not pursued in the project due to time constraints include:

- *Position Sizing* – Even though our trade size was fixed for all trades (\$25,000), breaking up the capital into small pieces helps spread the risk across various trades.
- *Size of the Opening Range* – although logically if the difference between the OR high price and OR low price is smaller the chance that the stock breaks its OR should be greater, what was partially tested with Google suggests that this might not always be the case.
- *GAP study* – Gap is defined as the price difference between prior day's close and today's open. Identifying stocks that fill their gaps most of the time could help trade the OR breakouts more efficiently.
- *Fading the OR* – If the Opening Range is wide, the trader could consider trading within the Opening Range.

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8 Appendix

8.1 Backtesting Results for Profit Making Exits

- PSA

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$177	\$114	\$63	1.93	2.34	1.61	57.32%	\$1.02	0.72
Percent Trailing	\$139	\$85	\$54	1.76	2.06	1.53	58.44%	\$0.87	0.71
ATR Ratchet	\$111	\$85	\$26	1.65	2.03	1.29	64.17%	\$0.70	0.78
RSI Overbought&Oversold	\$142	\$84	\$58	1.75	1.99	1.56	57.96%	\$0.91	0.73

- ICE

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$231	\$116	\$115	1.65	1.61	1.69	57.61%	\$1.97
Percent Trailing	\$130	\$57	\$73	1.38	1.3	1.47	59.15%	\$1.55
ATR Ratchet	\$98	\$58	\$40	1.29	1.31	1.27	62.81%	\$1.33
RSI Overbought&Oversold	\$167	\$77	\$90	1.48	1.42	1.55	58.96%	\$1.69

- GOOG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$455	\$156	\$299	1.5	1.28	1.84	54.62%	\$4.26
Percent Trailing	\$402	\$83	\$319	1.45	1.15	1.9	55.14	\$4.05
ATR Ratchet	\$319	\$98	\$221	1.38	1.18	1.75	59.25	\$3.55
RSI Overbought&Oversold	\$400	\$110	\$290	1.45	1.2	1.83	55.99	\$3.95

- SPG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$184	\$116	\$68	1.93	2.21	1.67	58.95	1.10
Percent Trailing	\$121	\$67	\$54	1.64	1.74	1.55	60.00	0.88
ATR Ratchet	\$119	\$87	\$32	1.67	1.94	1.38	65.93	0.76
RSI Overbought&Oversold	\$145	\$85	\$60	1.74	1.9	1.59	60.34	0.96

- COF

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$82	\$48	\$34	1.55	1.63	1.46	53.82	0.73
Percent Trailing	\$45	\$16	\$29	1.42	1.27	1.61	56.34	0.49
ATR Ratchet	\$42	\$36	\$6	1.3	1.49	1.08	59.69	0.51
RSI Overbought&Oversold	\$64	\$38	\$26	1.44	1.51	1.36	55.95	0.64

- WFC

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$41	\$30	\$11	1.78	2.25	1.4	56.88	0.5
Percent Trailing	\$23	\$17	\$6	1.46	1.75	1.22	59.33	0.37
ATR Ratchet	\$29	\$25	\$4	1.63	2.1	1.17	62.39	0.37
RSI Overbought&Oversold	\$31	\$23	\$8	1.61	1.96	1.31	57.8	0.44

- AAPL

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$92	\$40	\$52	1.3	1.24	1.35	52.44	1.25
Percent Trailing	\$63	\$24	\$39	1.21	1.15	1.27	52.76	1.15
ATR Ratchet	\$48	\$25	\$23	1.16	1.15	1.17	57.47	0.97
RSI Overbought&Oversold	\$78	\$22	\$56	1.26	1.14	1.4	53.9	1.14

- X

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$86	\$54	\$32	1.37	1.49	1.26	54.39	1.01
Percent Trailing	\$86	\$56	\$30	1.39	1.55	1.25	56.28	0.94
ATR Ratchet	\$89	\$61	\$28	1.44	1.6	1.27	60.48	0.83
RSI Overbought&Oversold	\$80	\$53	\$27	1.35	1.49	1.22	55.59	0.96

- GS

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$149	\$41	\$108	1.33	1.15	1.6	55.75	\$1.74
Percent Trailing	\$142	\$35	\$107	1.33	1.14	1.61	57.05	\$1.63
ATR Ratchet	\$75	\$11	\$64	1.18	1.04	1.41	60.13	\$1.34
RSI Overbought&Oversold	\$103	\$3	\$100	1.23	1.01	1.57	56.4	\$1.57

- BIDU

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$304	\$110	\$194	1.52	1.36	1.69	52.24	\$3.35
Percent Trailing	\$212	\$76	\$136	1.38	1.27	1.51	54.19	\$2.76
ATR Ratchet	\$223	\$75	\$148	1.41	1.25	1.6	57.7	\$2.61
RSI Overbought&Oversold	\$203	\$32	\$171	1.37	1.11	1.67	54.58	\$2.68

- RIMM

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf.	Short Porf.	Percent Profitable	Avg. Winning Trade
End of the Day	\$107	\$49	\$58	1.57	1.46	1.72	56.01	\$0.87
Percent Trailing	\$111	\$36	\$75	1.61	1.34	1.99	57.5	\$0.84
ATR Ratchet	\$91	\$52	\$39	1.51	1.49	1.55	61.94	\$0.71
RSI Overbought&Oversold	\$111	\$48	\$63	1.59	1.45	1.78	57.17	\$0.86

- SIRI

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$3.73	\$1.55	\$2.19	1.47	1.38	1.57	50.29%	\$0.04	0.03
Percent Trailing	\$2.68	\$0.75	\$1.93	1.36	1.19	1.54	53.04%	\$0.04	0.03
ATR Ratchet	\$2.33	\$0.83	\$1.50	1.33	1.20	1.49	55.13%	\$0.03	0.03
RSI Overbought&Oversold	\$2.89	\$1.09	\$1.79	1.38	1.28	1.47	52.28%	\$0.04	0.03

- RYN

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$73.72	\$56.46	\$17.26	1.76	2.3	1.32	53.43%	\$0.51	0.33
Percent Trailing	\$55.52	\$44.75	\$10.77	1.6	2.13	1.2	53.99%	\$0.44	0.32
ATR Ratchet	\$49.97	\$42.90	\$7.07	1.56	2.00	1.15	59.58%	\$0.37	0.35
RSI Overbought&Oversold	\$61.64	\$47.15	\$14.49	1.64	2.1	1.28	54.47%	\$0.46	0.34

- SCHW

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$30.43	\$18.05	\$12.38	1.6	1.65	1.54	54.23%	\$0.24	0.18
Percent Trailing	\$24.69	\$14.68	\$10.01	1.51	1.54	1.47	55.28%	\$0.22	0.18
ATR Ratchet	\$22.83	\$13.19	\$9.64	1.51	1.49	1.55	61.30%	\$0.18	0.19
RSI Overbought&Oversold	\$30.82	\$17.13	\$13.69	1.63	1.63	1.63	56.59%	\$0.23	0.18

- AMG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$133.72	\$82.35	\$51.37	1.59	1.77	1.43	55.16%	\$1.07	0.83
Percent Trailing	\$99.11	\$55.04	\$44.07	1.44	1.53	1.37	55.81%	\$0.94	0.82
ATR Ratchet	\$84.52	\$63.83	\$20.69	1.41	1.63	1.2	63.34%	\$0.75	0.92
RSI Overbought&Oversold	\$102.03	\$56.46	\$45.57	1.45	1.53	1.39	56.30%	\$0.95	0.84

- V

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$34.97	\$20.33	\$14.64	1.45	1.44	1.46	55.56%	\$0.84	0.72
Percent Trailing	\$26.46	\$13.13	\$13.33	1.34	1.28	1.41	55.74%	\$0.77	0.72
ATR Ratchet	\$17.40	\$6.95	\$10.45	1.24	1.15	1.39	61.48%	\$0.60	0.77
RSI Overbought&Oversold	\$32.12	\$18.20	\$13.92	1.43	1.42	1.45	57.79%	\$0.75	0.72

- MA

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$214.11	\$106.43	\$107.68	1.5	1.49	1.52	53.03%	\$2.62	1.97
Percent Trailing	\$229.75	\$113.78	\$115.97	1.58	1.56	1.59	55.51%	\$2.45	1.93
ATR Ratchet	\$126.57	\$77.02	\$49.55	1.31	1.35	1.27	58.75%	\$1.95	2.12
RSI Overbought&Oversold	\$213.66	\$107.86	\$105.80	1.52	1.52	1.53	55.08%	\$2.43	1.96

- BEN

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$101.70	\$56.82	\$44.88	1.38	1.47	1.31	52.04%	\$1.11	0.87
Percent Trailing	\$77.68	\$45.41	\$32.27	1.31	1.41	1.23	53.36%	\$0.97	0.85
ATR Ratchet	\$66.55	\$51.99	\$14.56	1.28	1.46	1.12	60.72%	\$0.78	0.94
RSI Overbought&Oversold	\$86.56	\$45.87	\$40.69	1.33	1.39	1.29	53.83%	\$1.01	0.89

- BAC

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$24.64	\$7.85	\$16.79	1.30	1.17	1.49	50.08%	\$0.34	0.26
Percent Trailing	\$8.22	-\$3.04	\$11.26	1.1	0.93	1.25	51.67%	\$0.27	0.26
ATR Ratchet	\$13.70	\$4.03	\$9.67	1.18	1.09	1.34	56.92%	\$0.25	0.28
RSI Overbought&Oversold	\$20.43	\$6.90	\$13.53	1.25	1.15	1.39	51.67%	\$0.31	0.27

- AKAM

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$48.07	\$31.18	\$16.89	1.59	1.87	1.37	53.17%	\$0.42	0.30
Percent Trailing	\$44.78	\$27.12	\$17.66	1.58	1.79	1.41	54.20%	\$0.39	0.29
ATR Ratchet	\$39.24	\$25.53	\$13.71	1.56	1.75	1.38	60.21%	\$0.31	0.30
RSI Overbought&Oversold	\$41.98	\$28.08	\$13.90	1.55	1.85	1.32	55.40%	\$0.37	0.30

- AFL

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$58.24	\$34.55	\$23.69	1.62	1.81	1.46	51.52%	\$0.53	0.35
Percent Trailing	\$41.36	\$30.67	\$10.69	1.45	1.76	1.21	52.58%	\$0.45	0.34
ATR Ratchet	\$38.85	\$30.87	\$7.98	1.47	1.76	1.19	57.75%	\$0.38	0.35
RSI Overbought&Oversold	\$53.38	\$30.89	\$22.49	1.57	1.73	1.44	52.94%	\$0.49	0.35

- AVB

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Prof.	Short Prof.	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$195.32	\$119.17	\$76.15	1.85	2.23	1.58	57.35%	\$1.18	0.86
Percent Trailing	\$154.51	\$93.13	\$61.38	1.71	2.00	1.49	58.63%	\$1.02	0.85
ATR Ratchet	\$133.46	\$97.26	\$36.20	1.66	2.05	1.34	64.22%	\$0.83	0.90
RSI Overbought&Oversold	\$172.20	\$102.94	\$69.26	1.78	2.10	1.54	58.79%	\$1.07	0.86

8.2 Backtesting Results for OR High & Low Money Management Stop

- ICE

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$232	\$118	\$114	1.65	1.63	1.68	56.52%	\$1.97	1.55
Percent Trailing	\$131	\$58	\$73	1.38	1.31	1.46	58.03%	\$1.55	1.55
ATR Ratchet	\$98	\$58	\$40	1.29	1.31	1.27	62.00%	\$1.31	1.66
RSI Overbought&Oversold	\$169	\$79	\$90	1.49	1.44	1.54	57.84%	\$1.69	1.56

- GOOG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$390	\$116	\$274	1.4	1.2	1.71	53.24%	\$4.27	3.47
Percent Trailing	\$337	\$42	\$295	1.35	1.07	1.76	53.74%	\$4.06	3.49
ATR Ratchet	\$251	\$57	\$194	1.28	1.1	1.59	57.81%	\$3.34	3.58
RSI Overbought&Oversold	\$336	\$68	\$268	1.35	1.12	1.7	54.74%	\$3.94	3.53

- SPG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$190	\$119	\$71	1.97	2.26	1.7	59.00%	\$1.09	0.80
Percent Trailing	\$127	\$70	\$57	1.68	1.78	1.58	60.00%	\$0.87	0.78
ATR Ratchet	\$124	\$90	\$34	1.71	1.98	1.41	65.83%	\$0.75	0.84
RSI Overbought&Oversold	\$149	\$87	\$62	1.77	1.94	1.62	60.33%	\$0.95	0.82

- COF

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$80	\$48	\$32	1.52	1.61	1.43	53.40%	\$0.73	0.55
Percent Trailing	\$57	\$34	\$23	1.39	1.46	1.32	55.56%	\$0.61	0.55
ATR Ratchet	\$40	\$35	\$5	1.28	1.47	1.07	59.54%	\$0.51	0.59
RSI Overbought&Oversold	\$65	\$38	\$27	1.43	1.5	1.36	55.72%	\$0.64	0.56

- WFC

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$44	\$30	\$14	1.58	1.77	1.38	52.38%	\$0.36	0.25
Percent Trailing	\$24	\$16	\$8	1.33	1.42	1.23	53.65%	\$0.29	0.25
ATR Ratchet	\$29	\$24	\$5	1.42	1.64	1.16	59.05%	\$0.26	0.26
RSI Overbought&Oversold	\$33	\$22	\$11	1.44	1.56	1.31	53.17%	\$0.32	0.25

- AAPL

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$111	\$50	\$61	1.38	1.33	1.43	52.21%	\$1.22	0.97
Percent Trailing	\$83	\$35	\$48	1.28	1.23	1.34	52.52%	\$1.12	0.97
ATR Ratchet	\$67	\$35	\$32	1.24	1.24	1.25	57.41%	\$0.94	1.02
RSI Overbought&Oversold	\$97	\$32	\$65	1.34	1.21	1.49	53.63%	\$1.12	0.97

- X

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$82	\$44	\$38	1.34	1.37	1.32	53.89%	\$1.00	0.87
Percent Trailing	\$83	\$47	\$36	1.37	1.43	1.31	55.74%	\$0.93	0.85
ATR Ratchet	\$65	\$10	\$55	1.15	1.04	1.35	59.43%	\$1.30	1.66
RSI Overbought&Oversold	\$75	\$43	\$32	1.32	1.36	1.28	55.07%	\$0.95	0.88

- GS

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$135	\$41	\$94	1.3	1.15	1.51	55.15%	\$1.69	1.60
Percent Trailing	\$134	\$35	\$99	1.31	1.14	1.56	56.42%	\$1.60	1.58
ATR Ratchet	\$66	\$11	\$55	1.16	1.04	1.35	59.59%	\$1.30	1.65
RSI Overbought&Oversold	\$88	\$2	\$86	1.2	1.01	1.49	55.78%	\$1.52	1.60

- BIDU

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$283	\$87	\$195	1.46	1.27	1.68	51.72%	\$3.31	2.43
Percent Trailing	\$194	\$56	\$138	1.34	1.18	1.51	53.83%	\$2.74	2.38
ATR Ratchet	\$204	\$54	\$150	1.36	1.17	1.6	57.09%	\$2.59	2.53
RSI Overbought&Oversold	\$184	\$10	\$174	1.32	1.03	1.67	54.21%	\$2.66	2.39

- RIMM

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$115	\$54	\$61	1.64	1.53	1.78	55.94%	\$0.88	0.68
Percent Trailing	\$120	\$42	\$78	1.7	1.42	2.07	57.43%	\$0.84	0.67
ATR Ratchet	\$101	\$58	\$43	1.6	1.59	1.61	61.88%	\$0.72	0.73
RSI Overbought&Oversold	\$119	\$53	\$66	1.66	1.52	1.85	57.10%	\$0.86	0.69

- SIRI

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$3.23	\$1.14	\$2.09	1.4	1.28	1.53	49.62%	\$0.04	\$0.03
Percent Trailing	\$2.38	\$0.63	\$1.75	1.31	1.16	1.47	52.47%	\$0.04	\$0.03
ATR Ratchet	\$1.82	\$0.60	\$1.22	1.24	1.15	1.36	54.56%	\$0.03	\$0.03
RSI Overbought&Oversold	\$2.42	\$0.72	\$1.70	1.31	1.18	1.43	51.71%	\$0.04	\$0.03

- RYN

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$75.59	\$56.34	\$19.25	1.8	2.31	1.37	52.88%	\$0.51	\$0.33
Percent Trailing	\$57.47	\$44.71	\$12.76	1.63	2.13	1.25	53.51%	\$0.44	\$0.32
ATR Ratchet	\$51.82	\$42.86	\$8.96	1.6	2.01	1.2	59.11%	\$0.37	\$0.35
RSI Overbought&Oversold	\$63.59	\$47.11	\$16.48	1.68	2.1	1.33	53.99%	\$0.46	\$0.33

- SCHW

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$27.66	\$16.06	\$11.60	1.52	1.56	1.48	53.82%	\$0.24	\$0.19
Percent Trailing	\$21.80	\$12.69	\$9.11	1.43	1.45	1.41	54.80%	\$0.21	\$0.19
ATR Ratchet	\$20.05	\$11.20	\$8.85	1.43	1.4	1.48	60.81%	\$0.18	\$0.20
RSI Overbought&Oversold	\$28.04	\$15.25	\$12.79	1.55	1.54	1.56	56.10%	\$0.23	\$0.20

- AMG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$129.94	\$72.41	\$57.53	1.56	1.63	1.5	54.83%	\$1.08	\$0.85
Percent Trailing	\$94.45	\$46.18	\$48.27	1.42	1.41	1.42	55.48%	\$0.95	\$0.84
ATR Ratchet	\$80.05	\$55.40	\$24.65	1.38	1.51	1.25	63.01%	\$0.75	\$0.93
RSI Overbought&Oversold	\$97.79	\$47.60	\$50.19	1.43	1.41	1.44	55.97%	\$0.95	\$0.86

- V

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$32.76	\$17.99	\$14.77	1.42	1.39	1.46	54.51%	\$0.84	\$0.72
Percent Trailing	\$24.68	\$10.79	\$13.89	1.31	1.23	1.43	54.92%	\$0.77	\$0.72
ATR Ratchet	\$15.62	\$4.61	\$11.01	1.22	1.1	1.43	60.66%	\$0.59	\$0.76
RSI Overbought&Oversold	\$28.21	\$13.73	\$14.48	1.37	1.3	1.48	56.56%	\$0.75	\$0.72

- MA

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$187.49	\$85.33	\$102.16	1.41	1.36	1.47	52.92%	\$2.61	\$2.09
Percent Trailing	\$202.00	\$93.08	\$108.92	1.48	1.42	1.53	55.29%	\$2.45	\$2.06
ATR Ratchet	\$98.42	\$55.92	\$42.50	1.23	1.24	1.22	58.53%	\$1.95	\$2.25
RSI Overbought&Oversold	\$192.44	\$86.76	\$105.68	1.45	1.39	1.52	54.86%	\$2.44	\$2.05

- BEN

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$100.72	\$42.71	\$58.01	1.38	1.32	1.43	51.49%	\$1.12	\$0.88
Percent Trailing	\$79.27	\$31.79	\$47.48	1.31	1.25	1.37	52.90%	\$0.98	\$0.85
ATR Ratchet	\$65.48	\$37.88	\$27.60	1.28	1.3	1.25	60.25%	\$0.78	\$0.94
RSI Overbought&Oversold	\$84.88	\$32.56	\$52.32	1.33	1.25	1.4	53.21%	\$1.02	\$0.89

- BAC

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$27.20	\$10.42	\$16.78	1.35	1.23	1.49	49.76%	\$0.34	\$0.25
Percent Trailing	\$10.79	-\$0.46	\$11.25	1.14	0.99	1.35	51.35%	\$0.27	\$0.25
ATR Ratchet	\$16.30	\$6.60	\$9.70	1.23	1.15	1.34	56.60%	\$0.25	\$0.27
RSI Overbought&Oversold	\$22.99	\$9.47	\$13.52	1.3	1.22	1.39	51.35%	\$0.31	\$0.26

- AKAM

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$38.26	\$30.52	\$7.74	1.45	1.84	1.16	52.49%	\$0.40	\$0.31
Percent Trailing	\$39.09	\$26.46	\$12.63	1.48	1.76	1.28	53.52%	\$0.38	\$0.30
ATR Ratchet	\$33.16	\$24.87	\$8.29	1.45	1.72	1.21	59.52%	\$0.31	\$0.32
RSI Overbought&Oversold	\$35.65	\$27.19	\$8.46	1.44	1.81	1.18	54.89%	\$0.36	\$0.31

- AFL

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$57.96	\$33.52	\$24.44	1.62	1.77	1.49	50.80%	\$0.53	\$0.35
Percent Trailing	\$41.08	\$29.64	\$11.44	1.45	1.72	1.23	51.87%	\$0.45	\$0.35
ATR Ratchet	\$39.33	\$29.88	\$9.45	1.48	1.73	1.23	57.04%	\$0.38	\$0.35
RSI Overbought&Oversold	\$53.15	\$29.91	\$23.24	1.57	1.7	1.46	52.23%	\$0.50	\$0.36

- AVB

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$174.41	\$112.65	\$61.76	1.71	2.1	1.43	56.23%	\$1.19	\$0.90
Percent Trailing	\$133.60	\$86.61	\$46.99	1.57	1.88	1.34	57.51%	\$1.03	\$0.89
ATR Ratchet	\$114.20	\$91.01	\$23.19	1.53	1.93	1.19	63.10%	\$0.84	\$0.94
RSI Overbought&Oversold	\$152.68	\$97.02	\$55.66	1.64	1.98	1.4	57.67%	\$1.08	\$0.91

8.3 Backtesting Results for V-Box Money Management Stop

- ICE

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$254	\$143	\$111	1.79	1.92	1.67	53.69%	\$2.03	\$1.31
Percent Trailing	\$149	\$82	\$67	1.48	1.53	1.43	55.20%	\$1.58	\$1.32
ATR Ratchet	\$120	\$84	\$36	1.4	1.54	1.25	58.79%	\$1.34	\$1.37
RSI Overbought&Oversold	\$188	\$104	\$84	1.6	1.69	1.52	55.01%	\$1.72	\$1.31

- GOOG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$416	\$164	\$252	1.46	1.32	1.65	50.42%	\$4.34	\$3.02
Percent Trailing	\$366	\$94	\$272	1.41	1.19	1.7	50.91%	\$4.13	\$3.04
ATR Ratchet	\$271	\$105	\$167	1.32	1.21	1.49	54.91%	\$3.37	\$3.11
RSI Overbought&Oversold	\$366	\$120	\$246	1.41	1.24	1.64	51.91%	\$4.01	\$3.07

- SPG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$170	\$101	\$69	1.9	2.05	1.74	54.00%	\$1.11	\$0.69
Percent Trailing	\$114	\$55	\$59	1.62	1.58	1.67	55.17%	\$0.89	\$0.68
ATR Ratchet	\$107	\$74	\$33	1.63	1.79	1.44	61.00%	\$0.76	\$0.73
RSI Overbought&Oversold	\$133	\$72	\$61	1.71	1.76	1.67	55.50%	\$0.96	\$0.70

- COF

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$68	\$37	\$31	1.45	1.46	1.43	48.09%	\$0.76	\$0.49
Percent Trailing	\$49	\$27	\$22	1.35	1.36	1.34	50.58%	\$0.62	\$0.47
ATR Ratchet	\$30	\$25	\$5	1.21	1.31	1.09	54.06%	\$0.52	\$0.51
RSI Overbought&Oversold	\$52	\$29	\$23	1.35	1.37	1.33	50.41%	\$0.66	\$0.50

- PSA

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$137	\$105	\$32	1.73	2.35	1.29	50.32%	\$1.02	-\$0.61
Percent Trailing	\$132	\$94	\$37	1.46	1.86	1.21	53.60%	\$0.80	-\$0.64
ATR Ratchet	\$87	\$79	\$8	1.52	2.05	1.09	57.32%	\$0.71	\$0.64
RSI Overbought&Oversold	\$109	\$76	\$33	1.59	1.99	1.31	51.27%	\$0.91	\$0.61

- WFC

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$38	\$31	\$7	1.49	1.86	1.18	49.05%	\$0.37	\$0.24
Percent Trailing	\$17	\$16	\$1	1.23	1.47	1.02	50.16%	\$0.29	\$0.24
ATR Ratchet	\$21	\$25	-\$4	1.29	1.71	0.9	55.24%	\$0.27	\$0.26
RSI Overbought&Oversold	\$28	\$23	\$5	1.36	1.63	1.12	49.84%	\$0.33	\$0.24

- AAPL

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$90	\$36	\$54	1.31	1.23	1.39	47.63%	\$1.27	\$0.88
Percent Trailing	\$62	\$21	\$41	1.21	1.14	1.29	47.95%	\$1.16	\$0.88
ATR Ratchet	\$45	\$20	\$25	1.16	1.13	1.2	52.68%	\$0.97	\$0.93
RSI Overbought&Oversold	\$76	\$17	\$59	1.27	1.11	1.45	49.05%	\$1.16	\$0.88

- X

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$61	\$29	\$32	1.25	1.25	1.26	49.49%	\$1.02	\$0.80
Percent Trailing	\$68	\$31	\$37	1.31	1.28	1.34	51.52%	\$0.95	\$0.77
ATR Ratchet	\$72	\$40	\$32	1.36	1.37	1.35	56.08%	\$0.82	\$0.77
RSI Overbought&Oversold	\$62	\$31	\$31	1.27	1.27	1.27	51.01%	\$0.96	\$0.79

- GS

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$174	\$91	\$83	1.44	1.42	1.45	52.77%	\$1.72	\$1.33
Percent Trailing	\$179	\$88	\$91	1.47	1.43	1.52	54.20%	\$1.63	\$1.31
ATR Ratchet	\$102	\$57	\$45	1.28	1.27	1.28	57.05%	\$1.31	\$1.36
RSI Overbought&Oversold	\$126	\$53	\$73	1.32	1.24	1.41	53.41%	\$1.54	\$1.34

- BIDU

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$279	\$93	\$186	1.49	1.32	1.67	48.28%	\$3.36	\$2.11
Percent Trailing	\$195	\$68	\$127	1.37	1.26	1.48	50.19%	\$2.77	\$2.04
ATR Ratchet	\$198	\$60	\$138	1.38	1.21	1.57	53.64%	\$2.57	\$2.15
RSI Overbought&Oversold	\$180	\$16	\$164	1.34	1.06	1.65	50.77%	\$2.66	\$2.05

- RIMM

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$118	\$57	\$61	1.68	1.59	1.79	53.47%	\$0.90	\$0.62
Percent Trailing	\$123	\$43	\$80	1.76	1.46	2.15	54.95%	\$0.86	\$0.60
ATR Ratchet	\$99	\$59	\$40	1.62	1.64	1.59	59.24%	\$0.73	\$0.65
RSI Overbought&Oversold	\$120	\$54	\$66	1.7	1.58	1.85	54.62%	\$0.88	\$0.62

- SIRI

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$3.42	\$1.19	\$2.23	1.44	1.3	1.61	47.72%	\$0.04	\$0.03
Percent Trailing	\$4.28	\$0.73	\$3.55	1.39	1.17	1.52	50.36%	\$0.04	\$0.03
ATR Ratchet	\$1.97	\$0.64	\$1.33	1.27	1.16	1.42	52.66%	\$0.03	\$0.03
RSI Overbought&Oversold	\$2.67	\$0.80	\$1.86	1.36	1.21	1.51	50.00%	\$0.04	\$0.03

- RYN

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$63	\$45	\$18	1.69	1.96	1.4	47.36%	\$0.52	\$0.28
Percent Trailing	\$54	\$38	\$17	1.4	1.62	1.22	50.62%	\$0.39	\$0.30
ATR Ratchet	\$40	\$32	\$8	1.47	1.69	1.22	53.28%	\$0.37	\$0.29
RSI Overbought&Oversold	\$50	\$36	\$15	1.55	1.77	1.33	48.48%	\$0.47	\$0.28

- SCHW

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$23	\$15	\$9	1.38	1.4	1.35	49.84%	\$0.25	\$0.18
Percent Trailing	\$17	\$12	\$5	1.21	1.39	1.1	48.30%	\$0.22	\$0.18
ATR Ratchet	\$16	\$10	\$6	1.34	1.38	1.29	57.00%	\$0.18	\$0.18
RSI Overbought&Oversold	\$23	\$14	\$10	1.45	1.51	1.38	52.12%	\$0.23	\$0.18

- AMG

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$102	\$62	\$40	1.45	1.57	1.34	50.33%	\$1.07	\$0.75
Percent Trailing	\$74	\$57	\$16	1.2	1.41	1.08	50.73%	\$0.82	\$0.70
ATR Ratchet	\$64	\$46	\$18	1.32	1.45	1.18	58.85%	\$0.74	\$0.81
RSI Overbought&Oversold	\$77	\$41	\$35	1.34	1.38	1.31	51.64%	\$0.95	\$0.76

- V

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$25	\$10	\$15	1.32	1.22	1.47	51.23%	\$0.84	\$0.67
Percent Trailing	\$28	\$2	\$26	1.26	1.04	1.5	53.74%	\$0.69	\$0.64
ATR Ratchet	\$9	-\$2	\$10	1.12	0.97	1.39	54.68%	\$0.59	\$0.70
RSI Overbought&Oversold	\$21	\$7	\$15	1.28	1.14	1.49	53.28%	\$0.75	\$0.67

- MA

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$206	\$105	\$101	1.5	1.52	1.49	49.03%	\$2.71	\$1.74
Percent Trailing	\$219	\$109	\$110	1.57	1.58	1.57	51.40%	\$2.53	\$1.71
ATR Ratchet	\$112	\$76	\$37	1.29	1.37	1.2	54.21%	\$1.99	\$1.84
RSI Overbought&Oversold	\$208	\$107	\$101	1.54	1.56	1.51	51.19%	\$2.51	\$1.72

- BEN

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$93	\$36	\$56	1.37	1.29	1.45	46.17%	\$1.16	\$0.74
Percent Trailing	\$34	\$35	-\$2	1.09	1.23	0.99	45.65%	\$0.92	\$0.72
ATR Ratchet	\$52	\$33	\$18	1.23	1.28	1.17	54.30%	\$0.79	\$0.78
RSI Overbought&Oversold	\$76	\$27	\$49	1.31	1.22	1.4	47.73%	\$1.05	\$0.74

- BAC

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$21	\$7	\$14	1.26	1.16	1.4	46.50%	\$0.34	\$0.24
Percent Trailing	\$5	-\$4	\$9	1.06	0.9	1.28	48.09%	\$0.26	\$0.23
ATR Ratchet	\$9	\$2	\$8	1.13	1.04	1.27	53.18%	\$0.24	\$0.25
RSI Overbought&Oversold	\$17	\$6	\$10	1.21	1.14	1.3	48.09%	\$0.31	\$0.24

- AKAM

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$36	\$24	\$12	1.43	1.62	1.26	49.40%	\$0.41	\$0.29
Percent Trailing	\$38	\$21	\$17	1.48	1.55	1.42	50.60%	\$0.39	\$0.28
ATR Ratchet	\$32	\$18	\$13	1.44	1.49	1.39	56.60%	\$0.31	\$0.28
RSI Overbought&Oversold	\$34	\$21	\$12	1.43	1.59	1.29	51.97%	\$0.37	\$0.28

- AFL

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$40.98	\$23.01	\$17.97	1.42	1.51	1.35	44.66%	\$0.55	\$0.32
Percent Trailing	\$56.27	\$24.57	\$31.70	1.44	1.44	1.45	50.17%	\$0.41	\$0.29
ATR Ratchet	\$25.69	\$19.38	\$6.31	1.31	1.45	1.16	50.98%	\$0.38	\$0.31
RSI Overbought&Oversold	\$36.82	\$20.41	\$16.41	1.39	1.47	1.32	45.81%	\$0.51	\$0.32

- AVB

Exit Type	Net Profit	Long Profit	Short Profit	Prof. Factor	Long Porf. Factor	Short Porf. Factor	Percent Profitable	Avg. Winning Trade	Avg. Losing Trade
End of the Day	\$143.41	\$95.84	\$47.57	1.61	1.93	1.36	49.68%	\$1.22	\$0.75
Percent Trailing	\$118.18	\$89.37	\$28.81	1.35	1.69	1.14	51.57%	\$0.90	\$0.71
ATR Ratchet	\$92.87	\$75.13	\$17.74	1.45	1.77	1.16	56.71%	\$0.85	\$0.77
RSI Overbought&Oversold	\$124.60	\$80.59	\$44.01	1.55	1.82	1.34	51.12%	\$1.10	\$0.75

8.4 Backtesting Results for Exponential Moving Average Indicator

Symbol	Net Profit		Long Profit		Short Profit		Prof. Factor		Long Porf. Factor		Short Porf. Factor		Number of Trades		% Net Profit
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	
ICE	\$31,837	\$38,032	\$25,789	\$22,010	\$6,048	\$16,022	1.29	1.47	1.63	1.57	1.09	1.38	541	446	19.46%
GOOG	\$18,784	\$15,366	\$7,629	\$8,720	\$11,154	\$6,646	1.34	1.36	1.29	1.39	1.39	1.34	591	495	-18.20%
SPG	\$60,149	\$63,942	\$46,822	\$46,462	\$13,326	\$17,479	1.77	2.12	2.90	3.00	1.25	1.52	602	530	6.31%
COF	\$30,068	\$26,713	\$17,561	\$16,011	\$12,506	\$10,702	1.27	1.29	1.39	1.35	1.19	1.23	583	518	-11.16%
AFL	\$14,564	\$21,741	\$7,420	\$12,393	\$7,144	\$9,348	1.17	1.43	1.18	1.54	1.17	1.34	657	487	49.28%
WFC	\$28,135	\$29,293	\$26,306	\$21,807	\$1,829	\$7,543	1.35	1.47	1.99	1.74	1.03	1.23	613	537	4.12%
AAPL	\$15,234	\$11,994	\$8,056	\$5,344	\$7,177	\$6,673	1.21	1.20	1.25	1.17	1.18	1.23	616	542	-21.27%
X	\$21,484	\$18,756	\$14,876	\$6,863	\$6,608	\$11,892	1.22	1.25	1.41	1.17	1.11	1.33	610	519	-12.70%
GS	\$12,089	\$6,965	\$7,231	\$4,749	\$4,858	\$2,215	1.14	1.09	1.19	1.13	1.10	1.06	630	539	-42.39%
BIDU	\$24,459	\$19,261	\$6,866	\$6,211	\$17,593	\$13,050	1.30	1.29	1.20	1.19	1.38	1.4	517	432	-21.25%
Average	\$25,680	\$25,206	\$16,856	\$15,057	\$8,824	\$10,157	1.31	1.40	1.54	1.53	1.19	1.31	596	505	-5%

8.5 Basic Opening Range Breakout Strategy: Easy Language Code

(TradeStation Forums)

[LegacyColorValue = true];

Inputs: iRangeLengthMin(30),

iBrakePoints(1),

iEntryTimeLimit(-90),

iContracts(1),

iProfitTarget(500),

Price(Close),

Length(12) ,

ShowText(true);

Var: OpenRangeTime(CalcTime(SessionStartTime(0,1), iRangeLengthMin)),

EntryTimeLimit(CalcTime(SessionEndTime(0,1), iEntryTimeLimit)),

RangeH(0),RangeL(0), // H&L of range

TimeH(0), TimeL(0), // time of H&L

RangeHtime(0), RangeLtime(0),

vDollarStop(500),

FirstTrade(true),

CustomCond(true),

```

        Cond4trade(true),

        vVolumeLenght(7),

        ExpAvg(0),

        firstcheck(true),

        MaxP(0)

        DateInFromTo(false);

// New day settings
if Date<>Date[1] then begin
    //DateInFromTo= (Date>=iFromYYYYMMDD and Date<=iToYYYYMMDD);

    FirstTrade=true;

    RangeH=H; RangeL=L; // first bars High Low are Ranges h&l

    TimeH=Time; TimeL=Time;

end;

// Range settings
If L<LowD(0)[1] then TimeL=Time; {if new H or L, remember the time of H or L}
If H>HighD(0)[1] then TimeH=Time;

If Time=OpenRangeTime then begin // if openning range is finished
    RangeH=HighD(0);

    RangeL=LowD(0);

    RangeHtime=TimeH;

    RangeLtime=TimeL;

end; // remember Range parameters

// ***** Trade *****

CustomCond= true;

Cond4trade = CustomCond and time>OpenRangeTime and time<EntryTimeLimit ; //and DateInFromTo

```

If Cond4Trade then begin

 If FirstTrade and Close>=RangeH then

 begin

 Buy("BrOR_L1") iContracts contracts Next bar at open;

 FirstTrade=false;

 end;

 If FirstTrade and Close<=RangeL then

 begin

 sellshort("RrOR_Sh1") iContracts contracts next bar at open;

 FirstTrade=false;

 end;

end;

SetStopContract;

SetStopLoss(100);

SetProfitTarget(100);

// ***** Plots and Text *****

Vars: Decimals(\$DecOfPriceScale),

PLot_hi(0),Plot_lo(0),

Low_line(-1),OR_Bar(-1),Hi_Line(-1),

Hi_text(-1),Lo_text(-1);

if time = OpenRangeTime then begin

Plot_hi = HighD(0);

Plot_lo = LowD(0);

{Draw Lines}

Hi_line = TL_new(date,time,Plot_hi,date,SessionEndTime(0,1),Plot_hi);

Tl_setstyle(Hi_line,tool_dashed2);

Tl_setcolor(Hi_line, yellow);

```

Low_line = TL_new(date,time,Plot_lo,Date,SessionEndTime(0,1),Plot_lo);

Tl_setstyle(Low_line,tool_dashed2);

Tl_setcolor(Low_line,yellow );

OR_bar = TL_new(date,time,Plot_hi,date,time,plot_lo);

TL_setcolor(OR_bar,lightgray);

{Text}

if ShowText then begin

Hi_text = Text_new(Date,SessionStartTime(0,1) ,Plot_hi ,numtostr(Plot_hi,decimals));

Lo_text = Text_new(Date,SessionStartTime(0,1),Plot_lo ,numtostr(Plot_lo,decimals));

end;

end;

```

8.6 Final OR Strategy: Easy Language Code

```

[LegacyColorValue = true];
{*****}
Use symbol @ES, ... custom session 8:30 - 3:15 (exchange time)
    or  @ES.D ...
*****}
Inputs: iBuy_Sell("Buy"),      // to short "Sell"
        iFromYYMMDD(1000101), iToYYMMDD(1200101),  // to take trades only in dates range (EL
format)
        iRangeLengthMin(30),
        iBrakePoints(1.7),
            iBrakePointsTop(1.7),
                iBrakeDownPoints(0.5),
        iEntryTimeLimit(0),      // minutes before SessEnd, do not entry after that time
        iContracts(1),
        iDollarStop(500),
        iProfitTarget(500),
            RangePrct (0.85),
        Price(close),
            ipf(1.01),
            LongTrailingPerc(20),
            ShortTrailingPerc(20),
            LongExitPerc (0.2),
            ShortExitPerc(0.2); //me

```

```

Inputs: ShowText(true),
        EmrePrice (Close), EmreAvgLength( 10 ),EmreBrkOutPct( 30), rangeLength(10),ATRLength(50),
        ATRPercent(0.03),RSI_Length(14),
        overbought(80),oversold(30);

Var: OpenRangeTime(CalcTime(SessionStartTime(0,1), iRangeLengthMin)),
      EntryTimeLimit(CalcTime(SessionEndTime(0,1), iEntryTimeLimit)),
      RangeH(0),RangeL(0), // H&L of range
      TimeH(0), TimeL(0), // time of H&L
      RangeHTime(0), RangeLTime(0), // time of H&L in range (to now what comes first for ex.)
      vEntryPrice(0),
      FirstTrade(true), // to limit one trade a day only
      CustomCond(true), // custom condition to take trade, if need
      Cond4trade(true), // all conditions to take trade
      LongSide(iBuy_Sell="Buy"), // Long - true, Short - false
      Cond4Breakout(true),
      CustomCondShort(true),
      gapIndicator(0) ,
      averageOCRange(0),
      yesterdayOCRRange (0),
      canTrade(0),
      buyEasierDay(0),
      sellEasierDay(0),
      rangeCond (true),
      vindicator(0),
      vProf(false),
      vCurrProf(0),
      firstcheck(true),
      MP(0),
      o35(0),
      myRSI(0),
      ProfitPoint(0),
      FirstHigh(false) ,
      FirstHighValue(0),
      FirstLow(false),
      FirstLowValue(0),
      FirstVolumeValue(0),
      FirstVolume(false),
      ATRCalc(0),
      ATR(0),AvgVolume(0),

```

```

    ///v-box variables///
        NewVolumeBarL(0),
        NewVolumeBarH(0),
        NewVol(0),
        PivotValue(0),vVolume(0),
        Long_InsideCondition(false), Short2(false), Buy2(false),
        MyD2Avg( 0, Data2 );

Var: DateInFromTo(false),
    EmreBrkOutFactor( 0 ),
    volavg2(0,data2),
    volavg1(0,data1);

// New day settings
if Date<>Date[1] then begin
    DateInFromTo= (Date>=iFromYYMMDD and Date<=iToYYMMDD);
    FirstTrade=true;
    RangeH=H; RangeL=L;      // first bars High Low are Ranges h&l
    TimeH=Time; TimeL=Time;
        firsthigh=false;
        firstlow=false;
        firstVolume=false;
        Long_InsideCondition=false;
        Short2=false;
        Buy2=false;
////////// new V-box variables //////////
        NewVolumeBarL = L;
        NewVolumeBarH = H;
        NewVol=volume;volavg1=0;

    end;

// Range settings
If L<LowD(0)[1] then TimeL=Time;      {if new H or L, remember the time of H or L}
If H>HighD(0)[1] then TimeH=Time;

/////Identify the H and L of the high volume Bar////////////////////////////////
if time < OpenRangeTime and volume > NewVol then
    begin
        NewVolumeBarL = L;
        NewVolumeBarH = H;

```



```

        NewVol = volume;
    end;
////////////////////////////////////

If Time=OpenRangeTime then begin          // if opening range is finished
    RangeH=HighD(0);
    RangeL=LowD(0);

        volavg2=Average(volume of data2,20) of data2;
        volavg1= Average(volume,5);
        RangeHtime=TimeH;
    RangeLtime=TimeL;

        end;          // remember Range parameters

// ***** Trade *****
Inputs: FastLength (20),SlowLength (50),ExpoLength(12);

Var: my20DayAvg(0, Data2),
    my50DayAvg(0, Data2),
    slopeMA20 (0, Data2),
    slopeMA50 (0, Data2),
        ExpAvg(0);

    EmreBrkOutFactor= 1 + (EmreBrkOutPct * 0.01);
    ExpAvg= xAverage(Price, ExpoLength); /// exponential average

    MyRSI = RSI( Price, RSI_Length ) ;
    ATR = AvgTrueRange( ATRLength)data2;
    ATRCalc= ATR*ATRPercent;
    MyD2Avg = (Average( Volume of Data2, 20 ) of Data2)/78 ;
    MP=marketposition;

    AvgVolume= AverageFC(Volume,EmreAvgLength);

If cond4trade and firsthigh=false and firstVolume=false and C>RangeH then begin
    FirstHighValue=H;
    Firsthigh=true;
    FirstVolumeValue=Volume;
    vVolume= AvgVolume;

```

```
        firstVolume=true;
end;
```

```
If cond4trade and firstlow=false and C<RangeL then begin
```

```
    FirstLowValue=L;
```

```
    Firstlow=true;
```

```
end;
```

```
CustomCond = Volume>=(AverageFC(Volume,EmreAvgLength))*EmreBrkOutFactor and  
              (Close of Data2)< ((Close[1] of Data2)+(Low[1] of Data2)+(High[1] of Data2))/3 ;  
              //and H[1]>H and L[1]<L ; /// inside bar ///
```

```
CustomCondShort = (Close of Data2 >= ((Close[1] of Data2)+(Low[1] of Data2)+(High[1] of Data2))/3 )  
                  and Volume>= (AverageFC( Volume, EmreAvgLength ) *  
EmreBrkOutFactor);
```

```
Cond4trade= DatelnFromTo  
    and time>=OpenRangeTime  
    and time<EntryTimeLimit  
    ;
```

```
///BUY LONG ///
```

```
    If Cond4Trade then begin  
        If FirstTrade and CustomCond {and time<1530} {and (RangeH-RangeL)<0.7*ATR} {and  
ExpAvg>RangeH} and C> RangeH  
            {and Open>FirstHighValue}  
            //and L>FirstHighValue  
            {and L>FirstLowValue} {and C> FirstHighValue+ATRCalc} {+iBrakePoints} then  
begin  
Buy("BuyLong") {iContracts contracts} next bar at market; //RangeH+1 points stop ;  
    FirstTrade=False;  
end;
```

```
///SELL SHORT ///
```

```
    If FirstTrade and {H<FirstLowValue} C<RangeL and CustomCondShort {and Open<FirstLowValue} {and  
ExpAvg<RangeL}  
        {L<= (RangeL-iBrakeDownPoints)} then  
begin  
SellShort("SellShort") {iContracts contracts} next bar at market; //RangeL-1 points stop;
```

```

FirstTrade=False;
    cantrade=0;
end;

```

```

/// OR High& Low Stop Loss ///

```

```

    {If mp=1 and H<RangeL then sell("Stop_Loss_L") icontracts contracts next bar at market;
    If MP=-1 and L>RangeH then buy to cover("Stop_Loss_H") icontracts contracts next bar at
market;}}

```

```

///// V-BOX Stop Loss //////////

```

```

{    If MarketPosition=1 and RangeH<>NewVolumeBarH and high<NewVolumeBarH
    then sell("protective stop_L") icontracts contracts next bar at market ;

    If MarketPosition=1 and RangeH=NewVolumeBarH and high<RangeL
    then sell("protective stop_L2") icontracts contracts next bar at market ;

    If marketposition=-1 and RangeL<>NewVolumeBarL and Low>NewVolumeBarL
    then buy to cover("protective stop_S") icontracts contracts next bar at market;

    If marketposition=-1 and RangeL=NewVolumeBarL and Low>RangeH
    then buy to cover("protective stop_S2") icontracts contracts next bar at market;}

```

```

////////RSI Profit EXIT //////////

```

```

{    if MP=1 and RSI(close,RSI_length) crosses above 80
    then sell icontracts contracts next bar at market;

    If MP=-1 and RSI(Close,RSI_Length) crosses below 20
    then buytocover icontracts contracts next bar at market; }

```

```

///// Percent Trailing Profit Exit //////////

```

```

{
    if MarketPosition=-1 and (positionprofit)>= (entryprice*0.02) then
        SetPercentTrailing(positionprofit,LongTrailingPerc);

    if MarketPosition=1 and (positionprofit)>=(entryprice*0.02) then

```

```

        SetPercentTrailing(positionprofit,ShortTrailingPerc);
    }

end;

SetStopContract;
SetStopLoss(iDollarStop);
SetProfitTarget(iProfitTarget);
SetExitOnClose; /// END OF THE DAY EXIT ///

// ***** Plots and Text *****
Vars: Decimals($DecOfPriceScale1),
      PLOT_hi(0),PLOT_lo(0),
      Low_line(-1),OR_Bar(-1),Hi_Line(-1),
      Hi_text(-1),Lo_text(-1),

      LowVol_line(-1),HiVol_Line(-1), PivotValue_Line(-1); //V-Box//
if time = OpenRangeTime then begin
Plot_hi = HighD(0);
Plot_lo = LowD(0);
{Draw Lines}
Hi_line = TL_new(date,time,PLOT_hi,date,SessionEndTime(0,1),PLOT_hi);
    TL_setstyle(Hi_line,tool_dashed2);
    TL_setcolor(Hi_line, yellow);
Low_line = TL_new(date,time,PLOT_lo,date,SessionEndTime
(0,1),PLOT_lo);
    TL_setstyle(Low_line,tool_dashed2);
    TL_setcolor(Low_line,yellow );
OR_bar = TL_new(date,time,PLOT_hi,date,time,PLOT_lo);
    TL_setcolor(OR_bar,lightgray);
////////// v-box
    { HiVol_line =
TL_new(date,time,NewVolumeBarH,date,SessionEndTime(0,1),NewVolumeBarH);
    TL_setstyle(Hi_line,tool_dashed2);
    TL_setcolor(Hi_line, magenta);
LowVol_line = TL_new(date,time,NewVolumeBarL,date,SessionEndTime (0,1),NewVolumeBarL);
    TL_setstyle(Low_line,tool_dashed2);
    TL_setcolor(Low_line,magenta );}
//PivotValue_Line= TL_new(date,time,PivotValue,date,SessionEndTime(0,1),PivotValue);
//    TL_setstyle(Low_line,tool_dashed2);
//    TL_setcolor(Low_line,blue );

```

```

////////// v-box
{Text}
if ShowText then begin
    Hi_text = Text_new(Date,SessionStartTime(0,1) ,Plot_hi ,numtostr
(Plot_hi,decimals));
    Lo_text = Text_new(Date,SessionStartTime(0,1),Plot_lo ,numtostr
(Plot_lo,decimals));
end;
end;

```

8.7 ATR Ratchet Long Exit - Easy Language Code:

(TradeStation Forums)

```

[LegacyColorValue = true];
{
    atrMultiplier:    A value that is multiplied against ATR for determining the stop level.
    shortAtrLength:   The short length ATR for volatility calculations.
    longAtrLength:    The long length ATR for volatility calculations.
    numLowsBack:      The number of lows back to use.
    numAtrsToStartRatchet: The number of ATRs in favour of the direction to start ratcheting from
}

inputs:
    atrMultiplier(0.05), shortAtrLength(4), longAtrLength(20),
    numLowsBack(5), numAtrsToStartRatchet(4);

vars:
    stopPrice(0), atrValue(0), ratchetingBarCnt(0),
    hasStarted(false);

if marketPosition = 1 then begin
    atrValue = _highestAtr(shortAtrLength, longAtrLength);

    if C > (entryPrice(0) + (atrValue * numAtrsToStartRatchet)) and hasStarted = false then begin
        hasStarted = true;
        stopPrice = entryPrice(0);
    end;

    if hasStarted then begin
        if ratchetingBarCnt > 0 then begin

```

```

        if stopPrice < Lowest(L, numLowsBack) then stopPrice = Lowest(L,
numLowsBack);
        stopPrice = stopPrice + (atrValue * (atrMultiplier * ratchetingBarCnt));
    end;

    sell("Ratchet_LX") next bar at stopPrice stop;
end;

    ratchetingBarCnt = ratchetingBarCnt + 1;
end;

if marketPosition <> 1 then begin
    hasStarted = false;
    ratchetingBarCnt = 0;
end;

```

8.8 ATR Ratchet Short Exit - Easy Language Code

(TradeStation Forums)

```

[LegacyColorValue = true];
{
    atrMultiplier:    A value that is multiplied against ATR for determining the stop level.
    shortAtrLength:   The short length ATR for volatility calculations.
    longAtrLength:    The long length ATR for volatility calculations.
    numHighsBack:     The number of lows back to use.
    numAtrsToStartRatchet: The number of ATRs in favour of the direction to start ratcheting from.
}
inputs:
    atrMultiplier(0.05), shortAtrLength(4), longAtrLength(20),
    numHighsBack(7), numAtrsToStartRatchet(2);
vars:
    stopPrice(0), atrValue(0), ratchetingBarCnt(0),
    hasStarted(false);

if marketPosition = -1 then begin
    atrValue = _highestAtr(shortAtrLength, longAtrLength);

    if C < (entryPrice(0) - (atrValue * numAtrsToStartRatchet)) and hasStarted = false then begin
        hasStarted = true;
        stopPrice = entryPrice(0);
    end;
end;

```

```

end;

if hasStarted then begin
    if ratchetingBarCnt > 0 then begin
        if stopPrice > Highest(H, numHighsBack) then stopPrice = Highest(H,
numHighsBack);
            stopPrice = stopPrice - (atrValue * (atrMultiplier * ratchetingBarCnt));
        end;
        buy to cover("Ratchet_SX") next bar at stopPrice stop;
    end;
    ratchetingBarCnt = ratchetingBarCnt + 1;
end;
if marketPosition <> -1 then begin
    hasStarted = false;
    ratchetingBarCnt = 0;
end;

```