

Trading System Development: Trading the 10 O'Clock Bulls

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ABSTRACT

The purpose of this IQP was to scientifically develop a profitable automated stock trading system. Through developing the system the group members implemented the tools and techniques commonly used to scientifically develop a profitable trading system. Initially the members researched the fundamental concepts and theories about trading and how to develop trading systems. Next, the members implemented these theories by scientifically developing a system that an average citizen can use to improve their trading. Lastly the team performed back testing and analysis on the system using historical data to determine how well the system would have previously performed. The back testing proved the system to be extremely profitable. As a result the team members would like to trade this own system with their own investment capital.

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INTRODUCTION

Since the late 1990's there have been numerous computerized trading platforms, such as TD AmeriTrade™ and TradeStation™ that have emerged which enable one to have a greater control of their financial future. This technology allows an average citizen to take control of their own financial future from their personal computer. An individual can take control of their financial future by trading a wide variety of asset classes such as stocks, currencies, and commodities from the comfort of their own home. However, many of these traders have limited success as they do not have an understanding of how to trade systematically. This leads the majority of average citizen traders to trade based on recommendations from others without their own system in place to determine when the right time for them is to buy and sell a particular asset in order for them to continuously generate profits.

The purpose of this project was to scientifically develop a profitable automated stock trading system. Through developing the system the group members used tools and techniques that are commonly implemented to scientifically develop a profitable trading system. Initially the members learned fundamental concepts and theories about trading and how to develop trading systems. Next the members gained practical experience by scientifically developing a system that an average citizen can use to improve their trading. Lastly the team performed back testing and analysis on the system using historical data to determine how well the system would have previously performed.

The report discusses the background research that was performed and how a trading system was scientifically developed and tested. Initially the background research that was performed to gain an understanding of trading and trading system development is discussed.

Next the report describes how the group scientifically developed a trading system that an average citizen can implement to become a more successful trader. Then the report discusses how the system was tested to ensure that it could make an average trader more successful. Lastly the report provides recommendations of how the system can be further improved and if a trader should use it to trade.

BACKGROUND/LITERATURE REVIEW

This section of the report provides background information concerning trading and trading system development. The group utilized this information to familiarize themselves with topic of trading system development.

Asset Classes

There are a wide variety of asset classes that one can invest in. Common asset classes include stocks, bonds, options, futures contracts, currency pairs, exchange traded funds, and mutual funds (Investopedia). Each asset class performs differently in different market situations.

A well-known asset class is stocks. Stocks are an instrument which signifies ones ownership position in a corporation. The ownership position entitles one to a portion of the company's assets and earnings. Corporations sell ownership positions in the form of shares of stock to individuals in order to raise capital for their business. Stocks tend to be the most profitable short and long term investments. This ability to be highly profitable comes along with the high risk involved in stock trading. Equities can increase significantly in value but they can also fall significantly in value. The share price of a company's stock commonly fluctuates throughout every trading session.

Another asset class is a bond which is an instrument in which an individual lends capital to a corporation or government and the corporation repays the capital lent along with interest at an agreed upon time. Bonds are typically investments that are meant to last for an extended

period of time. Bonds are not as risk driven as other asset classes but they contain more risk than cash investments. Their returns hold the same relativity. Interest on bonds is set in advance and is paid regularly. Additionally paying interest on bonds is a higher priority for companies than paying dividends to shareholders.

A less common asset class is options which are contracts that give one the right to buy or sell an asset at a specified price within a given time frame. The owner is not obligated to exercise the option however the seller must be prepared to fulfil the transaction at any time. Options are primarily traded for stocks, bonds and currencies. Options are a high risk asset class as their prices are typically significantly more volatile than a stock's price. This is because options prices are determined by a wide variety of factors including the time before the option expires and the price of the actual asset that the option can be used to purchase. As a result an option can also lose a significant portion of its value before its expiration date.

Similar to options, futures contract is an agreement between two parties to buy or sell a given amount of an asset for a given price on a specified date. Unlike options both parties must fulfil their end of the contract on the given date. The buyer profits if the actual price of the asset is greater than the contract price and the seller profits if the actual price is less than contract price. These contracts allow producers and consumers of commodities to transfer the risk that comes with price fluctuations to an investor looking to profit off the price fluctuations.

The most commonly traded asset class is currency pairs which are the relative value of a given currency to another currency. Currency trading is when a trader purchases a position in a given currency pair (i.e. USD/JPY).where they plan to profit off of the price fluctuations of the currency pair. The trader would profit if the price of the pair increases if they held a long

position or if they held a short position and the price of the pair decreased. Currency trading can be relatively risky as one can trade currencies using a 50:1 margin in the United States. In other words one can trade using up to 50 times the amount of money that they have in their trading account. This allows one to profit or lose up to 50 times the amount of money they would have profited or lost if they did not trade with a margin. This makes currency trading risky as one could lose their entire account if the value of a particular pair they were trading dropped 2% while trading on a 50:1 margin.

An exchange-traded fund is an investment fund that is traded on a stock exchange as a stock would be traded. An exchange traded fund contains a wide variety of assets including stocks, bonds, and commodities. This results in the fund's value being relatively close to its actual value. ETFs are an attractive investment option for many as they offer a well-diversified portfolio that is as simple to purchase as a stock.

A mutual fund is a professionally managed investment vehicle that many investors contribute capital to. The mutual fund is then managed by the investment company to generate profit for the clients by investing the fund's capital into a diversified array of investments. The goal of most mutual funds is to generate a steady profit for their clients. Mutual funds are used by many as a way to invest their retirement savings because the investor does not have to commit a significant amount of time to investing in mutual funds.

Sources of Data/Exchanges

A financial market is a market in which financial assets are traded (Mishkin). In addition to enabling exchange of previously issued financial assets; financial markets facilitate borrowing

and lending by facilitating the sale of newly issued financial assets. Examples of financial markets include the New York Stock Exchange (resale of previously issued stock shares), the U.S. government bond market (resale of previously issued bonds), and the U.S. Treasury bills auction (sales of newly issued T-bills). A financial institution is an institution whose primary source of profits is through financial asset transactions. Examples of such financial institutions include discount brokers (e.g., Charles Schwab and Associates), banks, insurance companies, and complex multi-function financial institutions such as Merrill Lynch.

Financial assets are traded in three different ways. Specialists, outcry pits, and electronic trading occur every day in the markets (Mishkin).

A specialist is a member of an exchange who acts as the market maker to facilitate the trading of a given stock. The specialist holds an inventory of the stock, posts the bid and asks prices, manages limit orders and executes trades. Specialists are also responsible for managing large movements by trading out of their own inventory. If there is a large shift in demand on the buy or sell side, the specialist will step in and sell out of their inventory to meet the demand until the gap has been narrowed.

The specialist's role is to maintain an orderly market and to provide liquidity to the marketplace. When no one else is available to buy or sell, the specialist stands ready to perform that function.

Open outcry is the name of a method of communication between professionals on a stock exchange or futures exchange. It involves shouting and the use of hand signals to transfer information primarily about buy and sell orders. The part of the trading floor where this takes place is called a pit.

Examples of markets which use this system in the United States are the New York Mercantile Exchange, the Chicago Mercantile Exchange, the Chicago Board of Trade, and the Chicago Board Options Exchange. In the United Kingdom, the London Metal Exchange still makes use of open outcry.

The open outcry system is being replaced by electronic trading systems (such as CATS and Globex). The supporters of electronic trading claim that they are faster, cheaper, more efficient for users, and less prone to manipulation by market makers and broker/dealers. However, many traders advocate for the open outcry system on the basis that the physical contact allows traders to speculate as to a buyer/seller's motives or intentions and adjust their positions accordingly. Today, most stocks and futures contracts are no longer traded using open outcry due to the lower cost of the aforementioned technological advances.

A "trading floor" is a trading venue. This expression often refers to a place where traders or stockbrokers meet in order to buy and sell equities, also called a pit. Sometimes, the expression "trading floor" is also used to refer to the "trading room" or "dealing room", i.e. the office space where market activities are concentrated in investment banks or brokerage houses. But, technically speaking, these two spaces are different.

Electronic trading, sometimes called e-trading, is a method of trading securities (such as stocks, and bonds), foreign exchange or financial derivatives electronically. Information technology is used to bring together buyers and sellers through electronic trading platform and networks to create virtual market places such as NASDAQ, NYSE Arca and Globex which are also known as electronic communications networks (ECNs). Electronic trading is in contrast to older floor trading and phone trading and has a number of advantages. Electronic trading systems are

typically proprietary software (e-trading platforms or electronic trading platforms), running on COTS hardware and operating systems, often using common underlying protocols, such as TCP/IP.

Exchanges typically develop their own systems (sometimes referred to as matching engines), although sometimes an exchange will use another exchange's technology (e.g. e-cbot, the Chicago Board of Trade's electronic trading platform, uses LIFFE'sConnect system), and some newer electronic exchanges use 3rd-party specialist software providers (e.g. the Budapest stock exchange and the Moscow Interbank Currency Exchange).use automated trading software originally written and implemented by FMSC, an Australian technology company that was acquired by Computershare, and whose intellectual property rights are now owned by OMX.

Trading Platforms

A trading platform is the software that traders use to place trades and monitor their accounts (Investopedia).Online trading platforms allow one to manage their own investments and be an informed investor. These platforms allow users to buy and sell assets through an online broker. Additionally trading platforms can be used by traders to automatically trade for them based on their trading strategy.

When selecting a trading platform there are a variety of factors that need to be evaluated based on ones investing needs. The first factor that needs to be considered is the fees associated with making a trade and having access to the software. These fees vary over the different platforms that are offered. Some platforms have set fees per trade, while others offer

contracts that allow reduced rates when making frequent trades. Some also require minimum balances and even charge account maintenance fees if the minimum balance is not met.

One must also consider which assets classes they would like to trade. Not all platforms offer the all of the major asset classes such as stocks, Forex, options, and futures. However nearly all platforms offer the ability to trade stocks, one may want to trade Forex, options, or futures. Additionally trading platforms provide educational resources as well as monitoring capabilities. With the addition of smart phones, many people take trading away from the computer and keep an eye on their investments from their mobile devices. Some platforms even offer cell phone alerts to allow the user to be more informed about your investments without having to constantly monitor the market.

Below is a table which compares all of the major commercially available trading platforms in the areas of commissions, maintenance fees, and mobile support. The companies compared include Scottrade, Fidelity, E*Trade Financial, Charles Schwab, and TD Ameritrade. These are the most commonly used trading platforms. Additionally all of the major platforms can trade all major asset classes and provide an extensive array of educational resources to help educate traders (TradeStation, Scottrade, Fidelity, E*Trade, Charles Schwab, TD Ameritrade).

Platform	Commissions	Tiered Commissions	Maintenance Fee	Mobile Support
TradeStation	\$9.99/Trade	Yes	Yes	No
Scottrade	\$7.00/Trade	No	No	Yes
Fidelity	\$7.95/Trade	Yes	No	Yes
E*Trade	\$7.99/Trade	Yes	No	Yes
Charles Schwab	\$8.95/Trade	Yes	No	Yes
TD Ameritrade	\$9.99/Trade	No	No	Yes

Figure 1. Comparison of Trading Platforms

Different Types of Trading/Active Investing Systems

Theories

Since the turn of the twentieth century trading theories have been developed and utilized. Some theories primarily used include the Dow Theory, Elliott Wave, and Fibonacci Numbers (Headley).

The Dow Theory was created by Charles Dow, the founder of Dow Jones and Company, commonly known for creating the Dow Jones Industrial Average. The theory has several components. The first component is that the market has three trends. The trends are that the market moves sharply in one direction, next it briefly recedes, and then it moves in the original direction. These trends are the basis of many technical analysis systems. The next component is that the market has three phases, accumulation by astute investors, then trend-followers jump on, and then the astute investors sell their shares. The theory also states that the market quickly reacts to news and that averages confirm each other. Finally the theory states that trades are confirmed with volume and that trends exist until signals indicate otherwise.

The next theory is the Elliott Wave. In short, the theory states that every market action is followed by a reaction. The theory also states there are five waves in the direction of the main trend followed by three waves in the opposite direction. The cycle concludes after this occurs. Another mainstream theory is Fibonacci Numbers. The Fibonacci Numbers are based on the ratio of 1.618 occurring often in nature as determined by a 12th century mathematician. This theory is commonly used to predict future prices.

Manual versus Automated Trading Systems

One can operate their trading system manually or automatically. Manual trading is when the traders manually place their own buy and sell orders on the trading platform. Automated trading is when the trading platform automatically places orders based on the trader's trading rules or strategy. The decision to trade automatically or manually is a difficult decision to make (Signal Trader). Each one has its advantages and disadvantages. The quickest way to learn about the market is to trade manually. Opening a position is very simple but the management of money and the emotional factor that sets in on manual traders can be tough to hold off. Automated trading is a great way for traders to gain faith in the market. The most obvious benefit of automatic trading is that it frees traders from the constant watching of the market. They can just set their system up and let it do its job. Automated trading also eliminates the emotional aspect of manual trading.

Fundamental versus Technical Trading Systems

Fundamental analysts approach an investment by looking into the company's reports earnings and financial statements (Investopedia). A technical analyst believes that this

information is all fulfilled by the stock's price. If the company is doing well and its financial statements match up then the stock price will reflect accordingly. These two analysts have different time frames of analytical research as well. Fundamental analysts take a relatively long-term approach to an investment. Technical analysts can take anywhere from minutes to weeks while fundamental analysts often look at data over a number of years.

Strategies

There many ideas that one can use to develop their own trading strategy. Notable ideas include trend following, counter-trending, stop and reverse, and specialized boutique systems (Wright). Trend following systems are designed to follow the trends in the market (i.e. the trader goes long on an asset in an up trending market). Another idea is to create a counter-trending system where the trader trades against the market (i.e. the trader shorts a stock in an up trending market). An additional idea that can be added to an existing strategy is a stop and reverse system. A stop and reverse system exits a current trade and then enters another trade in the opposite direction (Investopedia). An example of this is when one exits a long position and then immediately orders a short position. The last major type of strategy is a specialized or boutique system. These types of strategies focus on a specialized asset or industry (Investopedia).

Trading Tools

There are several tools that a trader can use to analyse an asset's price and trading patterns. Some commonly used tools include trend lines, indicators, channels, and Japanese Candle Stick Patterns (Investopedia). Trend lines are commonly drawn by connecting the each

bars high or low price together on the stock's chart. The trend lines display the prevailing direction of a price over time. Trend lines also provide a visual representation of the support and resistance levels of an assets price in a given time period.

An additional way to view the support and resistance level of an asset is to use channels. Channels are the range between the support and resistance levels. The support and resistance levels are the high and low of the price range for the asset over a given time period. Channels are essentially horizontal lines marked across the chart at the support and resistance prices. An example of these lines added to a chart can be found in Figure 2 below. The top line indicates the resistance level price and the bottom line indicates the support level price.

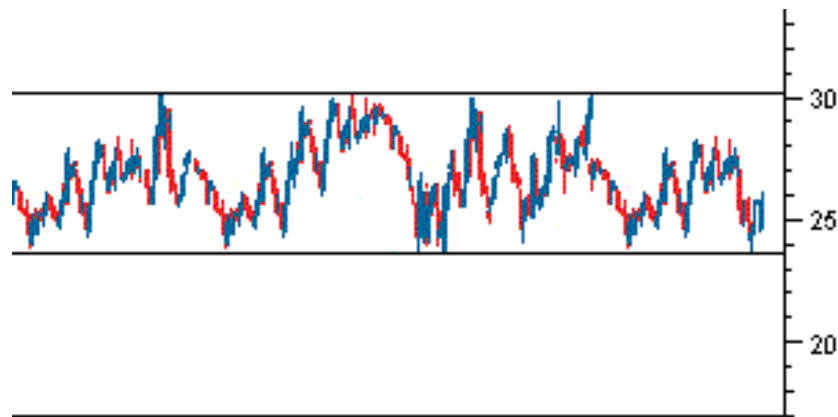


Figure 2. Price Chart with Support and Resistance Indicator

A tool used to track prices during each bar of trading is the Japanese Candle Stick Pattern. This tool is also known as candlestick charting. The Japanese Candle Stick Pattern displays the high, low, opening, and closing prices for an asset in a given bar. The bar also displays if the price increased over the previous bar by appearing green and displaying a price decrease by appearing red. On the next page Figure 3 displays each component of the Japanese candlestick.

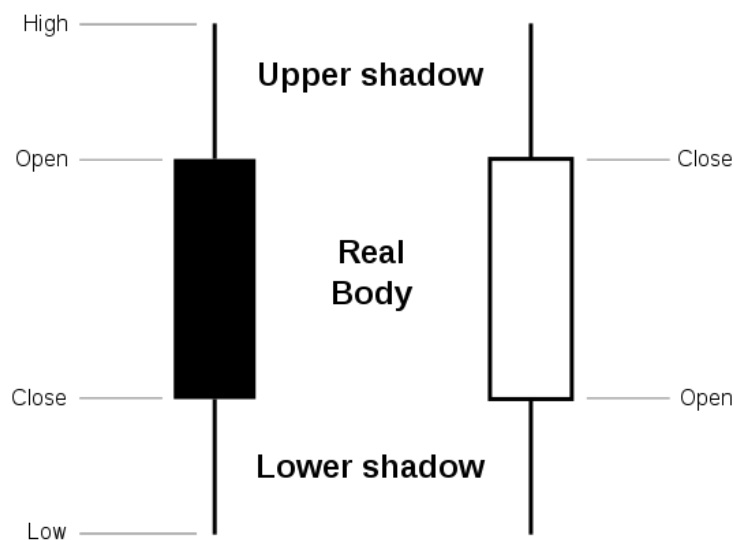


Figure 3. Japanese Candlestick with Components Labeled

Another commonly used tool is indicators. Indicators are a series of data points that are calculated using a particular formula. Indicators are used to predict the future direction of the market. A common indicator is VIX Fear Index which uses volatility in the market to calculate the amount of fear traders have. Another common indicator is the high-low index. The high-low indicator uses the record high percent index to determine if the market is in a strong uptrend (bullish).or in a strong downtrend (bearish).

Order Types

There are three main types of orders that one could place to buy or sell a particular asset (New York Stock Exchange). They are market orders, limit orders, and stop orders. Market orders are placed to buy or sell an asset immediately at the best available price. Market orders ensure that the order is filled, however the seller may be able to buy or sell at a better price if

they waited to place the order or placed a limit order. A limit order is when a trader places an order to buy or sell a set quantity of an asset for a given price or better. This ensures that the trader gets their desired price however there is no guarantee that the order will be filled within a given amount of time. The last type of order is a stop order, which is when the trader places an order to buy or sell a given quantity of an asset when the price reaches a predetermined entry or exit point. This is commonly used by investors to limit losses and lock in their profits.

METHODS

This section of the report describes how the group scientifically developed a trading system that an average citizen can implement to become a more successful trader. The section initially describes how the group determined which financial instrument the system will trade. Then the system performance objectives are discussed. Next the system development process is described. Lastly, the final system is described in detail.

Financial Instrument Traded

For the project the team decided to trade equities. The primary reason that the team members decided to trade equities was that the group had a personal interest in trading equities. This is primarily because equities follow day to day changes in the news and they are each tied to a respective company. Additionally this instrument provides a large amount of volatility relative to other instruments which provides the best opportunities for the largest profits. Large profit can be made in a short period of time. A stock trading system can be a day trading system, thus eliminating the risks of long term investing. The trader is also provided with real time accurate data from the stock exchange which allows them to accurately follow their trading strategy. This choice also provides liquidity for the trader as stocks can be bought and sold within the same minute. This liquidity allows the trader to end the day in cash and not hold investments over night.

While making this decision the team also considered the drawbacks of trading equities versus other instruments. The team has decided to accept these drawbacks due to their personal interest and ability to be highly profitable trading stocks. Some drawbacks include the

tax implications and regulations. All profits made from trading in the United States are subject to capital gains taxes. At the start of 2013 capital gains are taxed at a rate of 15-20% depending on one's income. All trades must also be reported to the I.R.S (Internal Revenue Service).when one files their income taxes annually (Internal Revenue Service).Another trading regulation is that one cannot day trade unless they have at least \$25,000 in their brokerage account prior to any day trading activity. Day trading is defined as completing 4 or more round-trip trades (buying and then selling).within a 5 business day period (Securities and Exchange Commission)

System Criteria/Objectives

Upon deciding to develop a system to trade equities, the team determined the system's performance objectives. These were established to guide the group in developing a trading system which would meet the trading needs of an average client. The performance objectives included the system's win percentage, the system's annual return, draw-down, and markets it can trade in. Additionally, the system's criteria included time commitment for trading, and time spent in the market.

The first system performance objective determined was the system's win percentage. The system's win percentage is the percentage of trades that the system generates a net a profit on. The team determined that the system must win approximately 60% of its trades. This was determined based on the average winning percentage of several professionally developed systems. Additionally this win percentage was determined to ensure that the client or trader is satisfied with the amount of winning trades while the system is allowed to let the winning trades rise to maximize profits and close the losing trades to limit losses.

The next performance objective determined was the system's annual return. The system's annual return is the total net profit generated trading the system for one calendar year. It was determined that the system shall produce an annual return of at least 15% and 1.25% per month. This annual return would make the system competitive with mainstream systems that are already in place. This annual return is also greater than the returns of stock market indices such as the Dow Jones Industrial Average and the S&P 500.

The third performance objective determined was the system's drawdown. The system's drawdown is the maximum net loss that the system will have at any given time. The team determined the maximum drawdown needs to be no greater than 10%. This drawdown was determined to ensure that the trader does not lose a significant amount of their trading capital at any point in time. This also reduces the likelihood that the trader will lose too much of their capital and become discouraged and stop trading as a result.

The next performance objective established was which market types that the system would successfully trade. The stock market at any time can be considered a trending, directionless, or volatile market (Wright). A trending market is when the prices are generally moving in one direction. A directionless market is when the stock prices tend to remain stagnant. A volatile market is when the prices move vigorously and unpredictably. The team determined that the system needs to successfully trade all three aforementioned market types to ensure that the system is profitable regardless of the market conditions.

Another system criteria established was the time commitment to trading and maintaining the trading system. The team determined that the trader shall not spend more than 3 hours per week trading and maintaining the system. The trader also must not have to

interact with the system during trading sessions. This requires the system to be an automated trading system. These criteria were determined so that an average person that works a full-time job can successfully trade using the team's trading system.

The final system criteria established was the amount of time that the system holds a particular trade in the market. The team determined that the system will hold trades for up to one trading session, effectively making it a day-trading system. Additionally, this means that the system will not hold trades overnight since the system's positions will be closed prior to the end of the trading session. These criteria were determined to minimize risk because holding trades over night can lead to large losses as there can be significant price drops from the close of one trading session to the start of another.

Time Frame for Trading

The team determined that their system will be a day-trading system. A day-trading system enters and exits trades during the same trading session. This was determined to eliminate the risk that comes with holding trades over night. Holding trades over night can lead to large losses as there can be significant price gaps from the close of one trading session to the start of the next one.

While making this decision the team also considered holding trades overnight to be able to profit off of the large price gaps from the close of one trading session to the start of another. However, the team decided not to hold trades over night because they will not know how much the position's value has changed since the close of the trading session until the start of the next trading session because the prices are not available when the markets are closed. This also prevents the system from being able to exit the trades overnight to protect profits or prevent

further losses until the start of the next trading session when it is often too late to exit the position. Additionally, an amateur trader may not be comfortable holding onto positions overnight due to the fear of large losses due to significant price gaps between sessions.

SCIENTIFIC JOURNEY TAKEN TO DEVELOP TRADING SYSTEM

Selection of Strategy Concept

Once the team determined the trading system's objectives, they began to scientifically develop a trading system to meet the aforementioned objectives. This process began by researching several well-known trading systems that are commonly used for day-trading stocks. After completing this research the team decided to create a trading system based on Geoff Bysshe's 10 O'Clock Bulls trading system. The 10 O'Clock Bulls system utilizes the 30 minute opening range to determine when to long or short a particular stock. The 30 minute opening range is composed of the high and low price of a particular stock during the first 30 minutes of a trading session. This system longs a stock when the stock's price is greater than the opening range high and it shorts a stock when the stock's price is lower than the opening range low.

The team decided to use this system as the basis for their system because it had a well-established edge on the market. This system had an edge on the market because 35% of the time a stock price's high and low for the day are reached during the first 30 minutes of a trading session (Bysshe). This is primarily due to traders reacting to the market news and overnight orders being filled. This means that the stock's price will likely remain within the opening range for the entire session and if the price breaks out it will continue to move in the direction of the breakout. These breakouts can be used by the trader to give themselves an edge as they indicate significant direction in the stock's price.

Development of Strategy

The development of the system began by writing an EasyLanguage program that automatically trades the basic 10 O’Clock Bulls Strategy. The completed EasyLanguage code can be found in Appendix A. The system purchases long positions when the stock’s price is greater than the opening range high. The system then exited all trades at 3:30PM which is 30 minutes before the close of the New York Stock Exchange’s trading session to ensure that the system did not hold any positions overnight.

This initial system was then back tested to evaluate its performance and identify ways it can be improved. The system was back tested using \$100,000 in simulated capital. The system was back tested with no implementation costs (slippage, commission, and margin fees).and fixed position sizes where the system purchased the maximum number of shares it could with the \$100,000 in capital. The initial back testing proved the system to be profitable as the system would have generated a profit of \$7,267.25 trading Apple’s Stock from January 1, 2013- April 1, 2013. The results of this back test can be found in Figure 4 below. While the system was profitable, it had many losing trades due to the stock’s price breaking out for a brief period of time and then dropping back below the opening range high. This represented a great opportunity to improve the system by testing various methods to confirm that the stock’s price is a breakout and will likely not drop below the opening range high.

Stock	Net Profit	Long Profit	Profit Factor	Long Profit	Number of Trades	Percent Profitable	Average Winning Trade	Average Losing Trade
AAPL	\$7,267.25	\$7,267.25	1.15	1.15	27	55.56%	\$3,721.43	(\$4,046.19)

Figure 4. Initial Back Testing Results

The first method tried to confirm breakouts was using an increase in volume from one bar to another in addition to the price breaking out to confirm a breakout. This concept is based on the fact that large increases in volume indicate that the price will increase as well. When the stock's price broke out and the volume for the current bar was greater than the previous bar, the system purchased a long position. This method did not improve the system over the initial system. It also kept the system out of many winning trades. Therefore the team continued research and test new methods to confirm breakouts.

The next method tried to confirm breakouts was identifying if the volume is greater than the average volume in addition to the price breaking out to confirm a breakout. When the stock's price broke out and the volume for the current bar was greater than the average volume, the system purchased a long position. This method also did not improve the system over the initial system. Therefore the team continued to research and test new methods to confirm breakouts.

Another method tried was using the simple moving average of the stock's price breaking out to confirm a breakout. Using this method the system purchased a long position when the simple moving average of a pre-set range and the stock's price broke out. This method was found to significantly improve the system over the initial system. This method would have generated a profit of \$14,596.00 while the initial system generated a profit of \$7,267.25 trading Apple's Stock from January 1, 2013- April 1, 2013. The results of this back test can be found in Figure 5 below. This method was more profitable because it prevented the system from entering the majority of trades where the stock's price dropped below the opening range high

shortly after it the price broke out. As a result the team elected to use this as the method for confirming breakouts.

Stock	Net Profit	Long Profit	Profit Factor	Long Profit	Number of Trades	Percent Profitable	Average Winning Trade	Average Losing Trade
AAPL	\$14,596.00	\$14,596.00	1.5	1.5	22	54.55%	\$3,650.71	(\$2,921.25)

Figure 5. Back Testing Results Using Simple Moving Average to Confirm Breakouts

Next the team tried different ways to set the support and resistance level indicators as alternatives to using the opening range high and low. The first method tried was using floor trader pivots to set the support and resistance levels. Floor trader pivots are support and resistance level prices that are determined using a series of calculations. This did not improve the initial trading system because the breakouts were not as great as the ones encountered using the opening range high and low.

Additionally, the team tried using the high and low price of the bar with the highest volume during the first 30 minutes of the trading session to set the support and resistance levels. As with the floor trader pivot points, this method for setting support and resistance levels did not improve the initial system. Additionally, the bar with the highest volume was usually the first bar of the trading session. As a result the team continued to use the opening range high and low to set the support and resistance levels for their system.

The next component improved upon was the system's exits. The first exit tried in addition to the 3:30PM end of day exit was an ATR (Average True Range). Ratchet. The ATR Ratchet exits a position if the price falls below a certain point calculated using the stock's average true range. This exit is not activated until a certain profit target is reached. This exit

performed well in back testing as it allowed winning trades profits to run until significant changes in the market occurred then the system exited.

Another exit tested was the trailing stop. The trailing stop exits the position after the price drops a predetermine amount below the maximum price since the position was opened. Implementing the trailing stop significantly improved the system's performance in back testing. This was primarily due to the system allowing winning trades' profits to run until they began to start dropping again. This also prevented many winning trades from turning into losing trades as the prices began to fall again.

The next exit tested was the LeBeau stops. LeBeau stops are a package of trailing stops that work together. The trailing stops in this package are chandelier stop, parabolic stop, and a yo-yo stop. Implementing LeBeau stops did not improve the system. The LeBeau stops exited many large winning trades within a 2-3 5-minute bars of when the position was opened. This effectively made the system a scalping system and significantly reduced the system's profitability.

After the three methods to exit with a profit were tested, the team determined which exit to use in their system in conjunction with the 3:30PM end of day exit. The team decided to use the trailing stop due to its performance in back testing. The trailing stop appeared to consistently generate the largest profits of the three exit methods tested. This exit also had the least amount of parameters that needed to be optimized. This allowed the exit to be optimized using historical data without significant risk of curve fitting. If curve fitting occurred, the system's optimization would only be effective when the historical data used repeated itself in the future.

The last exit tested in the system was a stop loss. A stop loss exits a trade when the trade has lost a predetermined amount. A stop loss is commonly used by traders to prevent large losses from being incurred on a trade. The stop loss was first tested in conjunction with the trailing stop without implementations. This method would have generated a profit of \$27,111.25 while the initial system generated a profit of \$7,267.25 trading Apple's Stock from January 1, 2013- April 1, 2013. The results of this back test can be found in Figure 6 below. The stop loss was found to make the system more profitable because it prevented many large losing trades. As a result the stop loss was used in the final system as an exit signal.

Stock	Net Profit	Long Profit	Profit Factor	Long Profit	Number of Trades	Percent Profitable	Average Winning Trade	Average Losing Trade
AAPL	\$27,111.25	\$27,111.25	2.31	2.31	24	58.33%	\$3,419.11	(\$2,075.63)

Figure 6. Complete System Back Testing Results (Without Implementation Costs).

Then the system was back tested with implementation costs incurred to simulate real-world trading where these costs are incurred. The complete system would have generated a profit of \$21,896.05 trading Apple's Stock from January 1, 2013- April 1, 2013. The results of this back test can be found in Figure 7 below.

Stock	Net Profit	Long Profit	Profit Factor	Long Profit	Number of Trades	Percent Profitable	Average Winning Trade	Average Losing Trade
AAPL	\$21,896.05	\$21,896.05	1.95	1.95	24	58.33%	\$3,201.81	(\$2,292.92)

Figure 7. Complete System Back Testing with Implementation Costs

Once the system's entries and exits were determined, the team developed a scanner to determine which stock to trade during a given session. Initially the group discussed trying to determine how often a stock breaks out, whether or not it closed above the opening after the

breakout, and create a list of stocks that meet a certain criteria. The system would be deemed to work for this custom list, but an error in this judgment was quickly recognized. The group realized that previous performance does not indicate future performance. As a result the scanner needed to be focused on how the stock is performing in the current trading session.

Due to these findings, the team created a scanner that evaluates stock's based on their current session performance. The criteria used to evaluate stocks included if its current price was greater than yesterday's closing price, daily volume is at least 50% greater than its 10 day average volume, and if its volume is greater than 1,000,000. The scanner would then be used to find stocks that met the criteria for the system to trade. Using this scanner proved to make the team members more profitable in their own simulated trading than if they traded stocks that were selected without using predetermined criteria.

Description of System Components

At the conclusion of the scientific journey the team had a well-developed and functional trading system that a trader could implement to become more profitable. The trading system is based on Geoff Bysshe's 10 O'Clock Bulls trading system. In addition to the basic 10 O'Clock bulls system, the team added a scanner and additional entry criteria. The team also added exit strategies to the system. The team feels that the system has an edge on the market because many day-traders and institutions use the opening range to set their support and resistance levels. Many traders and institutions then use these values to determine when to buy and sell their positions. Additionally, 35% of the time a stock's high and low are determined during the first 30 minutes of the trading session when the opening range is established

(Bysshe). Therefore when the stock's price breaks out of the range, it often stays outside of the range for the remainder of the session, thus giving the system an edge (Bysshe).

The system has entry rules that include a filter, set-up, and a trigger. The system's filter is a scanner which identifies which stocks the system should trade during a given session. The scanner provides the trader a list of stocks which meet the following criteria: its current price is greater than yesterday's closing price, daily volume is at least 50% greater than its 10 day average volume, and if its volume is greater than 1,000,000. The system's set-up is when the stock's price exceeds the opening range high and the system's trigger is when the simple moving average of a predetermined range breaks out.

Once a position is opened the system has a series of exit rules that can be used to close the position. The system exits a trade with a profit by closing at 3:30PM to ensure the position is exited at before the end of the trading session. The system can also exit with a profit using a trailing stop. Additionally, the system can exit with a loss, using a stop loss. The stop loss exits a trade if the trade loses a predetermined amount to prevent further losses.

The system enters and exits trades by placing an order to buy or sell a position. The system exclusively places market orders. Market orders are placed to buy and sell a particular stock at the market price. This ensures that the orders are filled immediately after they are placed.

The system determines position sizes by calculating the number of shares that can be purchased with the available capital. This results in the trader having all of their available investment capital used in each trade. Therefore all of their assets are allocated to trading this

system. Since the trader has all of their capital utilized in each trade there is significant risk. The system manages this risk using a stop loss exit to prevent large losses on any one trade.

RESULTS

Once the system was completed the system was back tested and optimized individually for each of the stocks that comprise the DJIA (Dow Jones Industrial Average). The DJIA was chosen for back testing because of its credibility in the financial market as an indicator of how the overall stock market is performing at any given time. The variables that were optimized for each test include the number of bars to set the opening range, the length of the moving average calculations, the floor amount for the percent trailing stop, the trailing stop percentage, and the stop loss amount. The results of these optimizations for each test can be seen in Figure 9. The first two variables are directly tied to how the strategy enters a trade, with the remaining three directly impacting the exit portion of the strategy.

Upon completion of the strategy optimization, a back test was run for the time period dating from January 1, 2013 through April 1, 2013 trading each of the 30 DJIA Stocks. The results of this back testing can be seen in Figure 8. As seen in the table, only 3 out 30, or 10%, of the stocks reported losses over the three month period. These losses were effectively kept to a minimum when compared to the significant gains that were achieved from some of the other stocks, especially when compared to the average, which is still over a 9% return in a three month period. These results, however, only show how the strategy would perform trading a single stock over three months. The average number of trades that the strategy made during the three month period is 32, or close to 3 trades a week. That means, on average, there was capital available that could be used to trade the remaining 2 days of the week. This means that the strategy has free capital during nearly 40% of the available trading days. The strategy

arguably is fine just the way it is, and many investors would be satisfied with the average rate of return that the strategy presents, but the 40% is an interesting return that leaves room for even higher profit margins.

According to the system criteria set forth by the group, the system did not meet all of the system objectives that were originally proposed. The system was to win approximately 60% of its trades, and on average only had a win percentage of 53.45%. This is certainly not far off from the proposed goal and was deemed effective enough by the group. Eight of the stocks, had a win percentage higher than 60% and a few were not far off. The system was also to be designed in order to create an annual return of at least 15%. This equates to approximately 3.75% return quarterly, or \$3,750 based on a \$100,000 account. The system produced an average return of \$9,870.28, or 9.87%. This would equate to an annual return of nearly 40% on average. Only seven out of the 30 stocks did not meet the 3.75% quarterly return, however approximately half of the stocks tested nearly met their annual return of 15% in one quarter.

During the quarterly back testing the group has determined that the system is capable of trading all market types, due to the likelihood that all market types were apparent during the 3 month period that the 30 DJIA stocks were tested. Since the system was profitable over this time period, the group has established that the system is capable of being profitable across all market types. The simplicity of the day trading system that the group has developed also requires minimal user interaction. The trader simply must take less than 30 minutes daily to activate the system and choose a stock to trade from the scanner results. However, there is no reason this could not be completely automated and thus not require the trader to interact with the system during each trading session.

The system does not have an exact set amount of time to hold a trade in the market. However the maximum amount of time that a trade is held is one trading session as the system exits each trade before the end of the trading session. The system essentially holds a trade as long as none of the exits are triggered, with the end of day exit being the latest a trade could be exited.

The back testing results are simply a good indicator of how well the system could perform, but not necessarily an exact representation. This is because back testing has a few variables that distinguish it from actual trading. First, back testing uses historical data for these performance reports and history is not likely to repeat itself perfectly. Second, the system was optimized to this historical data that was used for back testing, so optimization results could lead to curve fitting the data and the results produced may only be valid if history repeats itself. Lastly, back testing assumes that all orders are filled when they are sent, at the exact price that they are sent at. Traders know that this is not the case when actually trading. System orders take time to be processed; the market could have moved from where the order was placed. Back testing with an account that is large enough can run into the issue of a strategy ordering to a greater number of stocks than the number available. During back testing this order would be filled, but in actual trading, the filled amount could be significantly less, or rejected altogether. Also, back testing bases each trade on the starting equity, but does not take into account that equity changes based on losing or winning trades. So for some trades the account has more or less equity, so using the starting equity is a good average, but is also not fully accurate for profit gains. This does not mean that back testing is not valuable, as long as these discrepancies are

recognized back testing can give an important look into how a system could perform in the market.

Stock	Net Profit	Long Profit	Short Profit	Profit Factor	Long Profit	Short Profit	Number of Trades	Percent Profitable	Average Winning Trade	Average Losing Trade	Max Drawdown	Exit Used			
												End of Day	Percent Trailing	Stop Loss	Opening Range
MMM	\$12,411.52	\$12,411.52	\$0.00	1.65	1.65	n/a	46	67.39%	\$1,015.58	(\$1,271.42)	(\$11,503.36)	39	0	0	7
AA	\$25,247.55	\$25,247.55	\$0.00	2.16	2.16	n/a	23	60.87%	\$3,359.27	(\$2,420.24)	(\$12,871.30)	20	0	0	3
AXP	\$13,673.50	\$13,673.50	\$0.00	1.67	1.67	n/a	38	57.89%	\$1,545.70	(\$1,563.99)	(\$11,236.05)	29	0	0	9
T	\$2,298.78	\$2,298.78	\$0.00	1.16	1.16	n/a	32	56.25%	\$923.00	(\$1,022.51)	(\$8,045.73)	30	0	0	2
BAC	\$13,413.66	\$13,413.66	\$0.00	1.75	1.75	n/a	21	52.38%	\$2,845.32	(\$1,987.21)	(\$10,318.20)	21	0	0	0
BA	\$18,411.30	\$18,411.30	\$0.00	1.93	1.93	n/a	32	65.63%	\$1,816.24	(\$1,793.60)	(\$10,819.48)	30	0	0	2
CAT	\$5,713.20	\$5,713.20	\$0.00	1.25	1.25	n/a	25	52.00%	\$2,216.49	(\$1,925.10)	(\$11,426.40)	20	3	0	2
CVX	\$3,830.61	\$3,830.61	\$0.00	1.23	1.23	n/a	37	43.24%	\$1,274.71	(\$788.80)	(\$9,076.13)	31	2	0	4
CSCO	\$8,788.95	\$8,788.95	\$0.00	1.52	1.52	n/a	26	42.31%	\$2,325.96	(\$1,199.76)	(\$8,203.02)	26	0	0	0
DD	\$10,659.47	\$10,659.47	\$0.00	2.31	2.31	n/a	23	73.91%	\$1,105.67	(\$1,356.17)	(\$5,695.90)	21	0	0	2
XOM	\$2,608.89	\$2,608.89	\$0.00	1.13	1.13	n/a	35	51.43%	\$1,296.82	(\$1,219.64)	(\$13,547.92)	30	0	0	5
GE	(\$2,757.30)	(\$2,757.30)	\$0.00	0.87	0.87	n/a	25	52.00%	\$1,456.42	(\$1,807.56)	(\$13,602.68)	21	0	0	4
HPQ	\$53,429.31	\$53,429.31	\$0.00	2.13	2.13	n/a	35	62.86%	\$4,587.37	(\$3,653.29)	(\$21,289.84)	30	1	0	4
HD	(\$1,463.40)	(\$1,463.40)	\$0.00	0.93	0.93	n/a	30	43.33%	\$1,446.72	(\$1,266.92)	(\$9,972.80)	27	0	0	3
INTC	\$9,799.35	\$9,799.35	\$0.00	2.22	2.22	n/a	22	54.55%	\$1,484.75	(\$890.85)	(\$6,057.78)	22	0	0	0
IBM	\$4,525.75	\$4,525.75	\$0.00	1.25	1.25	n/a	34	38.24%	\$1,753.63	(\$870.07)	(\$13,219.40)	31	0	0	3
INJ	\$5,822.82	\$5,822.82	\$0.00	1.35	1.35	n/a	47	42.55%	\$1,114.86	(\$784.49)	(\$6,390.90)	41	0	0	6
JPM	\$254.25	\$254.25	\$0.00	1.01	1.01	n/a	32	50.00%	\$1,578.47	(\$1,562.58)	(\$14,238.00)	29	0	0	3
MCD	\$14,000.04	\$14,000.04	\$0.00	2.10	2.10	n/a	36	63.89%	\$1,161.42	(\$977.90)	(\$6,195.42)	31	1	0	4
MRK	\$13,533.48	\$13,533.48	\$0.00	1.95	1.95	n/a	33	57.58%	\$1,464.15	(\$1,298.67)	(\$6,098.42)	29	0	0	4
MSFT	\$5,176.40	\$5,176.40	\$0.00	1.29	1.29	n/a	27	48.15%	\$1,791.83	(\$1,294.10)	(\$8,152.83)	25	0	0	2
PFE	\$6,732.96	\$6,732.96	\$0.00	1.32	1.32	n/a	39	48.72%	\$1,444.72	(\$1,218.64)	(\$6,603.48)	33	0	0	6
PG	\$1,571.20	\$1,571.20	\$0.00	1.09	1.09	n/a	36	44.44%	\$1,215.23	(\$940.65)	(\$7,856.00)	33	0	0	3
KO	\$20,727.59	\$20,727.59	\$0.00	3.30	3.30	n/a	28	71.43%	\$1,486.57	(\$1,125.48)	(\$5,252.24)	28	0	0	0
TRV	\$5,405.88	\$5,405.88	\$0.00	1.36	1.36	n/a	37	56.76%	\$964.21	(\$989.50)	(\$10,811.76)	33	0	0	4
UTX	(\$256.02)	(\$256.02)	\$0.00	0.98	0.98	n/a	25	44.00%	\$1,225.79	(\$981.41)	(\$9,643.42)	25	0	0	0
UNH	\$11,325.40	\$11,325.40	\$0.00	1.55	1.55	n/a	36	44.44%	\$1,994.44	(\$1,083.45)	(\$11,591.88)	34	0	0	2
VZ	\$14,417.72	\$14,417.72	\$0.00	2.22	2.22	n/a	30	66.67%	\$1,311.40	(\$1,312.25)	(\$6,058.51)	27	0	0	3
WMT	\$16,483.35	\$16,483.35	\$0.00	2.10	2.10	n/a	32	56.25%	\$1,748.75	(\$1,071.01)	(\$10,115.95)	31	0	0	1
DIS	\$322.30	\$322.30	\$0.00	1.01	1.01	n/a	32	34.38%	\$1,998.26	(\$1,139.92)	(\$12,505.24)	30	0	0	2
Average	\$9,870.28	\$9,870.28	\$0.00	1.59	1.593	n/a	32	53.45%	\$1,698.46	(\$1,360.57)	(\$9,946.67)	29	0	0	3

Figure 8. Back Testing Results

Stock	Company Name	Bars to Set Range	Max Entries Per Day	Start Equity	Length	Floor Amount	Trailing Percentage	Amount
MMM	3M Co	3	1	\$400,000.00	2	2	5.00%	1
AA	Alcoa Inc	8	1	\$400,000.00	3	1	5.00%	1
AXP	American Express Company	4	1	\$400,000.00	2	1	5.00%	1
T	AT&T Inc	8	1	\$400,000.00	3	1	5.00%	1
BAC	Bank of America Corporation	9	1	\$400,000.00	3	1	5.00%	1
BA	Boeing Co	3	1	\$400,000.00	4	2	5.00%	1
CAT	Caterpillar Inc	5	1	\$400,000.00	3	1	5.00%	2
CVX	Chevron Corporation	9	1	\$400,000.00	2	1	10.00%	1
CSCO	Cisco Systems	7	1	\$400,000.00	3	1	5.00%	1
DD	Dupont(E.I.)Denemours	6	1	\$400,000.00	4	1	5.00%	1
XOM	Exxon Mobil	8	1	\$400,000.00	3	1	5.00%	1
GE	General Electric	6	1	\$400,000.00	3	1	5.00%	1
HPQ	Hewlett-Packard	7	1	\$400,000.00	2	1	5.00%	1
HD	Home Depot Inc	7	1	\$400,000.00	3	1	5.00%	1
INTC	Intel Corp	9	1	\$400,000.00	4	1	5.00%	1
IBM	Intl Business Machines Corp	6	1	\$400,000.00	3	3	5.00%	2
JNJ	Johnson & Johnson	3	1	\$400,000.00	2	1	5.00%	1
JPM	JPMorgan Chase & Co	6	1	\$400,000.00	4	1	5.00%	1
MCD	McDonald's Corp	5	1	\$400,000.00	3	1	5.00%	1
MRK	Merck & Co	3	1	\$400,000.00	2	1	5.00%	1
MSFT	Microsoft Corp	7	1	\$400,000.00	3	1	5.00%	1
PFE	Pfizer, Inc	3	1	\$400,000.00	4	1	5.00%	1
PG	Procter & Gamble	7	1	\$400,000.00	4	1	5.00%	1
KO	Coca-Cola Co	9	1	\$400,000.00	2	1	5.00%	1
TRV	The Travelers Companies Inc	3	1	\$400,000.00	2	1	5.00%	1
UTX	United Technologies	9	1	\$400,000.00	4	1	5.00%	1
UNH	UnitedHealth Group Inc	4	1	\$400,000.00	3	1	5.00%	1
VZ	Verizon Communications	8	1	\$400,000.00	3	1	5.00%	1
WMT	Wal-Mart Stores	5	1	\$400,000.00	2	2	5.00%	1
DIS	Disney (Walt) Co	9	1	\$400,000.00	2	1	5.00%	1
Average		6.2	1	\$400,000.00	3	1	5.17%	1

Figure 9. Optimization Results

Description of Optimization Parameters	
Parameter	Description
Bars to Set Range	This value refers to the number of bars used to set the opening range.
Max Entries Per Day	This limits the amount of entries the strategy uses daily.
Start Equity	This value is equal to four times the initial capital, which is equal to our daytime buying power.
Length	This value sets the number of bars to use for the moving average.
Floor Amount	This is the amount (in dollars) per share that must be exceeded before activating the Percent Trailing Stop.
Trailing Percentage	This is the amount the profit is allowed to drop before the strategy issues a sell order.
Amount	This is the amount (in dollars) per share of loss at which the position will close using the Stop Loss.

Figure 10. Description of Optimization Parameters

CONCLUSION

At the conclusion of the project, the team had completed the development of an automated stock trading system that trades stocks using the TradeStation Platform. By developing this system the group members gained valuable hands-on experience using the tools and techniques that are commonly implemented to scientifically develop a profitable trading system. To develop the system, the members first researched fundamental concepts and theories about trading and how to scientifically develop a profitable trading system. Then the members put these theories into practice by scientifically developing a trading system that an average citizen can use to improve their trading. Lastly the team performed back testing and analysis on the system using historical data to determine how well the system would have previously performed if it traded each of the 30 stocks that make-up the Dow Jones Industrial Average.

At the conclusion of the system back testing, the team deemed their system to be profitable. This confidence is due to the fact that 28 of the 30 stocks back tested would have generated a net-profit if traded during the testing period. As a result the team would like to trade their system using their own money if a few conditions were met. The first condition was if they had at least \$10,000 to in capital to trade with. \$10,000 in capital is needed to successfully trade the system because the system needs to generate enough of a profit on an average trade to pay the implementation costs incurred and still generate a net profit. The other condition is that the team members traded the system using a simulated account and generated a net profit after 1 full quarter of trading. Simulated trading is necessary because it

will prove that the system can be profitable using real-time data as opposed to the historical data that was used by the team to perform back testing.

Throughout the project the team encountered and overcame a few problems. The first problem encountered by the team was not having any prior experience using the TradeStation software. The team overcame this by completing TradeStation tutorials that familiarized them with the software functions and reading TradeStation Forums where users discuss how to perform various tasks within TradeStation. Another problem encountered by the team was a lack of knowledge of programming using EasyLanguage. The team overcame this by studying examples of EasyLanguage programs to learn how programs for various functions were written. The team then used this knowledge to create their EasyLanguage program that successfully trades.

Though the system was profitable in back testing, the system can always be improved as trading system development is an iterative process. The team recommends a few concepts be researched and tested that can potentially improve the system. The first concept is adding a short selling aspect to the strategy that short-sells a stock when its price falls below the opening range low price at a given time. Another concept is applying a commercially available scanner such as Market Gauge's Hot Scans scanner to identify which stock is best to trade in a given session using an opening range breakout system. Lastly, the team recommends further testing is done using LeBeau stops to exit trades. Though these exits did not improve the team's system when they were back tested, the team believes that they can be used to make the system more profitable if each component of the LeBeau stops was optimized individually.

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APPENDIX A: EASY LANGUAGE CODE FOR TRADING SYSTEM

inputs:

```
NumBarsToSetRng( 6 ),
MaxEntriesPerDay( 3 ),
StartEquity (400000),
DrawTrendLines( true ),
Price( Close ),
Length( 9 ),
Displace( 0 ),
PositionBasis( false ),
FloorAmt( 1 ),
TrailingPct( 20 ),
Amount( 1 );
```

variables:

```
OpeningRngHigh( 0 ),
OpeningRngLow( 0 ),
OpeningBarNum( 0 ),
OneTick( 0 ),
TL_ID_High( 0 ),
TL_ID_Low( 0 ),
Avg( 1 );
```

Once

```
begin
OneTick = MinMove / PriceScale ;
end ;
```

// Get the opening range

```
if CurrentSession(0).<> CurrentSession(0)[1] then
```

```
begin
```

```
OpeningBarNum = CurrentBar ;
```

```
OpeningRngHigh = High ;
```

```
OpeningRngLow = Low ;
```

```
if DrawTrendLines then
```

```
begin
```

```
TL_ID_High = TL_New( Date, Time, OpeningRngHigh, Date, Time,
OpeningRngHigh );;
```

```
TL_ID_Low = TL_New( Date, Time, OpeningRngLow, Date, Time, OpeningRngLow
```

```
);;
```

```
end ;
```

```

end
else
    if CurrentBar - OpeningBarNum < NumBarsToSetRng then
        begin
            if High > OpeningRngHigh then OpeningRngHigh = High ;
            if Low < OpeningRngLow then OpeningRngLow = Low ;
            end ;

// Adjust the TrendLines
if CurrentBar - OpeningBarNum = NumBarsToSetRng - 1 then
    begin
        if TL_ID_High > 0 then
            TL_SetBegin( TL_ID_High, Date, Time[NumBarsToSetRng - 1],
OpeningRngHigh );
        if TL_ID_Low > 0 then
            TL_SetBegin( TL_ID_Low, Date, Time[NumBarsToSetRng - 1],
OpeningRngLow );
        end ;

if TL_ID_High > 0 then
    TL_SetEnd( TL_ID_High, Date, Time, OpeningRngHigh );
if TL_ID_Low > 0 then
    TL_SetEnd( TL_ID_Low, Date, Time, OpeningRngLow );

// Issue Buy Orders
// After Range is Set
// Limit the Number of Entries per Day
// Don't Order After 3:30 PM
// Buy when both price and simple moving average are greater than the opening range high
if CurrentBar - OpeningBarNum >= NumBarsToSetRng - 1 and
AverageFC( Price, Length )> OpeningRngHigh and
Time> (1000).and
Time<(1530).and
MarketPosition = 0 and
EntriesToday( Date ).< MaxEntriesPerDay and
Time <> SessionEndTime( 0,1 ).then
begin
Buy (StartEquity/Last).shares next bar at OpeningRngHigh + OneTick Stop ;
end ;

// Exit If reverse through opening range low
Sell All shares next bar at OpeningRngLow - OneTick Stop ;

```

```
// Exit on Close at 3:30PM
If Time >(1530).then Sell All Shares next bar at market;
//Trailing Stop
if PositionBasis then
    SetStopPosition
else
    SetStopShare ;

SetPercentTrailing( FloorAmt, TrailingPct ).;

//Stop Loss
if PositionBasis then
    SetStopPosition
else
    SetStopShare ;

SetStopLoss( Amount ).;
```