Investment Trading and Strategy Development

An Interactive Qualifying Project Submitted to the Faculty
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Abstract:

The internet along with online brokers have opened up investment trading to anyone who is interested in pursuing it as a viable means of income. In order to do so education on the subject has become invaluable as many covet the methodology of developing a winning strategy. The goal of the project was to develop such a process through the scientific method by testing in a simulated trading environment. By testing and optimizing ideas, viable trading strategies were produced that function in various markets including foreign exchange, crude oil futures, and technology stocks. These strategies along with a basic understanding of background information serve as a starting point to inform an individual to the possibilities of investment trading.

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1. Introduction

1.1 Intro

The world of investing has been undergoing a dramatic change for the last the 20 years. With the introduction of computers and Internet, the masses now have a chance to trade things that only professionals had access too. With this huge shift, normal individuals now had the access to manage their own wealth and determine its path. Fast forward to present day and becoming a trader is even easier. With the continued advances in computer technology, people can trade things from currency to lumber futures contracts in their own house.

With this new world, came new careers, in industries other than finance. Take computer science for example; this major is one of the hottest each year around the United States for its usefulness in any profession. By combining this ever-growing technology, computer science, and finance disciplines a new field grew. This area focuses on heavy data analysis to create tools in order to have a market edge. With all of these new opportunities, also comes great risk. Just because someone can invest their own money doesn't mean they should.

1.2 Project Description

The main goals behind this project were really to learn the fundamentals of a chosen market and apply the disciplines of math, economics, finance, and computer science to create a trading system. The trading system could either be automatic or manual using the Tradestation platform (an online broker). Each individual in the

group focused on a different strategy then the other in order to gain a broader sense of the markets. The project lasted for 3 terms with the end goal of being able to test the trading systems with ample time and learn from both our winners and our losers.

1.3 Chosen Markets

As mentioned above, each individual in the group focused on a different market in order to gain a broader depth of knowledge. The markets that ended up being picked were the Forex market, technology stocks and crude oil futures. Below are the in-depth descriptions and fundamentals of each market.

2. Background

2.1 Intro to Forex Market

The foreign exchange market, also known as Forex, is where people from around the world trade currencies for other currencies. There are various reasons a person may desire to do so, perhaps they wish to travel abroad and need to exchange their currency for expenses. For example if someone from the United States wanted to travel to Germany they would have to trade in their United States Dollars for some Euros. If a company wishes to do business in a foreign country they will have to buy up large amounts of foreign currency to support their operations. Oil is priced in United States Dollar so a
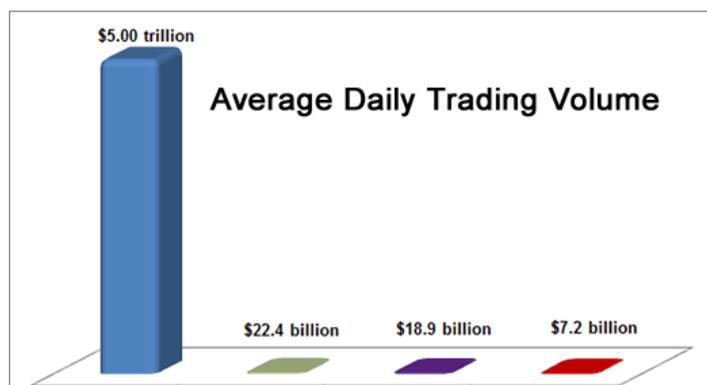
Figure 1 Daily Trading Volume chart

company based in Japan wanting to buy Oil from Saudi Arabia would need some US dollars. A relatively new use of the Forex market is to make money in a similar fashion to trading stocks. Regardless of the reason, a total of $5 trillion exchanges hands each day, fifty times the New York stock exchange. (Source 2.1.1) To put that in perspective the United States GDP is around $15 trillion, as in one third of the US GDP is traded daily. Of that $5 trillion only $1.49 trillion is comprised of retail traders, a number which still dwarfs the various stock exchanges worldwide.

Currency Pairs

Retail traders are those that use Forex for making money as opposed to business or travel. When a transaction is made in the Forex market a person will buy or sell pairs of currencies; one currency is traded for another. The two currencies being exchanged are called a pair. For example in order to trade the United States Dollar for Japanese Yen, the Dollar would be sold in return for purchasing Yen. Each currency is assigned a symbol, a three letter abbreviation, in this case United States Dollar is assigned USD, and Japanese Yen is shortened to JPY. So the pair being traded here would be USDJPY. The order determines which currency is being exchanged for the other. The price of the pair shows how much of the second currency can be bought with the first currency, this is the exchange rate. For example if the price of USDJPY is 100 then each United States Dollar will buy 100 Japanese yen, and if someone from Japan wanted to buy USD it would cost them 100 yen. The following are known as major currencies since they account for the *majority* of the currencies traded throughout the world.

Table 1 Currency symbols and distribution

Symbol	Country	Currency	Currency Distribution
USD	United States	Dollar	42.45%
EUR	Euro zone members	Euro	19.55%
JPY	Japan	Yen	09.50%
GBP	Great Britain	Pound	06.45%
CHF	Switzerland	Franc	03.20%
CAD	Canada	Dollar	02.65%
AUD	Australia	Dollar	03.80%
NZD	New Zealand	Dollar	

A pair which includes USD and any of the majors are known as major pairs. The major pairs are USDJPY, USDCHF, USDCAD, NZDUSD, GBPUSD, EURUSD, and AUDUSD. Any pair that exclude USD are referred to as cross pairs. Cross pairs amongst majors are known as major cross pairs or minors; examples of these would be EURCAD or GBPJPY. There is another category, exotic pairs which include a currency symbol from emerging economies such as Africa. One such example would be USDZAR which is the US dollar and the South African Rand. (Source 2.1.2) These comprise very small percentages of the pairs being traded and as such are accompanied by larger costs to trade.

Advantages to Forex

There are many advantages to trading Forex over other markets such as stocks or options.

No Commissions

While individual brokers may charge commissions, the majority do not. Instead brokers make their money in forex through what is known as the spread, the difference between the bid-ask spread. (Source 2.1.3)

No fixed lot size

In Forex the trader determines the amount of a currency they wish to purchase. This is known as the lot size; a standard lot is 100,000 units of currency. Many brokers allow purchasing of variable lot size though which may be as low as $25 dollars. Compare this to commodities which restrict order sizes to contracts. (Source 4)

Low transaction costs

The transaction cost is the bid-ask spread mentioned before and can be as low as one pip when trading major pairs. (Source 2.1.3)

A 24-hour market

The Forex market is open 24 hours a day, 5 days a week. There are four individual exchanges, located in London, New York, Sydney, and Tokyo. These four exchanges offer overlapping times and allow for the Forex market to stay open 24 hours. The times are as follows…

Table 2 Forex Market times

Market Center	Opening Time(EST)	Closing Time(EST)
London(Great Britain)	3:00 AM	11:00 AM
New York(United States)	8:00 AM	4:00 PM
Sydney(Australia)	5:00 PM	1:00 AM
Tokyo(Japan)	7:00 PM	3:00 AM

No one can corner the market

The retail Forex market sees $1.49 trillion changing hands each day. The size of this market makes it impossible for any single entity to control the market for any extended period of time. (Source 2.1.3)

Leverage

Forex brokers allow traders to control large amounts of currency with very small accounts. Leverage gives the possibility to make reasonable profits with little capitol. In the US leverage is restricted to a maximum of 50-to-1. The implications f this are that with as $2,000 account a trader can buy a standard lot, totaling $100,000. This means that the profits **and losses** are earned on $100,000 instead of only $2,000. In other countries leverage is allowed to go as high as 500-to-1. That would mean that same $2,000 account could control $1,000,000 of currency. (Source 2.1.3)

High Liquidity

Again the sheer size of the Forex market brings an advantage; liquidity. High liquidity means that when an order is placed it will be quickly filled. In forex there is high liquidity at any time of day, when a trader wants in their order will almost certainly be filled near instantly. (Source 2.1.3)

Low Barriers to Entry

Lastly a major advantage of forex is the barrier to entry is nearly non-existent. There are online brokers that allow account sizes of as little as $25. In addition there are much fewer government restrictions on forex allowing "day trading" with no minimum required capitol. Day trading refers to a trading style where someone will enter and exit the market multiple times a day and at the end of the day will have all positions closed. In order to do this in stocks there is a minimum requirement of $25,000. (Source 2.1.3)

2.2 Introduction to Crude Oil Futures

Figure 2 Crude oil Barrel

TICK SYMBOL: CL
MARKET TYPE: Futures/Commodities
HOURS OF TRADING: 5:45pm-5pm MTWTF
INSTRUMENT TYPE: Contract
CONTRACT EQUIVALENT: delivery for 1000 barrels
MARIGIN REQUIRMENT: avg $3500 per contract, $3800 maintenance margin

Overview:

After researching numerous different markets, the market of crude oil seems to stand out in terms of consistency, liquidity and potential gains.

Crude oil is perhaps the most important commodity in the whole world. It literally is the driver behind everything. Cars need oil, planes need oil, houses need oil etc., and so it is no wonder why the investing worldview of oil for the most part is as an indicator of economic health. The more demand for oil, the higher the growth and vice-versa. This has created a market that attracts companies, countries and speculators alike. Oil is a futures contract, which means it is essentially a deal for product in the future because it trades 1 month in advance.

Consistency:

Perhaps the best part about the crude oil markets is its relative consistency compared to the average market. Crude prices have a long-term range of $80-$120, with few exceptions stemming from market distress or political issues. Since oil moves everything, there must be implications when the price isn't at an affordable price. When oil becomes too costly, everything seems to suffer over time. If gas is more expensive, less people will want to drive and it will cost more to fly. Over the summer of 2013, oil had reached a peak price of $112 due to political concerns in the Middle East that could affect supplies. Although the price wasn't at the peak for very long, the effects could be seen within months. During the earnings report over the summer, Wal-Mart was quoted as saying their income was down because of the drastic increase in the price of oil. Companies like Wal-Mart and Target, who are really affected by the bottom line, lose a lot of money because shipping their normal goods goes up so much. The last time oil got way to high in price was right before the crash of 2009 when the price had hit $140 a barrel. If no one can afford oil, then the world slows down. This has actually been one of the factors attributed to the financial crisis. The price of oil always has a lot of room on the upside since people are generally bullish about a non-renewable resource. However if the price does drop to a significant level, then OPEC will step in and change that. (1) OPEC stands for Organization of the Petroleum Exporting Countries. This organization literally has all the power in the world when it comes to oil. They decide how much product gets put into the market as well as the price to be sold at. Since they control demand, they clearly wouldn't let the price fall below a point where they won't make money, thus effectively creating a price base for oil. With these clear tops and bottoms defined for both economic and political reasons, it makes oil a lot more consistent in the

long run and less subject to dramatic actions from other markets. Below is the 1-year chart of CL to demonstrate this consistency of price range.

Figure 3 Crude oil candlestick chart

Liquidity:

Oil is by far the number one commodity traded and for good reason. When this product drives all production and manufacturing in the world, you can assume that there is a lot of it to be traded. Liquidity usually means how quick can something be turned into cash. For the markets however, it means how quick can an order get filled as well as get out. Oil has tens of thousands of contracts traded each day, which really increases the odds of getting filled on time.

Potential Gains

Crude oil is something that can only really be traded on the futures market. A futures market is defined as "An auction market in which participants buy and sell commodity/future contracts for delivery on a specified future date."(2)

For crude oil the ticker symbol is CL. Each contract of CL is equivalent to 1000 barrels on delivery. That means if you activate your contract or it expires, then you have to pay for 1000 barrels of crude oil delivery to your house. This is almost impossible to happen on accident if you are an amateur trader because brokerage firms primarily are trying to protect you and your money. For CL the contract is continuous so a small trader doesn't need to worry about getting oil at their front doorstep. That being said, the price of oil is about $100 on average so 1000 barrels is going to be equivalent to $100,000 of oil. This is where the real beauty of futures lies. For on average of $3500 someone can open 1 contract of CL. That means that for only $3500, you can trade with near $100k. Keep in mind that this significantly increases the risk as well as the potential gains.

Below are some examples of crude oil trades that demonstrate the type of gains one could potentially see.

Table 3 Crude oil Potential gains

DATE	TIME	DESCRIPTION	FEES	COMMISSIONS	AMOUNT	BALANCE
3/18/14	1:00:00					100,970.91
3/19/14	1:00:00	Cash Balance				100,970.91
3/19/14	8:00:24	BOT +1 /CLK4 @98.48	1.47	-2.25		100,967.19
3/19/14	8:00:24	BOT +1 /CLK4 @98.48	1.47	-2.25		100,963.47
3/19/14	8:00:24	BOT +1 /CLK4 @98.48	1.47	-2.25		100,959.75
3/19/14	8:00:40	SOLD -1 /CLK4 @98.51	1.47	-2.25	30	100,986.03
3/19/14	8:00:47	SOLD -1 /CLK4 @98.51	1.47	-2.25	30	101,012.31
3/19/14	8:00:48	SOLD -1 /CLK4 @98.51	1.47	-2.25	30	101,038.59
3/20/14	1:00:00	Cash balance at the start of business day 20.03 CST				101,038.59

Above, this data shows that at 8:00:24 the trader bought 3 contracts of CLK4 at $98.48. From 8:00:40-8:00:48 the trader sold all 3 contracts for $98.51. This was a total gain of 3 cents or ticks. Since 1 contract trades with the equivalent of 1000 barrels, each cent movement yields $10 either up or down. Since the trader is using 3 contracts, each cent movement is now $30. Since the gains were 3 cents, the total amount of money made was $90 in about 30 seconds of being in the market.

<u>What are the main drivers in the price of CRUDE OIL?</u>

After studying oil for the past 2 years, this is the best list of events that move oil in price considerably.

1) Economic news relating to China and America. Since both of these countries are the biggest consumers of oil in the world, their economic status greatly paints a picture of what demand is going to be.

2) Political issues/tension in an area of high supply. Anytime there is an issue in the Middle East, oil is one of the first things to rally as fear sets in.

3) Overall market crashes or rallies. Oil is connected to everything so it is subject to huge moves like when the price rose to $140 a barrel in 2009 before tanking down to $40 after the crash happened.

4) Weekly news releases. Each week the EIA releases the total stockpiles of oil and its derivatives. This report can either be everything or nothing depending on the other news out at the time.

5) Seasonality. Oil has natural cycles of high and low demand like driving in the summer or heating oil for the winter. These types of trends can be seen over time quite clearly. Below is a chart actually demonstrating this.

CRUDE OIL SEASONALITY
Average Monthly Performance, 1983 - 2011
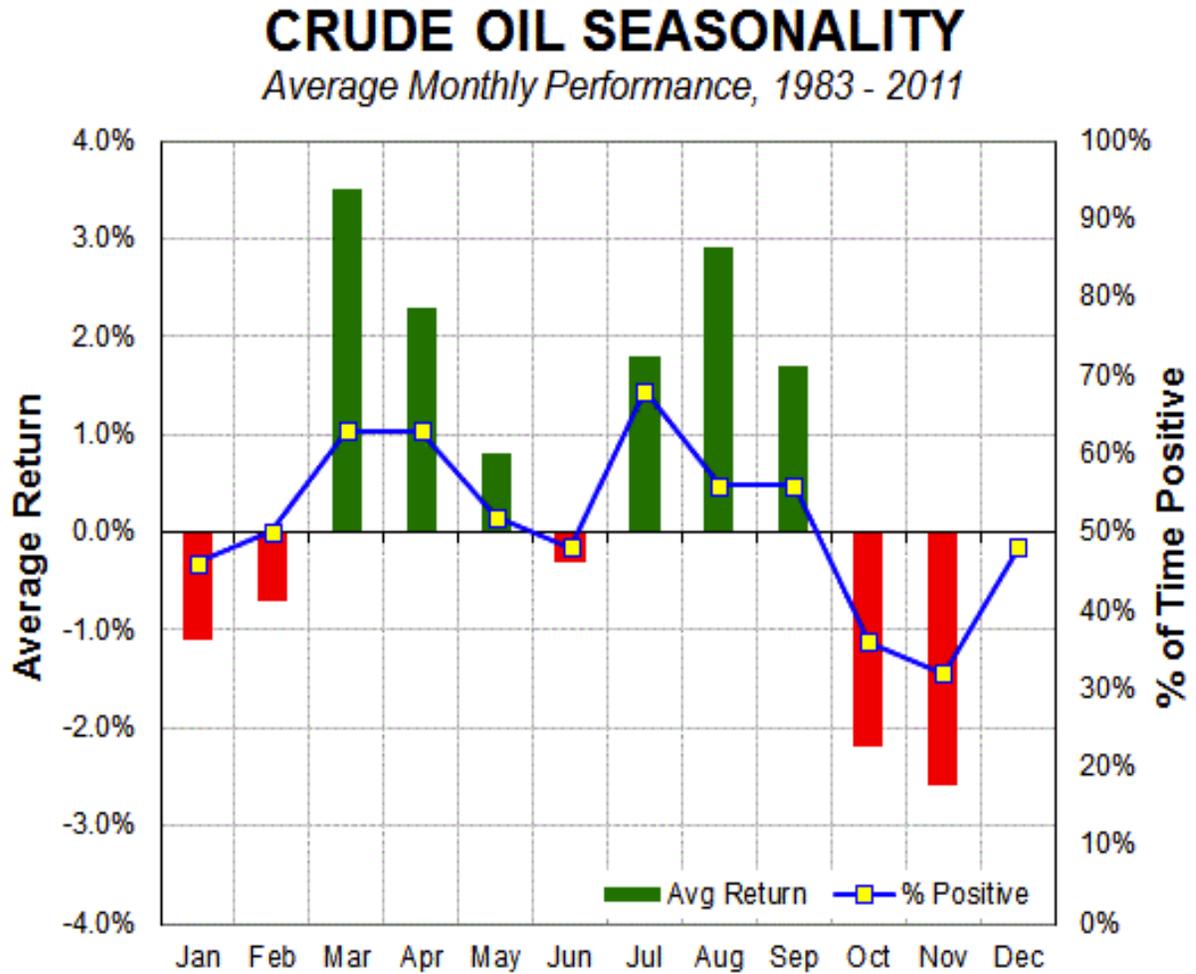
Figure 4 Crude oil gains by season

2.3 Introduction to Technology Stocks

Figure 5 Being "Bullish"

Stock, or equity, is a type of financial instrument that demonstrates ownership in a corporation. A holder of stock (a shareholder) possesses the privilege to own a part of the corporation's assets and earnings. Ownership is determined by the number of shares a person owns relative to the number of outstanding shares. For example, if a company has 3,000 shares of stock outstanding and one person owns 300 shares, that person would own and have claim to 10% of the company's assets. The market that enables shares of stock to be issued and traded is known as the stock market. Publicly traded companies can take part in this market and use it to raise large sums of capital. When companies are profitable, stock market investors make money through the dividends the companies pay out and by selling appreciated stocks at a profit called a capital gain. The downside is that investors can lose money if the companies whose stocks they hold lose money, the stocks' prices goes down and the investor sells the stocks at a loss. This can be combatted by the investor going "bearish"; this means that the investor bets on the shares falling and makes a profit of the companies' losses. Shares are traded through exchanges. The two biggest

exchanges in the United States are the New York Stock Exchange (NYSE) and the Nasdaq (NSDQ). Today, most trades are executed electronically, and even the stocks themselves are almost always held in electronic form, as opposed to physical certificates. For most companies there are two main types of stocks:

- Common Stock
- Preferred Stock

Common stock is what people who talk about stocks are usually referring to. Actually, most of a companies' shares are issued is in this manner. Common shares represent ownership in a company and a claim (dividends) on a portion of profits. Investors get one vote per share to elect the board members, who oversee the major decisions made by management. Over a long period, the common stock, by means of capital growth, brings about higher returns than almost all other forms investment. Although, the opportunity for higher returns come at a cost since common stocks entail the most risk. If a company goes bankrupt and liquidates, the common shareholders will not receive money until the creditors, bondholders and preferred shareholders are paid. In some instances an investor who possesses common stock may never see dividends if the company performs very poorly.

Preferred stock represents some degree of ownership in a company but does not come with the same voting rights, although this ultimately depends on the company. With preferred shares, investors are guaranteed a fixed dividend forever. This is in stark contrast to common stock, which has variable dividends that are never guaranteed. Another advantage is that in the event of liquidation, preferred shareholders are paid off before the common shareholder but still after debtholders. Preferred stock may also be

callable, meaning that the company has the option to purchase the shares from shareholders at any time for any reason (usually for a premium).

The stock market, naturally, is broad with hundreds of thousand companies from various sectors being traded on a daily basis. For the purpose of this project, the focus was trained on one sector in particular. Namely, the technology sector.

Figure 6 Microsoft (MSFT) traded through NYSE (created using Tradestation)

The Technology sector is a category of stocks that relates to the research, development and/or distribution of technologically based goods and services. This sector comprises of enterprises that revolve around the manufacturing of electronics, creation of software, computers and any services relating to information technology. Within the technology sector, there are four major types that make up the majority of the technology companies in today's market:

- Semiconductors
- Software
- Networking and Internet
- Hardware

Semiconductors This s the industry term for computer chips. Industries in this field were the first tech companies to go public. Semiconductors are the foundation of most technology needs to provide further innovation and success. They are ubiquitous and are arguably the backbone of the technology sector. Semiconductor stocks are considered the most stable within the technology industry. Examples of companies within this field are Intel Corporation (INTC) Entegris Incorporated (ENTG), and PDF Solutions Incorporated (PDFS).

Software is the technology that enables interaction between a human and a devices capabilities. Nothing much happens in the modern world. Computers are everywhere and represent critical components of everything from pacemakers to cars, but none of those computers do anything without software. As such, it is not surprising that software is a huge industry as well. Software requires virtually no infrastructure and is difficult to protect via patents. Hence, Software is often considered to be less stable than semiconductors. Examples include: Microsoft Corporation (MSFT), Oracle Corporation (ORCL) and AVG Technologies (AVG)

Networking and Internet This field is the one I spent a higher degree of time on. It is arguably the biggest tech innovation since the microchip. The internet itself has facilitated major changes to commerce and has underpinned entirely new business models like store-free retailing and software as a service. Networking is in many respects a sub-sector of the other mega-sectors; it requires hardware and software to function. That said, it is large enough and important enough to stand on its own. The number of internet companies that rise fast and fall just as quickly is has increased exponentially over the past decade and the stocks in this field are considered the most

volatile. Examples of companies under this field are Facebook Incorporated (FB), Twitter

Incorporated (TWTR), LinkedIn (LNKD), and Cisco Systems (CSCO).

__Hardware__ This field can be broken down into many sub-sectors, including

communications equipment, computers and peripherals, networking equipment, technical

instruments and consumer electronics etc. Examples of companies are: Hewlett-

Packard(HP), Tesla Motors(TSLA), Apple(AAPL).

The sector itself has been on an upwards trend since the tech bubble burst of the 2000s,

and an exponential growth post-recession of 2008. On a whole, Technology stocks are

not as often traded in comparison to their counterparts in construction, finance etc. A

good reason would be their volatility and nascent nature, but with the right tools and

analysis techniques, it can be made to be more obvious to spot trends when they present

itself.
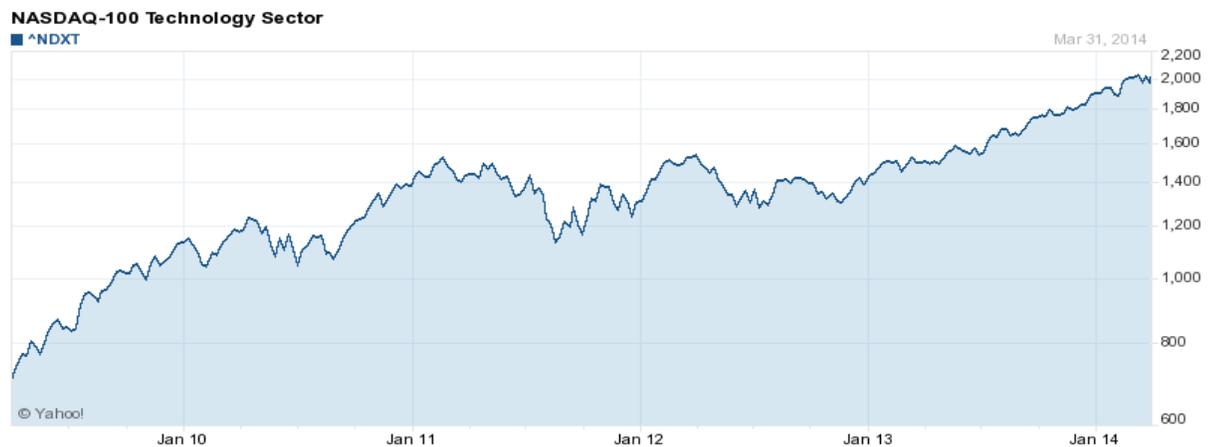
Figure 7 Performance of the technology sector traded through NASDAQ

2.4 Fundamentals of Trading

In order to find success in trading it is important to keep track of price

movements. To accomplish this those movements must be summed up and delivered in a

useful and accessible way. A price chart is a visual manner for doing just that. The most

common charts use four pieces of information, the open, high, low, and close prices of a certain time frame. The typical chart that most traders will use are known as candlestick charts.

Candlesticks:
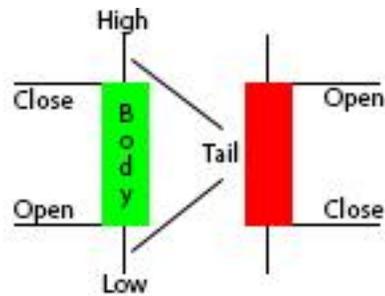
Figure 8 Candlesticks

These bars are known as candlesticks in the world of trading. They originated from Japan and were brought into western popularity by Steve Nison. (Source 2.4.1) These bars are a very compact method of presenting data in a visual manner. Open, high, low, and close of the price in a period of time are contained within each candle. The body represents the open and close of the price on a given time frame. For example given a fifteen minute period of time, if the price moved up, the bottom of the body would represent the price at the start of the fifteen minute window. The top of the body would then be the price at the end of the fifteen minutes. The upper and lower wicks are show the high and low, respectively, during the whole time period. When the price has a net movement up the body is generally colored green by default and red if the price moves down. Also when the price moves down in a given time the open is at the top of the body and the close is at the bottom. When candlesticks are aligned side by side they form a candlestick chart which represents price movements over time; four fifteen minute

candles would show the price movement over an hour. This is an example of what a candlestick chart may look like.

Figure 9 Examples of Doji

Under normal circumstances each open will match the previous bar's close. When this is not true the chart is said to have gapped up or down. Notice that candlesticks can come in all different shapes and sizes; in addition the wicks vary greatly in size. Different combinations of body and wick size, whether the upper wick is significantly larger than the lower wick, or the body is small with extreme highs and lows, can be of great importance to traders. A common bar type is known as the doji and it occurs when the body is almost nonexistent and the wicks are very large on both sides. This can often times signal indecision in the market and possible reversal points in the price. In the example picture three dojis are pointed out and there was in fact a reversal

near all three. The doji is just one form that these bars may take and in fact there are some recurring patterns that may occur that involve up to three candlesticks in a row.

2.5 Trading Fundamentals- Buying and Selling

Most people understand the concept of buying and selling stocks, currencies, commodities or whatever in order to make money. The rule is that an investor or trader must buy when the price is low and then sell when the price is high. Under this circumstance it is not possible to make money if the price is decreasing, instead the buyer must either wait for the price to hit the bottom or ride through the rough times as they hold their positions. This sort of idea is more strongly tied into, what traders refer to as buying and praying. Instead there are many different ways to trade which can capitalize on upward moves as well as downward moves.

Buying is known as going long in the market. If a trader is long then the price must increase so that when that position is sold they make profit. When a trader closes a long position it is called selling. It is possible however to short so that when the price decreases the trader will be able to make money. Behind the scenes when someone places a short order the broker will effectively lend the desired amount of shares, currencies or contracts. The trader then sells these borrowed shares and then waits for the price to decrease. Then this person will buy the shares back at the lower price and repay the loan. The trader then earns the difference in the borrowing price and the price at which they eventually bought back the shares. All of this happens out of sight though and instead a short is simply an order type that functions the same as a long order except profit is made when the price moves downward. When a trader closes a short position

this is called buying to cover. Flattening a position refers to either selling to close a long or buying to cover to close a short. Shorting is also known as selling short to differentiate itself from simply selling.

Figure 10 Examples of when to short and when to buy

2.6 Trading Fundamentals-Basic Risk Management

Taking Profit

Perhaps one of the most important things to know when it comes to developing a trading system is to know how much you are trying to make. Lots of traders know when they want to enter a trade, however few use a set profit mark in order to exit the trade. Either placing a limit or stop order achieves a take profit point.

Investopedia helps defines these two terms below

Limit Order-

"An order placed with a brokerage to buy or sell a set number of shares at a specified price or better. Because the limit order is not a market order, it may not be executed if the price set by the investor cannot be met during the period of time in which the order is left open. Limit orders also allow an investor to limit the length of time an order can be outstanding before being canceled."(1)

Stop Order-

"An order to buy or sell a security when its price surpasses a particular point, thus ensuring a greater probability of achieving a predetermined entry or exit price, limiting the investor's loss or locking in his or her profit. Once the price surpasses the predefined entry/exit point, the stop order becomes a market order."(2)

Example:

An example of a take profit mark would be someone buying stock XY for $100 a share. After placing the order the investor would then place a limit or stop order for the desired price at which point to sell. The investor is seeking gains of 5% so when the price gets to $105, the share of XY will automatically sell.

Benefits of Take Profit Marks

The advantages of using a take profit mark on trades is staggering. First of all, if the investor doesn't have a profit mark it's usually a very bad sign. This means that limited thought went into how much money they want to make for any given trade. Although some traders watch their investments closely and try to have a continuously changing relative take profit point, the majority of traders do not do

this. An example to show how detrimental no profit taking point is, take the example below.

There are two investors, one name Jake, the other named riley. Both Jake and Riley are investing in XYZ Corporation as well as equal shares. Jake believes that XYZ is going to shoot through the roof, but has no real price in mind. Riley also believe this stock is a winner, but realizes that any profit is better than none. Because of this, Riley ends up placing a take profit for 10% higher price on his stock. Jake just buys his share and leaves it, while checking on it weekly. After an earnings report, XYZ crushes its mark and rises over 12%. This move triggered Riley's take profit order and he is now sitting at a cash balance and up 10%. The stock continued to move up and the price ended up being 30% up from when Jake bought it. Jake assumes that its only going to go higher and the next week the markets make a slight correction. All of a sudden that +30% is now down to +3%. Jake could have made 3x as much as Riley, but Riley's take profit assured him money as well as less market risk. The point of this example is to demonstrate why no matter what, you will never feel bad taking a profit, you will however feel very bad about losing potential profit.

Stopping Loss

On the flip side of taking profit, there is stopping loss. Stop loss orders can be used once again by either a limit or a stop order. Most people use stop order because like the definite says, a limit order only executes at that exact price. This means that if the stock gaps and misses your price, you could still end up in the trade. Having a

stop order turns that order into a market order that almost guarantees you will get out in time.

The logic behind a stop loss is a little bit different than a take profit point. Taking a profit is great because you are locking in money despite missing out on higher gains than what your target was. A stop loss locks in losing money, which isn't all that great, however it could be a lot less than the overall drop. This type of order really serves as your own personal protection against risk. The investor has the right to decide how much I am willing to make per trade as well as lose. This terms trading into more of a science than a guessing game that most people seem to play. If you set a stop loss for -5% and a take profit of +10%, then you are practically saying, "I will risk 5% of my equity to make 10%."

Trailing Stop-Loss

A unique tactic specific to the loss side is a trailing stop. The way this order works is it has a set stop loss mark, however if the price of the stock moves in your favor, then the stop loss follows. For example if you are trading ZY for $10 a share and you have a stop loss of -$3(sell at $7), if the price moves up $2 then the stop loss will now be set to $9. This order acts to lock in profit as you make any, however it has some severe downsides. If the price moves up and then backs down again, the stop is not adjusted on the down move. That means that you could have a stop loss set for -5% and then the price could move up 5% and then back down to where you bought it which would result in a flatten.

Overall both stop loss and take profit orders are probably the most important items in an effective risk management system. In terms of cost at a brokerage, these

trades are typically the same price as any buy or sell order, which is around $10 for

the average.

2.7 Indicators

Below are the indicators that were tested across all three markets. Below is the math and code behind what makes them run as well as picture examples.

INDICATORS

- Simple Moving Average

- Exponential Moving Average

- Relative Strength Index

- Moving Average Convergence Divergence

- Balance of Power

- Aroon Indicator

- Momentum

- Kurtosis Indicator

- Ballinger Bands

- Fast Stochastics

- Slow Stochastics

- Chalkins Volatility

1. **Simple Moving Average**

   Type: trend following

   Best used: in combination

   The simple moving average is a plotted line that measures the average price of a currency pair over a specific period of time to understand the overall market direction. The plotted line shows whether a trend is bullish, bearish, or nonexistent. We can use the moving average to identify the trend and the right time to buy or sell.

   Since moving averages represents an average closing price over a selected period of time, they have the ability to filter out excess market noise.

   Two moving average may plotted on a chart (one short term and one long term) when lines cross with a sharp angle and an obvious separation from one another, this may be an indication of a change in price direction (Source 2.7.1)

   Calculation:

   Simple moving average is calculated by averaging a number of past data points. The resulting average is then plotted onto a chart. The shorter the time span used to create the average, the more sensitive it will be to price changes. The longer the time span, the less sensitive, or more smoothed out, the average will be.

   Example: 5 period moving averages

   2 6 7 9 3 6 7 6 8 4 5 5

   $(6 + 7 + 6 + 8 + 4)/5 = 6.2$

Figure 11 200 period Moving Average. Exponential: Green; Simple: Orange

2. Exponential Moving Average

Type: Trend following

Best used: in combination

This is a type of moving average that gives more weight to recent prices in an attempt to make it more responsive to new information.

A buy signal is generated when the price rises above its moving average and a sell signal is generated when the price falls below its moving average. (Source 2.7.2)

Calculation:

$$EMA = (P * \alpha) + (Previous\ EMA * (1 - \alpha))$$

P = Current Price

α = Smoothing Factor = $\dfrac{2}{1+N}$

N = Number of Time Periods

The first point of the EMA: Use simple moving average

3. **Relative Strength Index (RSI)**

Type: overbought, oversold measurement

Best Used: Pick Tops/bottoms /Profit taking

The Relative Strength Index measures price changes over the past X period (X is the input that we enter into the indicator). RSI determines when a currency is overbought or oversold (8)

Calculation:

$RSI = 100 - (100/(\ 1 + Up/Down))$

Up: the average of the upward closing changes over the selected period.

Down: the average of the downward closing changes over the selected period

RSI have the value between one and 100

RSI above 70 is considered overbought

RSI under30 is considered oversold (price may be interpreted as undervalue)

The usage of RSI is looking to buy when price crosses up and over the 30 level, and sell when RSI cross below 70 level. (Source 2.7.3)

Created with Marketscope/Trading Station

Figure 12 Relative Strength Index
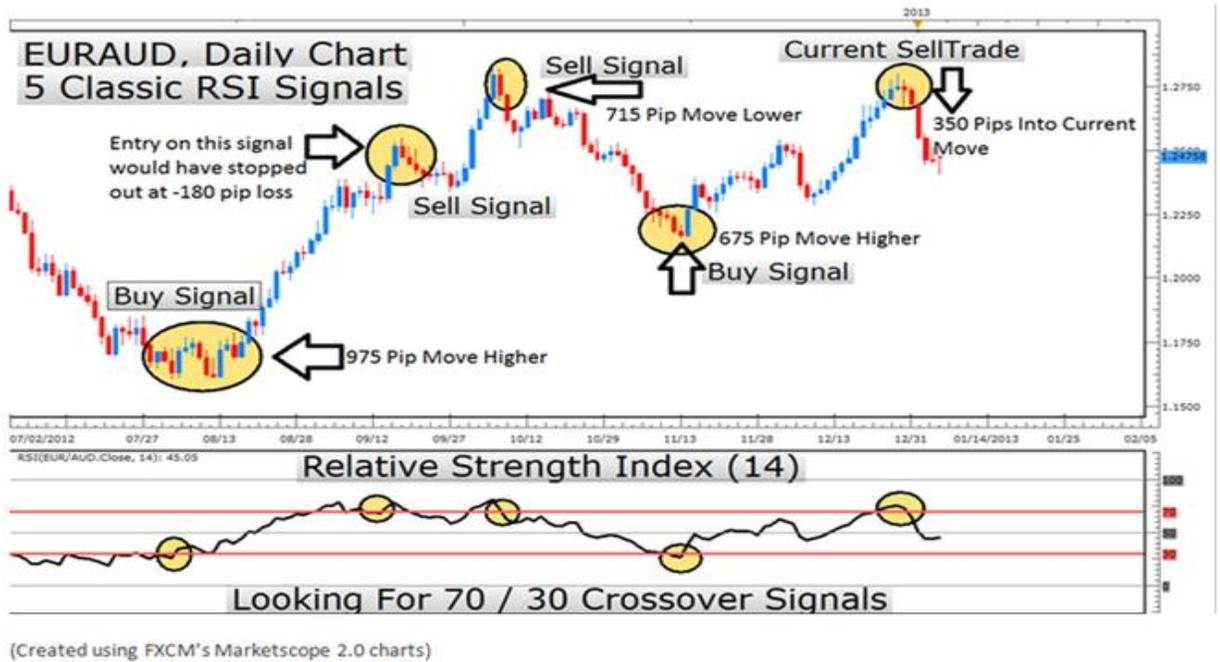
(Created using FXCM's Marketscope 2.0 charts)

Figure 13 RSI 70/30 crossover signals

4. **Moving Average Convergence Divergence (MACD)**

Type: Trend Strength/New Trend

Best Used: for confirmation with other indicators (combine with other indicator for maximize its potential)

The MACD turn two moving average indicators to a momentum oscillator by subtracting the longer moving average from the shorter moving average. The MACD bring together momentum and trend in one indicator. (Source 2.7.4)
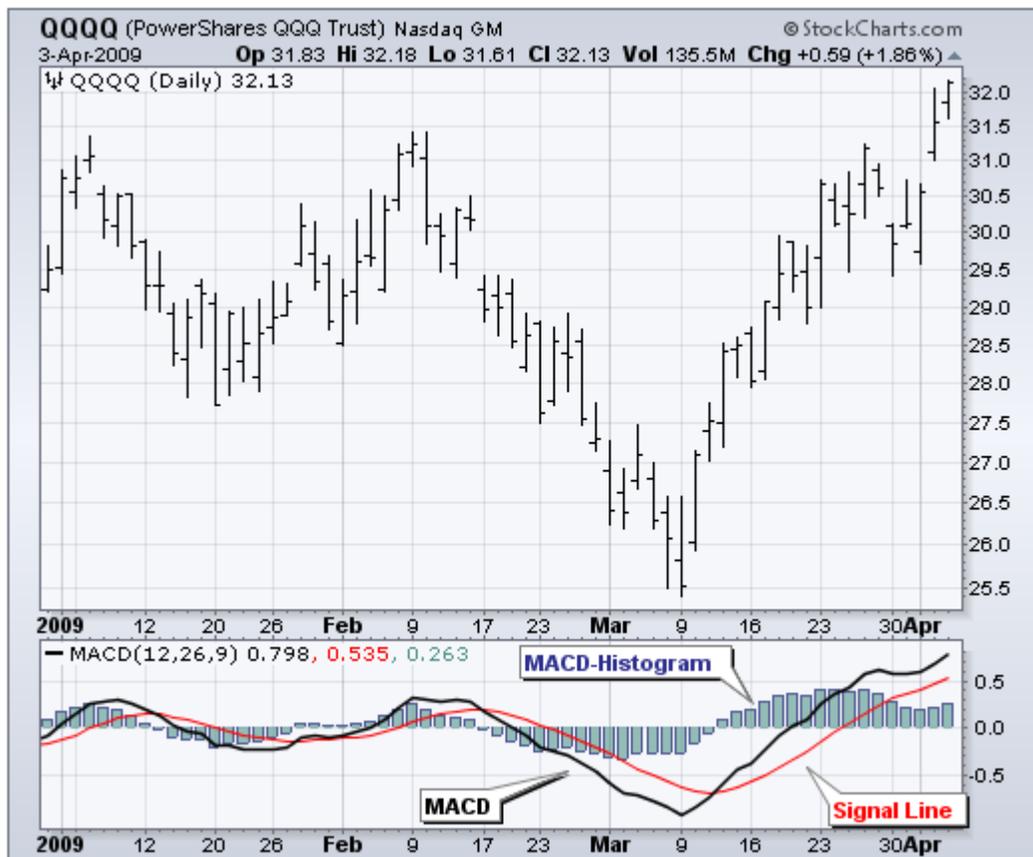
Figure 14 MACD indicator

Calculation:

MACD Line: (12-day EMA - 26-day EMA)

Signal Line: 9-day EMA of MACD Line

MACD Histogram: MACD Line - Signal Line
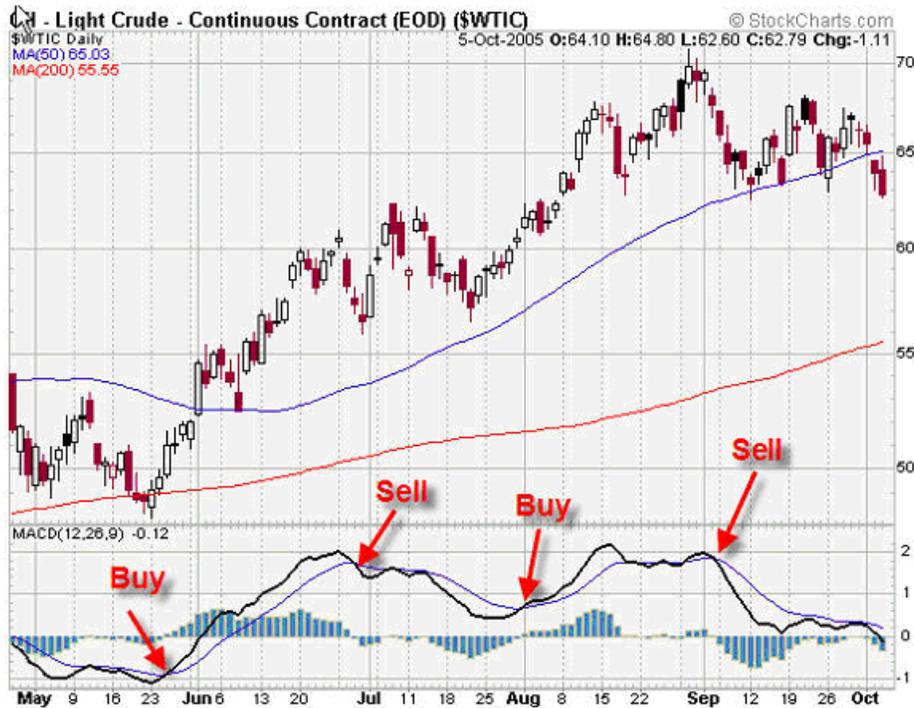
Figure 15 MACD crossover signals

For trending market, especially when the MACD is above zero, the MACD indicator suggests buy when the MACD line crosses above the signal line and sell it when the MACD line crosses below the signal line.

A positive MACD value (when the short-term average is above the longer-term average) is used to signal increasing upward momentum. On the other hand, a negative MACD values suggests that the downtrend is getting stronger and that it may not be the best time to buy. (Source 2.7.5)

Source: Chart by MetaStock
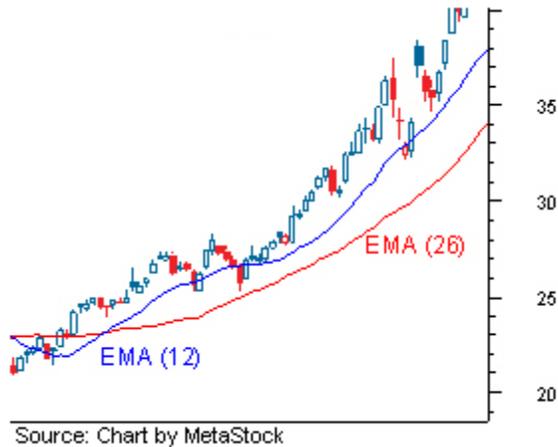
Figure 16 Exponential moving averages

5) Balance of Power Indicator

Type: Trend Strength/ New Trend

Balance of Power can be fundamentally viewed as a "tug of war" between the bulls and bears in the market. Described by Igor Livshin; It is an indicator that measures the strength of the bulls or the bears through the assessment of each ones ability to push the price to an extreme level.

The indicator is typically calculated using this formula:

$$BOP = \frac{Close\ Price - Open\ Price}{High\ Price - Low\ Price}$$

It should be noted that the resulting BOP value is usually smoothed over by Moving Average. (Source 2.7.6)
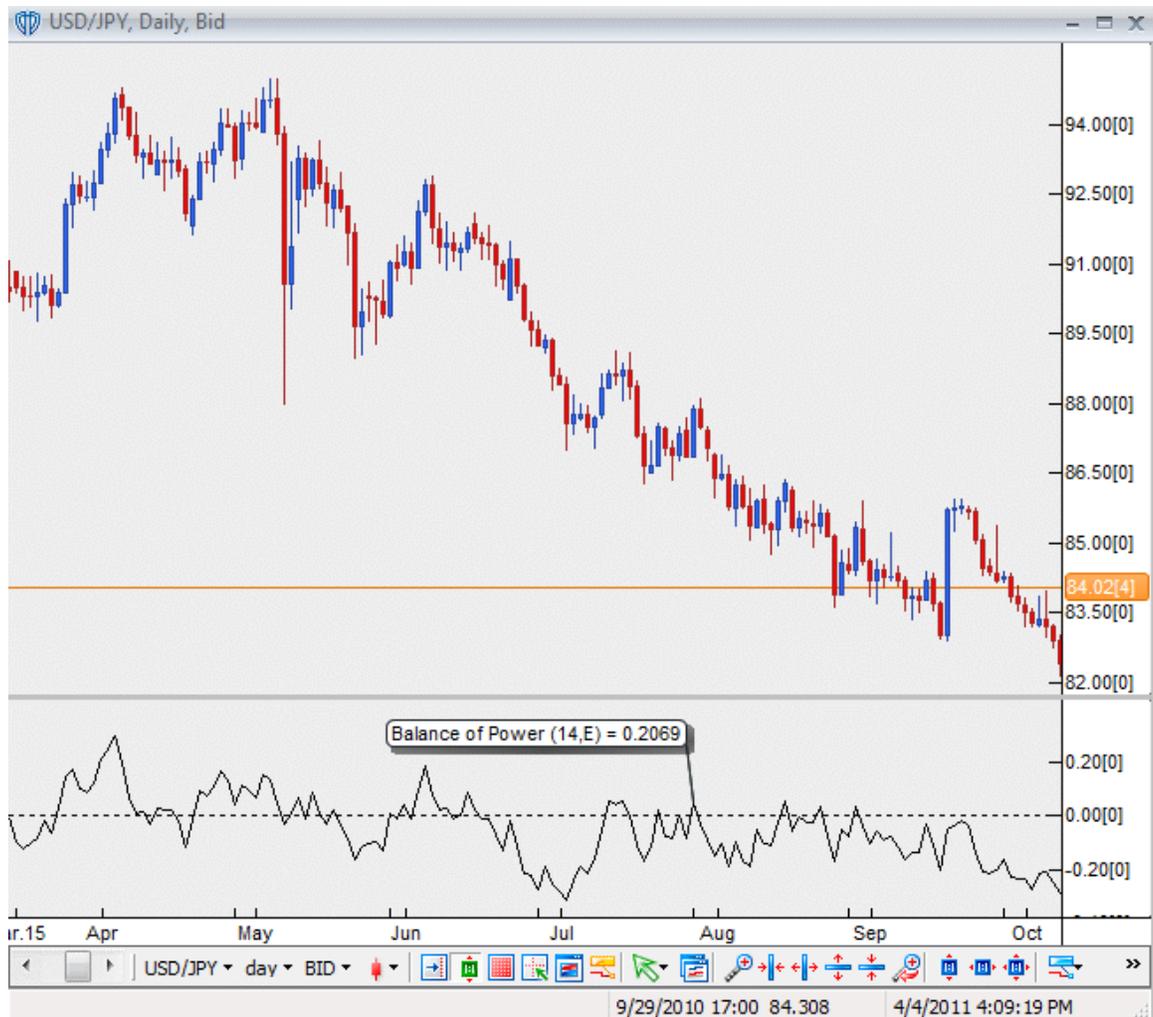
Figure 17 BOP on the USD/JPY Daily Chart in 2010

The above figure gives us a graphical representation of BOP. The BOP graph is the one below. There are a few basic techniques often used for the BOP to generate trading signals:

- Trend Direction: When BOP is rising, prices are in an upward trend. When BOP is declining, prices in a downward trend. Zero crossovers can be useful at this point. When the BOP crosses above zero, a buy signal is given. If the BOP goes below zero, a sell signal.

- Overbought/Oversold Conditions: The BOP can help identify potential overbought and oversold conditions in price movements. Hence, providing early warnings for potential trade reversals. These conditions are generated by observing where the BOP clusters its' tops and bottoms.; settling its oversold or overbought levels around those values.

- Classic Divergence (aka Regular Divergence): There are two types of divergences under it. Bullish Divergence possesses lower lows in prices and higher lows in BOP. Bearish Divergence shows higher highs in BOP and lower highs in prices.

- Hidden Divergence (Reverse, Continuation or Trend Divergence): Lower lows in BOP and higher lows in price show Bullish Divergence, while Bearish Divergence has higher highs in BOP and lower highs in price. (Source 2.7.7)

6) The Aroon Indicator

Type: Trend Strength/ New Trend

The Aroon indicator is used to either spot a whether trend is appearing or not, and define how strong the trend will be. It was designed by Tushar Chande developed this indicator in 1995. This particular indicator is made up of two lines: The Aroon(Up), and Aroon(Down). Aroon(up) is the amount of time(in percentage) elapsed between the start of a time period and the point at which the highest price occurred. If your trading instrument sets a new low within that period, Aroon(up) equals zero. Likewise, if the trading instrument closes higher than the rest of the time period. Aroon(up) is 100. (Source 2.7.8)

Aroon(up) is calculated using this formula:

$$Aroon(up) = \frac{N - N_h}{N} * 100$$

N = # of periods

N_h = # of periods since highest high during that time

For example, consider plotting a 10-period Aroon(up) line on a daily chart. If the highest price for the past ten days occurred 6 days ago (4 days since the start of the time period), Aroon(up) for today would be equal to ((10-6)/10) x 100 = 40. If the lowest price in that same period happened yesterday (i.e. on day 9), Aroon(down) for today would be 90.

Each period that passes without a new high. Aroon(up) moves down by 100/N.

Aroon(down) is calculated in just the opposite manner, looking for new lows instead of new highs. When a new low is set, Aroon(down) is equal to +100. If the stock is setting a new high for the given time period, Aroon(down) will be zero.

Aroon(down) possesses just about the same formula as Aroon(up):

$$Aroon(down) = \frac{N - N_l}{N} * 100$$

N_l = # of periods since lowest low during that time

Figure 18 EURJPY with an Aroon indicator

The above figure shows the Aroon indicator in action. Typically whichever line is on top, the trend will likely follow suit. For example the above figure shows EURJPY beginning to decline, but the Aroon(up) line is still at the top. This means that the market is still trending upwards and the trader should not be too worried. However, if the two lines are in close proximity, then a trend reversal is extremely likely. (Source 2.7.9)

7) Momentum

Type: Trend Following

Momentum is a measure of price change velocity calculated as the difference between the current bar's price and the price a selected number of bars ago. The faster prices rise, the larger the increase in momentum. The faster prices decline, the larger the decrease in momentum. As the price movement begins to slow the momentum will also slow and return to a more median level. The Momentum indicator is one of the more basic indicators and should definitely be used in combination. (Source 2.7.10)

The formula to calculate Momentum is given:

$$Momentum = \frac{P}{P_N} * 100$$

P = Current Price

P_N = Price(N periods ago)

Figure 19 USDCHF with Momentum

Due to its' simplicity, Momentum is a versatile indicator. However, It has three main uses:

Zero-Level Crossovers: A buy signal occurs When Momentum crosses above zero and a sell signal occurs when momentum crosses below zero.

Extreme Overbought or Oversold levels: This is only possible if potential overbought or oversold situations were identified using previous indicator readings; When choosing the overbought and oversold levels the user should ensure that at least two-thirds of previous Momentum values fall between the overbought and oversold levels. Readings above the overbought level imply an overbought condition (and a pending price correction) while readings below the oversold level imply an oversold condition (and a pending rally).

Trend Line Breakouts: Trend lines can be drawn connecting the peaks and troughs of the Momentum indicator. Often momentum begins to turn before price thereby making it a leading indicator. Momentum readings breaking above a declining trend line warns of a possible bullish reversal while Momentum readings breaking below a rising trend line warns of a possible bearish reversal. (2.7.11)

8) Bollinger Band Indicator

Type: Trend Following

While the math that strengthens Bollinger bands is complicated, the concept is simple. The Bollinger bands measure a stock's unpredictability in relation to like a 20-day moving average. For any stock or index, there will be a middle band, which measures the central tendency, and upper and lower bands, which measure a certain amount of standard deviations from the central line. Standard deviations that we learn from statistics class play a big role behind this. This is basically mean that one should SELL when prices move outside the Upper Bollinger Band and BUY when prices move outside the Lower Bollinger Band. Sideways market will get you money, but in a trending market you get torn down. (2.7.12)

Figure 20 Bollinger bands

Figure 10 reveals the Ballinger Bands all in pinks with 3 line the central, the

upper band at 2 standard deviations, and lower band at 2 standard deviations.

- an N-period moving average (MA)

- an upper band at K times an N-period standard deviation above the moving

  average (MA + $K\sigma$)

- a lower band at K times an N-period standard deviation below the moving average

  (MA − $K\sigma$) (2.7.13)

Standard Deviation Formula

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} \left(x_i - \bar{x} \right)^2}$$

$\bar{x}$ is the mean closing price for N periods as depicted by a moving average line.

(Source 2.7.14)

x_i is the closing price at each day during N periods (depicted by the sigma

signal's i).

which equal to

The <u>middle band</u> is a simple moving average:

Where n is the period.

$$\frac{\sum_{j=1}^{n} Close_j}{n}$$

The <u>upper band</u> is: Middle band + D $\quad * \sqrt{\frac{1}{N} \sum_{i=1}^{N} \left(x_i - \bar{x} \right)}$

Here D is the number of standard deviations, the default is 2.

The <u>lower band</u> is: Middle Band − D $\quad * \sqrt{\frac{1}{N} \sum_{i=1}^{N} \left(x_i - \bar{x} \right)}$

Typical values for *N* and *K* are 20 and 2, respectively. The default choice for the average is a simple moving average, but other types of averages can be used as well. Exponential moving averages are a common second choice.

9) Fast Stochastic

Type: Trend Following

The fast stochastic is more sensitive than the slow stochastic to changes in the price of the underlying security and will likely result in many transaction signal. This was developed because during an uptrend, the closing price tends to rise. However, when the uptrend matures, price tends to close towards the bottom of the price range for the period. Likewise, in a downtrend, the reverse holds true. (Source 2.7.15)

Calculations:

The formulas for the Fast %K and Fast %D lines are as follows:

n = number of sessions being considered in %K.

Fast %K = (Today's Close – Lowest Low in n) x 100

(Highest High in n) – Lowest Low in n)

Fast %D = 3-period moving average of %K.

The indicator plots two lines,one solid and one dotted, in its indicator panel. The two lines are the %K line and the %D line. (Source 2.7.16)

10. Slow Stochastics

Slow stochastics is a smoother version of fast stochastics. Fast stochastic likely creates whipsaws so slower version was created using 3 period moving average.

Long:

If the Stochastic (%K or %D) falls below the Oversold line, place a trailing buy stop. When you are stopped in, place a stop loss below the Low of the recent down-trend (the lowest Low since the signal day).

Short:

If Stochastic rises above the Overbought line, place a [trailing short stop](). When you are stopped in, place a stop loss above the High of the recent up-trend (the highest High since the signal day).

It uses trend indicator to exist.

Calculation:

n = number of sessions being considered in %K.

Fast %K = (Today's Close − Lowest Low in n) x 100

(Highest High in n) − Lowest Low in n)

This line is not visible; it is only used to calculate the Slow %K and Slow %D.

Slow %K = 3-period moving average of Fast %K (same as Fast %D).

Slow %D = 3-period simple moving average of Slow %K (an extra layer of smoothing).

Why should we use this:

Many traders find the Stochastic Oscillator too volatile and prefer to use the Slow Stochastic due to the fact that:

1. The %K [Slow] is equal to the %D [Fast] from the above formula.
2. The %D [Slow] is calculated by smoothing %K [Slow]. This is normally done using a further 3 period simple moving average.
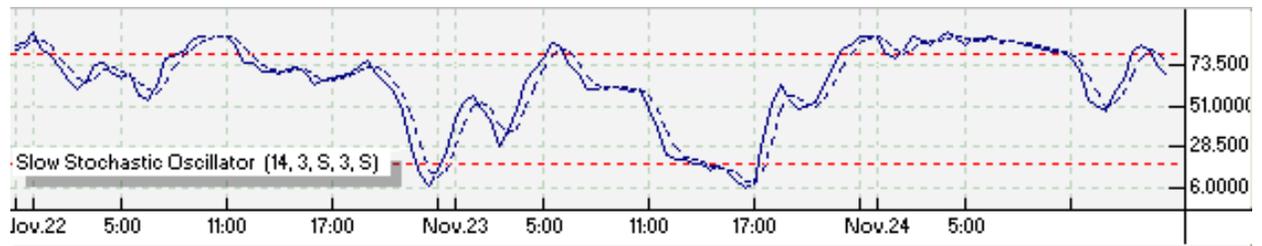
Figure 22 Slow Stochastic Oscillator

The fast stochastic is agile and changes direction very quickly in response to sudden changes. The slow stochastic takes a little more time to change direction. (Source 2.7.17)

2.8 TradeStation

TradeStation is an online brokerage company based in Plantation, Florida. The company is known for its trademark analysis software and electronic trading platform which it provides to active trader and certain institutional trader markets. The TradeStation platform features electronic order execution and enables clients to design, test, optimize, monitor, and automate their own custom equities, options, futures and forex trading strategies. TradeStation platform is really ingenious and offers unlimited potential to signals, indicators, and strategy mechanisms. It has features that allow traders to write programs or strategies which monitor the price movements and even perform automatic trading. The platform provides extensive functionality for receiving real-time data, displaying charts, enter orders and manage outstanding orders and market positions. (Source 2.8.1) TradeStation offers six types of analysis techniques: Indicator, ShowMe, PaintBar, ActivityBar, ProbabilityMap, and Strategy, all written with Tradestations proprietary EasyLanguage software. Indicators are used to predict price movements and

show market trends. They are formed by entering information about a security's past and current prices. ShowMe is an indicator which draws a dot in a chart window to make the trader aware that the conditions defined in the program are met. PaintBar is fills the bars with a pre-determined color to indicate the conditions defined in the program are met, and ProbabilityMap provides the information of historically driven price data. Another technological feature also prevents the customers from missing trading opportunities due to temporary internet connection loss.

Figure 23 Trade station charting

In Tradestation, Programmers can perform walk forward analysis on the system and back test in order to perfect their programs against historical data as much as several years back and see how their individual strategies perform. Thus, TradeStation is one of the best brokers in US helping traders with their trading to be successful. (Source 2.8.1)

3 Methodology

The process of developing a strategy is that of learning and optimization. In order to be successful a starting point must be chosen that can initialize this process. Therefore a logical point is to start with something well known and mold it with personality and experience as it comes. When trading it is important to develop an edge, an idea which gives an advantage in the market. In this case it is beneficial to start with an indicator or set of indicators. Indicators sum up large amounts of information into a manageable format which allow educated trades to be placed. On a side note it is recommended to focus on a couple different time frames such as 15 min and 1 hour, during the initial stages. Different indicators can behave differently and work better or worse on any given time frame. All indicators are useful in some way so when choosing one to start with it is important to select one that is fully understood. Learning and adapting is fundamental and it is not helpful to trade with an indicator that is not understood. Even more so it is not possible to learn the subtle behaviors of the indicator if the overall concept is not fully grasped. Often times the simplest indicator will prove to be the most useful. Once the indicator, or set of indicators is chosen there is only one way to proceed, practice trading with them.

By practice trading the price movements which trigger the indicators can begin to be recognized. In addition it becomes possible to see when the indicator fails to trigger in time or gives false signals. Once shortcomings are identified then it is time to move forward and begin developing or enhancing indicators. Since the time has been taken to understand how the price movements affect the indicators function it is easier to "fix" them and recognize possible solutions. It is during this time that more extensive research

should be put towards time frame selection. As mentioned the time can have a large impact on indicators. Momentum indicators such as moving averages generally work better on longer time frames which can be less susceptible to volatility. Experimentation is the key to moving towards a good strategy. Simply keep in mind that this stage never really ends. There are many different ways to trade successfully and always room for improvement. It is important to simply not stop trying new ideas and to fix problems.

3.1 Forex Strategy

Week to week as experience was gained executing trades strategies were developed and improved upon. Though no single system was developed the following is a culmination of all the ideas that were explored throughout the year.

This strategy has the goal of minimizing dependency on technical indicators and instead draws upon the ability to establish an idea of where the price is headed. While an indicator may offer insight into potential price moves it does not ensure that the move is understood.

Rules

The strategy involves viewing both a 15 minute chart and a 60 minute chart.

(1) Firstly the currency must not be moving sideways on the 60 minute chart

    a. If the currency is moving up the price must also be above the moving average or below if the currency is moving down, currently the term length is a 34 term exponential average.

(2) The next step is to predict whether the price will continue to move in its current direction or reverse. This is done on the 60 minute chart and is done by analyzing possible chart patterns as well as using the moving average.

(3) Once a prediction is established the focus is only now turned to the 15 minute chart where the strategy waits for an entry signal from a technical indicator.

    a. The signal on the 15 minute chart must match the prediction established above.

    b. If there indicator gives a buy signal but the prediction was for a reversal of an uptrend than no trade is taken

Small take profits: 5-10 pips

(i) The ability to predict possible direction is improving

(ii) Estimates as to the total movement size are still very shaky

(iii) Therefore the aim is to simply take a small enough portion of the move such that the total movement is never smaller than the profit target

(iv) To counter taking small percentages of the moves a larger leverage is used, currently it is set at 10 times, or 10 standard lots

(v) The stop Loss is set to 10 pips ensuring a maximum loss of 1% of the account

Time of day: ranging from 12:00 am until 9:00 am

(i) Thus far from observation there appear to be many moves that begin trends or reverse current trends

(ii) The moves tend to break 5 pips at a minimum even when the market is moving slowly. In addition the time in market is generally not that long in order to see these gains.

The goal of the strategy is to first ensure that price movement is fully understood before placing any trades. By first making an informed prediction, although subjective, it

serves to filter possible fake signals. Even more importantly though is if the user predicts a reversal of a downtrend and all of a sudden a sell signal is given it means that the price movement is not understood. If this is true and the movement goes against the prediction then it is advisable to avoid the current action since it is clear that it remains unknown where the price is headed. On the flip side if a downtrend reversal is predicted and a buy signal is given this reinforces confidence the price will actually go where it was believed to be heading.

Now to elaborate on step two and reveal more in depth how the prediction is being made currently there are essentially two methods being used which are, as mentioned, moving averages and a specific chart pattern. The chart pattern being watched for most is the waves of any given movement. If the price begins to move up the buyers take short breaks where they perhaps take profits are wait to decide whether to take the price higher. This creates a slight retracement of the original movement. After a brief period the buyers may regain momentum and take the price to a new high. So the goal of trading this is to wait for a retracement after a large move then enter as the price begins to move back up. Through observation some rules have been added to separate these retracements from outright reversals. First and foremost one rule that has been added is that following the retracement the price must make a new high close before entering. If the buyers are unable to make a new high before going down again then it appears unlikely they will.

Figure 24 60 min forex trading strategy example

The example outlined in the yellow box shows both methods in one move. First off the price is moving sideways for about ten hours and then all of a sudden the price breaks out downward crossing the moving average. At this time the currency now bears watching since it fits the criteria of moving strongly in one direction. Then all of a sudden a green bar appears so this begs the question, is this a slight retracement or outright reversal. As soon as the next bar breaks the previous low however this is a strong signal the downtrend will continue especially as the price is now very convincingly below the average. So with this in mind a prediction is set that the price will continue to move downward. Also note the movement following the one outlined

where the pair moves to test the moving average. It proceeds to bounce off and continues

the downtrend.

This is the same movement outlined on in yellow except on the fifteen minute chart. The indicator shown is the Woody CCI mentioned before. The indicator is clearly giving a strong sell signal throughout the movement but instead a specific entry signal is waited for. The signal is then given after the yellow bar where the indicator reenters a negative value after briefly positive.

Figure 25 15 min forex trading strategy example

Figure 26 Trend Lines in use

The strategy was further improved through the inclusion of trend lines. Not only

do they help to give an idea of where the price is moving and how fast but they create

significant points of interest when the trends break. Here are some trend lines in action which were actually drawn in real time as trends were being noticed. The first line was tested three times and after the third bounce the price failed to break the 34 term moving average. At this point it seemed likely the price would continue its downtrend so at the first white dot could have been a good entry point. The second trend line shows a significant break in an uptrend. As soon as this occurs it becomes a point of interest and all that's left is to wait for an entry signal. Of all the drawing tools explored, trend lines

Table 4 Strategy results from Feb 18 to Feb 21

have proven to be the simplest yet most effective tool.

18-Feb

Order	Currency	Entry Time	Entry Price	Exit Time	Exit Price	Profit
Short	USDJPY	3:20	102.43	3:28	102.365	6.50

19-Feb

Order	Currency	Entry Time	Entry Price	Exit Time	Exit Price	Profit
Short	USDJPY	2:21	102.2	2:45	102.149	5.10

20-Feb

Order	Currency	Entry Time	Entry Price	Exit Time	Exit Price	Profit
Short	USDJPY	2:02	101.876	2:36	101.821	5.50
Long	EURUSD	5:21	1.36965	6:41	1.36965	0.00
Long	USDJPY	9:11	102.242	9:46	102.266	2.40

21-Feb

Order	Currency	Entry Time	Entry Price	Exit Time	Exit Price	Profit
Long	USDJPY	0:57	102.577	2:19	102.578	0.10
Short	USDJPY	3:35	102.394	5:58	102.426	-3.20

Total Trades	Winning	Losing	Total Profit
10	8	2	18.90

This is an example of trading during the week of February 17th. All trades are done between 12:00 AM and 9:00 AM with one exception. The take profit varied throughout the week between 5-6 pips. The stop loss was not triggered this week but there were two losing trades and a break even. The total profit for the week was 18.9 pips. Since the strategy uses 10 standard lots with a $100,000 account the total profit for the week was approximately $1890, or 1.89%.

3.2 Stock Strategy

Technology stocks, in recent years, have been seen as highly volatile. Hence, the task was to implement a trading strategy that would navigate the technology market and reap respectable profits. The decision with this market was to start off with a simple indicator and build upon that. The end goal of the strategy is to enable a trader to get a better idea of price movements and make a decision accordingly. The strategy would train the trader in identifying buy or sell signals and eventually, even rid the use of indicators altogether.

Before the strategy is detailed. A number of rules must be put into place to assist in the trading activities:

i) The charts used are either 5 minute charts for quick trades, or 15 minute trades if the individual plans to hold on the shares for a longer period of time.

ii) Implement a take profit between 10 to 15 points, and a stop loss of 12 points. The stop loss is quite large because this would leave opportunity for the stock to correct itself if it diverts from the expected directions. For example if you go long on a stock and the share price seems to be going down, the 12 point

stop loss would allow the individual not to panic and see if the shares go in the direction you predicted.

iii)   Trade between 10:00am and 3:00pm. The markets open up at 9:00am, and close at 4:00pm. Starting to trade an hour after the markets open will give some time for the shares to relatively stabilize from the opening volatility. After 3:00pm the markets lean towards volatility and it is advised to stay away from such situations as they are much less predictable

iv)   Fully leverage. This is the best way to maximize returns from the strategy

Strategy

1) The first signal comes from establishing whether the stock is moving towards a buy or sell position.

- The stock can be moving towards a buy position if there are three consecutive bars on the upwards trend. Although this signal could be misleading if the second or third bar is a "doji"(They form when a stock's open and close are virtually equal.)

- The stock can be moving towards a sell position if there are three consecutive bars on the downward trend. Again, this could be misleading if one of the bars is a doji.

Figure 27 Left: Potential buy signal; Right: potential short signal

2) After a trend is identified, the second signal is provided by the indicators. This is step is multi-faceted. Meaning that this signal is a culmination of minor signals. Each minor signal being each indicator included within the strategy

- The first technical indicator is the 3-line Moving Average. The three moving averages were a fast moving average with a length of 4, a medium moving average with a length of 8, and a slow moving average with a length of 18.


Figure 28 Example of a three line moving average crossover system

So the fast moving averages is the yellow line, the blue line is the medium moving average and the cyan line is the slow moving average. The order of the moving averages is pertinent in identifying either a Buy or Sell signal. For a buy signal, the price bars have to be above the fast moving average; the fast moving average has to be above the medium average and the medium moving average has to be above the slow moving average. They also all have to be trending upwards. Once all that is in place, the 3-line moving average

establishes a BUY signal. The inverse is needed for a SELL signal. For a SELL signal, the price bars have to be below the fast moving average, the fast moving average is below the medium moving average; the medium moving average is below the slow moving average and all of them have to be trending downwards. From the above diagram, the Sell signal is fairly evident.

- The second technical indicator is the Moving Average Crossover (MACD). The indicator consists of 2 moving averages. One has a length of 9 and another of length 18.
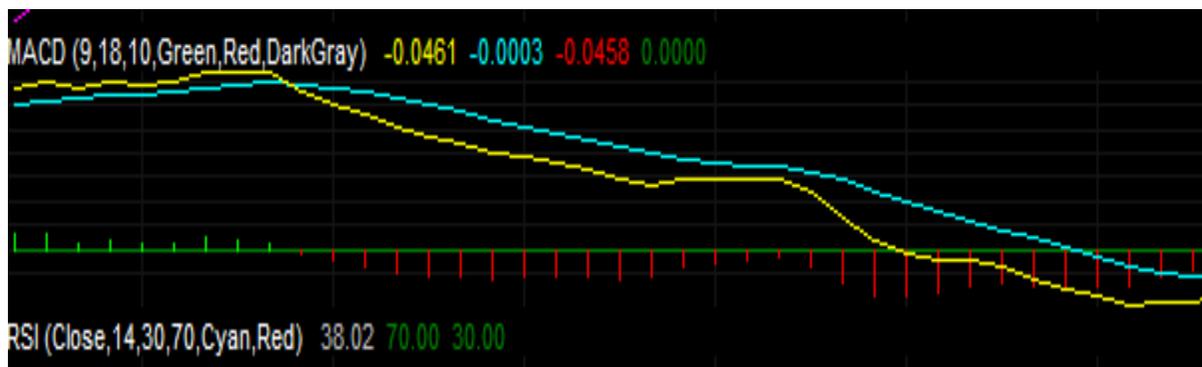
Figure 29 MACD example

The yellow line is the slow moving average, and the blue line is the slow moving average. For a BUY signal, the fast moving average most have crossed over the slow moving average and both lines are trending upwards. For a SELL signal, the fast moving average must cross below the slow moving average, with both lines trending downwards. The bars shown display the volume of either BUY or SELL orders. The above figure exhibits a SELL signal.

TradeStation Trade Analysis			Collapse ⌃
	All Trades	**Winners**	**Losers**
Total Number of Trades	13	7	6
Avg. Trade Net Profit	($72.74)	$102.43	($277.10)
Std. Deviation of Avg. Trade	$339.53	$107.63	$411.95
Avg. Trade + 1 Std. Deviation	$266.79	$210.05	$134.85
Avg. Trade - 1 Std. Deviation	($412.27)	($5.20)	($689.05)
Coefficient of Variation	466.78%	105.07%	148.66%
Time Averages			
Avg. Time in Trades	37 Mins	42 Mins	30 Mins
Avg. Time Between Trades	17 Hrs, 39 Mins	23 Hrs, 41 Mins	1 Dy, 4 Hrs, 32 Mins
Avg. Time Between Trade Profit Peaks	11 Hrs, 12 Mins		

Figure 30 This is the trade analysis of the Technology stock trading strategy

3.3 Crude Oil Strategy

The crude oil futures strategy uses a combination of indicators to form a simple, yet precise system. The indicators of choice are Woodies Pivots and with a moving average crossover. The main goal of this system is to achieve small targets using a higher equity in order to make decent profits.

Below are the need-to-know concepts of the strategy. Some things like the profit target and stop loss were relative to change but for the most part kept a tight range.

Strategy Fundamentals

Type of Chart Used: Candlestick

Time Frames Used: 2min for trades and 15min for setups

Profit Target: 7ticks to 15ticks

Stop Loss: 10ticks to 15ticks

*Average Position Size (100k equity): ~*40% or 10 contracts (~$3800 each)

Time Of Day: Start-7am End-12pm

Relativity: News events, seasonality, price levels all considered daily.

Woodies Pivots:

Woodies Pivots are an indicator that was taken from Ameritrade's ThinkorSwim platform. Their definition of this indicator is, "The Woodies Pivots study calculates pivot, support, and resistance plots on Ken Woods proprietary formula."(1) Breaking apart the code of this indicator one can see that the midpoint or pivot line, is calculated using the previous time frames (high + low +(open x 2)/4). This is essentially taking the average of the previous time frame with a weight on the open. The support and resistance plots are taken by taking the standard deviations of the midpoint. Below is a picture demonstrating this indicator based using the daily time frame fro crude oil.

Figure 31 Woodie's pivot points

This a 15min candlestick charts. The midpoint is colored magenta while the first resistance zone is colored red and support is green respectfully. On this particular day the price was hanging around the pivot point before going up and touching the first level of resistance. The price hovered there for a little bit before breaking down to the midpoint line.

Exponential Moving Average Crossover:

The next indictor used in this strategy is a moving average crossover. As defined in the *indicator* section, an exponential moving average is a average of the price using a weight on the newer prices. A simple moving in comparison does not weight the prices differently. The idea behind using a exponential moving average is that is slightly more reactive to the current trend. For the 15min chart the indicator uses a length of 7 and 20 for its fast and slow averages. Using the ability to change the code, the indicator in this case was added with a "cloud" between the two lines to better visualize bullish and bearish patterns. Below is the exact same time frame from above, but with the moving average indicator added.
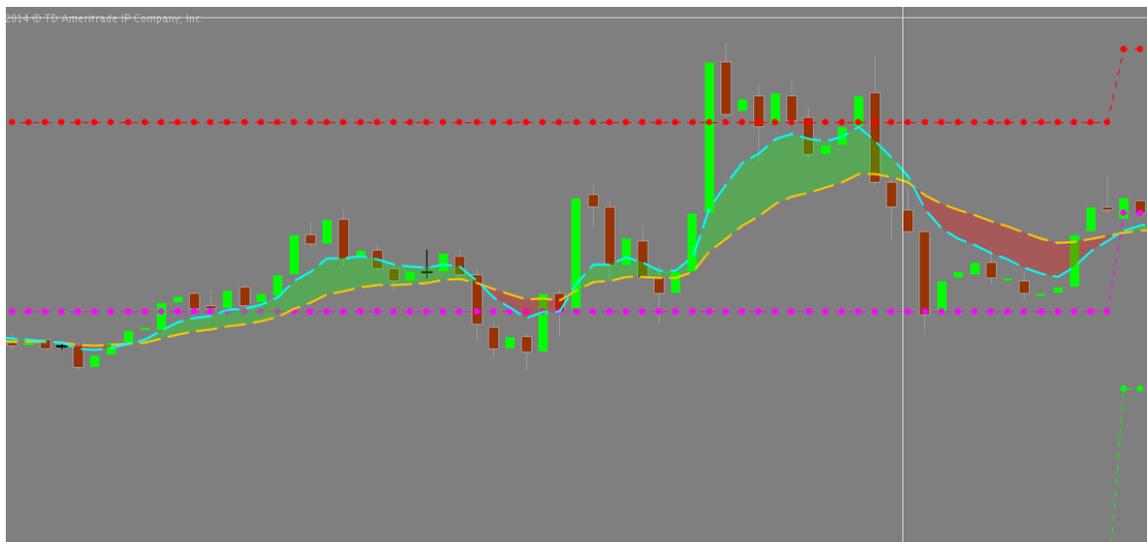

Figure 32 Crude oil Moving average crossover

Using a Combination:

By taking both the moving average crossover indicator as well as Woodies Pivots gives a nice way to establish trend. This strategy specifically looks for an opening up

between the slow and fast average with the price making a break of the midpoint or pivot line. In the chart above one can the bullish cloud that forms when the price starts to rise. This strategy is a very short-term system that typically either makes it profits or hits it stops fast. The idea behind this is to manage risk by limiting the time in market. On average the system only looks for profits of 10 ticks (the equivalent of 10cents in price). This is a very insignificant move with oil for the most part, however each tick is equivalent to $100 when using 10 contracts. This results in a profit of $1000 or a potential loss of equal proportions.

Results:

Overall this system has been very effective throughout the year as it relies on extreme relativity using small targets. As the methodology states, each strategy as been a continuous work in progress as no system is perfect. Countless indicators were tested and the end result was that less was more. Crude oil is a trendy trading instrument and focusing on just simplicity made this system much more profitable. Some of the trading days used higher equity and lower targets to make it more of a scalping system. Below are some of the best results of this system with a profit of around $5000 in around an hour of trading.

Table 5 Examples of trades taken by the strategy

TIME	FEES	COMMISSIONS	AMOUNT	BALANCE
7:36:27	-5.8	-10		104,830.10
7:51:28	-14.7	-20		104,795.40
8:06:57	-5.8	-10	500	105,279.60
8:12:33	-14.7	-20	100	105,344.90
8:16:27	-7.35	-10		105,327.55
8:17:20	-7.35	-10	200	105,510.20
8:19:09	-29.4	-40		105,440.80
8:19:33	-29.4	-40	600	105,971.40
8:21:27	-29.4	-40		105,902.00

8:21:50	-29.4	-40	-200	105,632.60
8:22:09	-29.4	-40		105,563.20
8:24:10	-29.4	-40	600	106,093.80
8:24:33	-29.4	-40		106,024.40
8:30:49	-29.4	-40	600	106,555.00
8:31:23	-29.4	-40		106,485.60
8:32:07	-29.4	-40	600	107,016.20
8:32:31	-29.4	-40		106,946.80
8:33:35	-29.4	-40	600	107,477.40
8:34:34	-29.4	-40		107,408.00
8:35:06	-29.4	-40		107,338.60
8:37:58	-36.75	-50		107,251.85
8:39:39	-36.75	-50	-1,250.00	105,915.10
8:40:10	-36.75	-50		105,828.35
8:41:13	-36.75	-50	250	105,991.60
8:41:42	-36.75	-50		105,904.85
8:42:24	-36.75	-50	750	106,568.10
8:43:05	-36.75	-50		106,481.35
8:43:26	-36.75	-50	250	106,644.60
8:43:49	-36.75	-50		106,557.85
8:44:18	-36.75	-50	750	107,221.10
8:44:50	-36.75	-50		107,134.35
8:45:03	-36.75	-50	750	107,797.60
8:45:29	-36.75	-50		107,710.85
8:46:02	-36.75	-50	250	107,874.10
8:46:38	-36.75	-50		107,787.35
8:47:06	-36.75	-50	500	108,200.60
8:47:29	-36.75	-50		108,113.85
8:48:26	-36.75	-50	750	108,777.10
9:02:25	-36.75	-50		108,690.35
9:03:02	-36.75	-50	-500	108,103.60
9:05:08	-36.75	-50		108,016.85
9:05:57	-36.75	-50	-500	107,430.10
9:06:18	-36.75	-50		107,343.35
9:06:33	-36.75	-50	250	107,506.60
9:07:53	-36.75	-50		107,419.85
9:07:56	-36.75	-50	750	108,083.10
9:08:12	-36.75	-50		107,996.35
9:12:35	-36.75	-50	750	108,659.60
9:13:58	-36.75	-50		108,572.85
9:14:23	-36.75	-50	250	108,736.10
9:15:37	-36.75	-50		108,649.35
9:15:50	-36.75	-50	750	109,312.60

9:21:10	-36.75	-50		109,225.85
9:21:15	-36.75	-50	750	109,889.10
9:21:46	-36.75	-50		109,802.35
9:22:07	-36.75	-50	250	109,965.60
9:24:31	-36.75	-50		109,878.85
9:24:38	-36.75	-50	750	110,542.10

Lessons Learned:

Crude oil futures contracts offer investors a chance to take part in the most liquid commodity in the world while offering gains that were never possible for someone other than a pro. The strategy outlined above is very simple because there is so much weight on other factors like seasonality, demand, and news. There is no set guide on could right to address each one of these impacts, however they paint a much better picture when considered. Oil is one of the few trading instruments that plays between a range year after year and that is chiefly what this strategy tries to take advantage of. So the biggest takeaway without a doubt would be to keep it simple because in the end its only going to do two things, go up or down.

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```
    input price = close;
input price2 = close;
input fastLength = 9;
input slowLength = 18;
input displace = 0;
input AverageType = {default SMA, EMA};

plot fastAvg;
plot slowAvg;
switch (AverageType) {
case SMA:
   fastAvg = Average(price[-displace], fastLength);
   slowAvg = Average(price2[-displace], slowLength);
case EMA:
   fastAvg = ExpAverage(price[-displace], fastLength);
   slowAvg = ExpAverage(price2[-displace], slowLength);
}

fastAvg.SetDefaultColor(GetColor(1));
slowAvg.SetDefaultColor(GetColor(0));
```

```
DefineGlobalColor("Bullish", Color.YELLOW);
DefineGlobalColor("Bearish", Color.RED);
AddCloud(fastAvg, slowAvg, globalColor("Bullish"), globalColor("Bearish"));
```

4.0 Takeaways and Conclusion

This IQP set out and achieved exactly what it needed to. The original goals were to broaden market knowledge and be able to create a trading system. The systems that were created touched a little bit on each different market and really gave a nice sample of the popular types of strategies.

The biggest lessons we learned and are continuing to learn are mostly about being patient and calm. Trading is stressful even using fake money so it's definitely a career that one needs to think deeply about before considering going into it. With high leverage and margin, people need to be aware of the very real risks of investing. Things can often look too good to be true with the potential gains of some trades and it often traps traders into thinking its easy. Technology has come far enough for people to put their investments in their own hands, but that doesn't mean it should always be done. We hope our report gave a good introduction to the basics of trading as well as a nice summary of the crude oil, forex and technology stock markets.

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