Investing as a Business

An Interactive Qualifying Project Report

Submitted to the Faculty

of

WORCESTER POLYTECHNIC INSTITUTE

In partial fulfillment of the requirements for the

Degree of Bachelor of Science

By

_____

Gabriel McCormick

_____

Devin Kehler

Date: March 11, 2012

Approved:

_____

Hossein Hakim, Advisor

Table of Contents

List of Figures

List of Tables

1. Introduction

In the successful civilizations in human history, methods for investing have always emerged, as a response to certain needs. Initially, commodities markets appear, in response to farmers looking to remove themselves from much of the risk associated with the daily market movements in prices. Stock markets require a more advanced society as a whole, as companies must be successful, as well as willing to publicly trade their companies (trading ownership in the company in order to raise capital). Finally, foreign exchange market, as we know it today, only emerges when there is a need for large and quick global currency transactions, at little risk. In addition, the foreign exchange market is dependent on moving away from currencies that are dependent on the gold standard. Investment markets exist to fill their respective needs, and historically, these markets have always appeared when the need arises.

An investor in the foreign exchange market provides the liquidity for companies that are looking to exchange currencies. Traders provide this service, and in return, there is the potential of making profit off of these trades. However, this profit is by no means guaranteed. In addition, even if a trader is successful, the price of currencies only moves in small fractions of a unit of currency. Large movements are extremely rare. Thus, profiting off of a trade without much capital would be extremely difficult, were it not for leverage. Leverage allows investors to multiply gains and losses, at the expense of exposure to greater risk. Most investing principles have application in the Forex market, except that for analyzing the market fundamentally requires a greater understanding of world economics, as well as macroeconomic issues that have potential to affect currency values. This is the market that our group chose to invest in.

1.1 Project Description

The ultimate goal of this project is to design and launch an investment company. In this investment company, the trading strategies will revolve around personal trading strategies of the group members, which have been translated into investment robots, using the MQL4 language. The company will have parameters that will be agreed upon by all group members, parameters that will be thoroughly researched. Design parameters that need to be taken into account are as follows: location of the company, legal structure, licensing and marketing. The money management (and risk management) of the company will also be a collective decision, but it relies heavily both on client needs, as well as different trading strategies.

2. Background

Investment is a reoccurring event during the many dominant and advanced civilizations through history, but the reasons for having investments are actually quite similar. However, none of these historic "markets" have reached the level that investment plays in modern society however, and the Foreign Exchange market is actually very new in comparison to other markets.

Futures markets were likely the first investment markets to appear in society. Farmers needed to have a method of selling their crop and livestock at a stable price, rather than according to supply and demand. "In the ancient history of futures trading, their motivation for doing so was probably much the same as ours today...to make trading for goods they needed, whether immediately or later on in the future, easier and more predictable." (History of Futures Trading) One of the earliest examples of this is in Babylon, an ancient Sumerian city. Archaeologists have uncovered clay tokens that are either in the shape of livestock, or have images of livestock on them(History of Futures Trading). It is believed that set quantities were traded, then sealed in clay containers that had the number of tokens contained inside marked on the outside(History of Futures Trading). The belief is that this is how traders promised to deliver a set amount of livestock, at a set time(History of Futures Trading). It remained important for Farmers to protect the price of their crop and livestock, so as not to expose themselves to the risks of the market, which is why the commodities market persisted throughout history. In addition, the ancient civilizations that protected and encouraged trade prospered, and the most powerful of which acted as arbitrators, overseeing and regulating trade(History of Futures Trading). It is of no surprise then that these markets have advanced and persisted into the modern time period.

Stock markets were a little longer in coming around, as they are of a more complex nature. Investment banks started to appear in both the Roman and Greek civilizations (History of

Investment Banking in the US and Britain - An Overview). It mostly consisted of providing long term loans to certain industries (History of Investment Banking in the US and Britain - An Overview). In the Middle Ages, it is known that the Knights of the Templar involved themselves in investment banking, as well as commodity trading, on their return from the Crusades(History of Investment Banking in the US and Britain - An Overview). The first brokers also appeared at about the same time. “In 12th century France the *courratiers de change* were concerned with managing and regulating the debts of agricultural communities on behalf of the banks. Because these men also traded with debts, they could be called the first brokers”(Stock Market). In the thirteenth century, merchant families set up trading centers in trading cities (Stock Market). In addition, Venetian bankers started to trade government securities around this time (Stock Market). The market was influential enough that in 1351, the Venetian government outlawed the spreading of rumors in order to impact the value of government funds (Stock Market). It was in the fourteenth century that other trading metropolis’ followed suit, cities like Pisa, Verona, Genoa, and Florence; these Italian city-states also saw the first issuing of shares by a company (Stock Market). These locations fostered this growth because they were not ruled by a Duke, and were instead an independent city-state that was governed by a council of (usually wealthy) citizens (Stock Market). Once the basis was laid for both companies issuing stocks, and investment in government bonds, other countries followed suit. The next major advance saw the Dutch East India Company, a joint stock company, have a fixed capital stock, which enabled investors to continuously trade in company stock on the Amsterdam Exchange (Stock Market). From here, more companies used stock markets to raise money, and more markets were created around the world. Fast forwarding to today, there are stock markets in every developed economy,

and access to these markets has been greatly enhanced by using computers and the internet (Stock Market).

The foreign exchange market is a very new market, probably because of its nature, which is heavily reliant on globalization. The foreign exchange market is it exists today only began forming in the 1970's, after "three decades of government restrictions on foreign exchange transactions (the Bretton Woods system of monetary management established the rules for commercial and financial relations among the world's major industrial states after World War II)" (Foreign Exchange Market). It was around this time that countries started to adopt floating exchange rates, ending the previous fixed "exchange rate regime" (Foreign Exchange Market). Previous to the twentieth century, mostly fixed exchange rate systems were used, or currencies were not exchanged at all. In the past most currencies also held the value that they represented (for example, gold coins). Thus, since most countries values the precious metals that were used to create currencies, there was no real need for an exchange rate. Even after the adopting of currency systems that did not physically represent a value, countries held their currencies to the gold standard. This meant that a unit of currency represented a specific amount of gold. The idea was that if currency was not physically valuable, it needed to represent something that was valuable in order to be accepted. After World War II, under the Bretton Woods agreement, many countries agreed to adopt a "gold exchange standard", in which all currencies were fixed to the value of the dollar, which still was on the gold standard, and the value of gold was set to thirty five US dollars an ounce(Foreign Exchange Market). This effectively fixed most currencies to a value in gold as well. However, after a decline in the economic influence of the US dollar globally, as well as fiscal strain resulting from the Vietnam War, the United States officially ended reliance on the gold standard, enabling a floating point exchange rate(Foreign Exchange

Market). Since all global currencies were valued based on each other, this opened up new possibilities for globally exchanging currencies. Although the foreign exchange market is not one single exchange, it is considered in such a manner because currency quotes are all very similar, and base on quotes in London, as it is the unofficial foreign exchange center(Foreign Exchange Market). The market provides companies with the unique opportunity to exchange currencies nearly at will, and in large volumes, due to the high liquidity.

Individual traders help provide this huge liquidity, allowing companies to trade large amounts of currencies almost immediately, and at relatively stable pricing. The average daily turnover in the global foreign exchange market is estimated at $3.98 trillion dollars, which is nearly unparalleled by other markets(Foreign Exchange Market). The low return on investments is counterbalanced with the use of leverage. This enables individual traders to make acceptable profits on very small price movements (at the cost of higher risk).

Investment has always surfaced in advanced civilizations, as the same needs have always come to light. However, in the modern world, these needs have been addressed by the modern markets, which meld new technology with old investing ideas. The commodities markets have existed in some shape or form as soon as farmers sought a method to remove themselves from the risk associated with trading in a volatile market dominated by supply and demand. Stock markets surfaced as soon as companies saw the value in publicly trading stock continuously as a method of raising capital. Finally, with globalized economies, and global companies, there arose a need to trade currencies at little risk and in large volume. This has been addressed by the decentralized Foreign Exchange market.

2.1 Common Forex Terms

There are a number of terms that are used by traders that have little to no meaning outside of investment. These terms are important to grasp, as many investment programs and investors will make reference to them without an afterthought. All of these terms will be encountered often when trading, and when doing trading research.

2.1.1 Pip

The smallest price change that a security can process (Pip). This changes from currency to currency, as it depends heavily on the value of one unit or a currency. For instance, in the Japanese yen US Dollar cross, one pip is one hundredth of a yen. However, in the Euro US Dollar cross, one pip is one ten thousandth of a euro. This can also be called a basis point. When looking at currency charts, it is important to keep the pip value in mind, as often measure a currency to a value smaller than one pip. The profit or loss garnered from a trade depends mainly on the amount of pips the currency has moved from when the trade was opened to the close, and on the lot size of the trade. Because profit or loss depends on lot size as well as the pips made or lost, often the pips made on a trade is used as an indicator of performance. Often, the amount of pips made by a trader is more indicative that their profit. For instance, take two profitable traders, one with one hundred thousand dollars in capital, and the other with two thousand dollars in capital. The traders are going to have very different profits. However, the amount of pips made is a much more comparable stat, as it doesn't rely on capital.

2.1.2 Leverage

Leverage is the act of multiplying gains and losses by using a larger amount of capital in your investment (Leverage Definition). In the Forex market, Leverage allows a trader to buy

much more money than the trader actually has. This is because the change in price in a currency is small enough that a lot of money is needed of a currency to make a significant impact. Traders are allowed to use leverage on the idea that they will not lose any more than their initial investment. However, with increased leverage comes increased risk. Leveraging and entire account each trade is highly advised against, as there is a large amount of risk that the account will be wiped in a single trade. Most investors will only recommend leveraging against two to five percent of an account at any given time, in order to minimize risk. Countries have different laws on the maximum leverage that investors are allowed to use. In the United States, recent legislation has mandated that the maximum leverage used is fifty to one. Other countries have much higher leverages, at four hundred or five hundred to one. However, a resident in the United States will have a lot of difficulty setting up accounts in another country, as the IRS is cracking down on these instances. Generally, a leverage of fifty to one should be sufficient for most trading strategies.

2.1.3 Lot Size

The lot size is a measure of the amount of units of a currency being purchased in a trade. One standard lot is one hundred thousand units of the base currency of the currency pair being traded (Forex Lot Sizes and Risks). Other sizes available are mini lots, which are ten thousand units of the base currency, and micro lots, which are one thousand units of a base currency. Note that if the base currency is different than the currency that a trader's account, the amount of money in the trade will be the amount of units being traded of the account currency, multiplied by the currency conversion to the base currency of the trade. The lot size directly affects the profit or loss garnered from a trade. For instance, if the base currency is USD, then the profit from one pip would be ten dollars for one standard lot, one dollar for one micro lot, and ten cents

for one mini lot. Thus, trading in smaller lots sizes will minimize risk, loss and profit, while trading with higher lot sizes will increase risk, profits, and losses. If an account has a maximum leverage of 50:1, two thousand dollars is required to purchase one standard lot of a base currency, provided that the base currency is either worth less than the account currency, or the base currency is the account currency. As covered in leverage, a trader usually does not want to be using the maximum leverage allowed for the size of account, as this will maximize the risk associated with trading, and will likely result in wiping the account.

2.1.4 Bid Price

The bid price for a security is the price that the market or a buyer is willing to buy. In Forex, this is the price that the base currency is being bought at, and the price that a trader will likely have to pay to buy the base currency (Bates). When closing a short trade, this is the price that the order will be closed at, and this will be the price that will be initially be filled if a trader goes long.

2.1.5 Ask Price

The ask price for a security is the price that the market or buyer is willing to sell. In Forex, this is the price that the base currency is being sold at (Bates). When closing a long position, this is the price that the order will be closed at, and when opening a short position, this is the price that the order will be filled at.

2.1.6 Spread

The difference between the bid and the ask price (Bates). This amount varies depending on the broker being used, as well as the time of day and the currency pair being traded. Typically, the lowest spreads for a broker will be for the major pairs, while less traded currency

pairs will have higher spreads. The lowest spreads for a broker are typically seen during the times of the highest activity, which is usually during the London session into the New York session. Finally, the spread has a large impact on selecting a broker, but this will be covered later in the section Choosing a Broker. When entering a trade, a trader must first make enough pips to surpass the spread when the order was filled in order to make profit on a trade. Normally, the spread will be no more than three pips for a major currency pair, and will probably be between one and two pips, for a decent broker. Low spreads are due to the liquidity that is available to traders of the Forex Market.

2.1.7 Short/Long

Taking a long position on a currency pair means that a trader is buying the base currency, with the intention that the value of the base currency will increase and/or the value of the quote currency will decrease (Long (or Long Position) Definition). Taking a short position on a currency pair is synonymous with selling the base currency. This is done with the intention that the value of the base currency will decrease, and/or the value of the quote currency will increase (Short (or Short Position) Definition).

2.1.8 Currency Pair

A currency pair is a measure of the relative value of one unit of currency against one unit of a different currency. The currency being quoted is called the base currency, while the currency being referenced is the quote currency, or the counter currency. All of Forex trades are made within a currency pair, as currencies must be compared in order to have value. The currency pairs that are traded the most globally are called the Majors, and contain the euro, US dollar, Australians Dollar, Japanese Yen, Swiss Franc, Canadian dollar and Great Britain's pound sterling. There is a priority ranking as to which currency takes the base position in the currency [10]

pair, although there is no actual standard for this. Any other currency is considered a Minor, and is generally only traded in a pair with a Major. The Major pairs are EUR/USD, USD/JPY, GBP/USD, AUD/USD, USD/CHF, and USD/CAD.

2.1.9 Margin Call

Issued when the capital in the margin account in less than the minimum margin requirement set by the broker, a margin call is a demand to either increase the capital in the margin account, or close out the current position (Hassam). Generally, this only happens when an account gets wiped as the result of either snowballing bad decisions by a trader (like adding to a losing trade), or market conditions that cause rapid loss. Margin calls are never good news, and as a trader, it is important to use discipline and take steps to minimize risk, which in turn will minimize the risk of receiving a margin call.

2.1.10 Stop Loss

A stop loss is an order that is placed in advance, which then executes a sell (or close) when the security's value reaches a certain point (Stop-Loss Order). Stop losses are usually an important factor to consider in risk management, as they are the best way to avoid damages resulting from huge swings in the market. It is recommended, especially to beginning traders, to have a stop loss on every trade executed.

2.1.11 Take Profit

Similar to a Stop Loss, a take profit order is placed in advance, and executes a close order when the price reaches a certain point, or the price is a certain number of pips above the filled price (Take-Profit order - T/P). As the name implies, the take profit is used to secure profits once the price reaches a trader-determined point. A take-profit is only really necessary if the trader is

not actively involved in the trade. Otherwise, the take profit can be used as a risk management tool in order to lock in profits.

2.1.12 Currency pairs

EUR: The euro, the currency of the European Monetary Union.

USD: The United States dollar.

GBP: Great Britain's pound sterling.

AUD: The Australian dollar.

NZD: New Zealand dollar

CHF: Swiss franc

JPY: Japanese yen

CAD: Canadian dollar

3. Methodology

The end result of this project is to set up and manage an investment company that will trade in the Forex market, using programmed robots. In order to complete this goal,we conducted many weeks of research in order gain a better understand of investing, as well as learning the MQL4 language, so we could better program the robots that will eventually make trades for the company. Our process can be broken into three steps:

- Research – From the history of investing to the common terms and what they mean, there was a lot to understand before we were ready to trade in the Forex market.
- Trading – in order to make successful trading robots, we first needed to formulate and mature our own trading strategies. This part of the research was focused on different indicators, what each one can tell us, and how reliable or useful that information can be.
- Understanding the company – once we had a good grasp on the Forex market and how to trade in it, the only thing left was to learn how to form a money management company. We researched the tax laws, trading regulations, and other legislature surrounding the Forex market, so that we could make informed decisions about how to run our company.

4. Execution

4.1 Choosing a Broker

When choosing a broker for trading the Forex Market, it is important to consider that these are companies that are trying to make money off of your business. Perhaps one of the most important considerations is whether this is a large broker, and whether other traders use this broker. A broker's quality of service and reputation is as, if not more important than the spreads and amenities that the broker offers. This not to say that these factors should not be considered, but rather that it is important to select a broker that is not constantly trying it's best to rip off the traders that it services. Larger brokers have better reputations, and thus are much less willing to threaten that reputation with unethical business practices.

Forex brokers come in three main types; dealing desk brokers (DD), Straight Through Processing broker (STP), and Electronic Communications Network brokers (ECN) (Greenburg, Finally the Brokers Guide explaining what Marker Maker, STP and ECN broers really are: Part 1/2). Dealing desk brokers (sometimes also called market makers) don't forward trades to the market, because the broker is the client's market. They take the opposite side of an order placed with the broker. In other words, a DD broker will both buy and sell with its clients, and hope to make a profit on the bid-ask spread and/or turn. They provide a market for their clients to trade on by supplying the liquidity. Interestingly, because orders are never routed to the market, a trader will very rarely see a re-quote an order placed. Instead, the broker chooses whether to accept the trade or not (Greenburg, Finally the Brokers Guide explaining what Marker Maker, STP and ECN broers really are: Part 1/2). This usually only happens in periods on high volatility in the market, like when breaking news is occurring, in which the broker does not want to overexpose itself to risk. Dealing desk Forex brokers have received a lot of criticism in the past [14]

few years because of the idea that they are invested in having its clients fail. Although it is true that dealing desk brokers profit from traders losing money, this does not mean that the broker is unethical, as all the large brokers are regulated, and would not last very long as a business if they were ripping off their customers. However, smaller, unregulated businesses will sometimes ride the edge of unethical business practices in order to garner more profit, which is one reason why it is important to select a Forex broker that has many clients, and is regulated.

Electronic Communication Network (ECN) brokers, on the other hand, provide their clientele with direct access to the market, acting as a true broker, providing a medium to connect buyer and seller. The broker applies a markup to the actual bid-ask spread, and pockets that markup (Greenburg, Finally the Grokers Guide explaining what Market Maker, STP and ECN brokers really are: Part 2/2). This provides for the broker's main source of income, typically. However, true ECN brokers are not commonly available to individual traders, as they usually require a large account size, and minimum lot sizes on trades, in order to facilitate profits (Greenburg, Finally the Grokers Guide explaining what Market Maker, STP and ECN brokers really are: Part 2/2). If a trader had access to these kinds of resources, an ECN broker would probably be a good choice. However, for most traders, ECN brokers are not a possibility.

Most brokers fall under the category of Straight through Processing (STP) brokers. These are brokers that provide quotes that have correlation to the market's quotes (Greenburg, Finally the Grokers Guide explaining what Market Maker, STP and ECN brokers really are: Part 2/2). However, many brokers that claim a STP brokerage method use a combination of Dealing Desk (DD) and STP practices. Successful or larger clients will be routed directly to the market. However, smaller or losing traders will have their orders filled by the broker (Greenburg, Finally the Grokers Guide explaining what Market Maker, STP and ECN brokers really are: Part 2/2).

This combination allows brokers to maximize profits and clients, and all the while they can claim to be a non-dealing desk broker. Although it can be very hard to tell the difference between a DD and a STP broker, it should be noted that most large companies are not specifically out to get their clients, and force them into loosing situations. This is due to transparency and regulations. In addition, when a company has unethical business practices, they usually quickly earn a reputation for it, and lose clients. It just isn't profitable (at least for very long) to rip off clients as a big broker.

Other than a broker's practices, it is important to select a broker based on specific trader needs. Most brokers offer similar amenities, like mobile trading platforms, and twenty four hours, seven days a week customer service. In addition, many brokers will provide recourses for beginning traders. These resources might include, but are not limited to, custom technical indicators and tools, live news feeds, predefined trading strategies, and real-time analytics. However, each trader should decide how important these are when selecting a broker themselves. More importantly, most major brokers offer a Meta Trader 4 client (which is both free and the minimum standard for the industry). Some brokers also offer their own proprietary trading client that usually has more user friendly options and indicators. Again, the trading platform is completely up to the trader, as Meta Trader 4 is and extremely competent and powerful client, that also includes a programming client for creating indicators and trading robots, as well as custom scripts. All trading clients will require a bit of a learning curve, as they are complex by nature, but most proprietary clients are generally easier to use.

The minimum spreads offered are the most bragged about statistic by brokers, and very important to consider, as every trade made will be affected by the spread. The bid-ask spread is the reason why every trade starts in the red; to be profitable the price of the currency pair must

rise above the filled price plus the bid-ask spread. Lower spreads are sought after because they allow a trade to become profitable, faster. The dependency on spreads depends on a trader's trading strategy. Traders looking to trade over very long periods of time would likely care less about spreads, as they are looking to make many pips on a single trade. One to three pips is going to have a minimal impact on a trade of larger than one hundred or more pips. However, for short term traders, the spread has much more of an impact, as each trade must overcome that one to three pips initially to become profitable, when most trades are under ten or twenty pips. These traders generally make more trades as well, so the spread adds up. Lower spreads are always better, but it is important to weigh the importance of low spreads in a trading strategy when settling on a broker. In addition, it is not worth it to switch to a much smaller broker due to very low spreads. Stay with a broker with an established reputation, and endure slightly higher spreads in order to have peace of mind that your money is safe. Typically, the lowest spreads for major brokers will be around one to two pips, while higher spreads for major brokers are two to three pips. This is for the major currency pairs at peak times, and does not apply to minor currency pairs, or off-peak hours for trading.

The minimum account size for a Forex broker is another factor that varies in importance depending on the amount of capital available to the trader. Some brokers offer a minimum of only fifty dollars to open an account. Others require that you open an account of one thousand dollars or more. Some traders won't need to consider these limitations, but others might need to select a certain broker because they are the only broker to offer the optimal account size. This also will vary on the experience of the trader in question, as a more experienced trader is likely to want to open a larger account. However, if a trader is just starting out, they might only want to invest fifty or one hundred dollars initially, or whatever amount they feel comfortable, knowing

that they could lose it all (and likely will!). In addition, although some brokers offer small account sizes, their customer service for smaller accounts is lacking. This will come out while researching brokers.

Selecting a broker involves a lot of research, and should not be a decision that is made lightly. Your choice is likely to have a large impact on your trading, so it is important to select a broker that both has a good reputation first, and secondly provides the optimal amenities and trading climate for your trading strategy. These factors include the minimum spreads, minimum account sizes, customer service, and proprietary trading software. The importance of these factors varies wildly from trader to trader, but in general, all should be accounted for when choosing a broker to trade on the Forex Market.

4.2 Technical Indicators

Technical analysis is the use of past market data in order to more accurately predict future market movements. Generally, this involves the identification of price patterns in the actual market price, or indicators that are designed using market price and volume, as well as other variables. It is important to understand the limitations of technical indicators; all indicators are simply representative of past data. Technical indicators cannot provide the user with new information; they can simply represent it in a different manner, one that hopefully allows the reader to more easily identify market patterns. In addition, it is unwise to rely wholly on one method or indicator. Instead, it is wise to have multiple indicators that present different data. In this way, a trader can have a system of checks before getting into a trade. This minimizes the risk.

There are a number of principles that technical analysis employs. The first is that the market discounts everything. Technical analysts assume that the current price is an accurate

representation of the security. In other words, at any point in time, everything that can be reflected in a securities price, is. The second principle is that price moves in trends. It is up to the technical analyst to identify these trends, and act upon them. Technical indicators are designed to help traders better identify these trends, often filtering out unnecessary data, in order to represent a specific aspect. Finally, a technical analyst believes that history repeats itself. Knowledge about the past provides important knowledge of the future. This is based on the idea that investor behavior is repetitive, as well as investor sentiment. Knowing how the markets have reacted in the past can lead to understanding how they will act in the future.

4.2.1 Trend Lines

Figure 1: Trend line defined by three points, and broken by a fourth

Probably the most important tool in identifying patterns in price movement is the trend line. Trend lines are very simple to understand; if the price breaks through a trend line, up or down, the trend is over. If not, the trend continues and the trend line is used as a support/resistance line depending on the trend. Below is a chart of USD/JPY on a 5 minute period, with an upward trend line drawn in.

[19]

The three smaller circles are places where the price hit the trend line and rebounded. The larger darker circle at the top is where the price broke down through the trend line. As soon as this happened, the uptrend was over and the price began to move down. It's important to note that there were price drops of similar size earlier in this chart, but this one is more significant because it crossed the trend line, which indicates, that the price is done moving upward at the same rate (Forex4Noobs).

There is some debate as to what constitutes a trend line break. The third reversal I have noted did in fact cross the trend line slightly, and someone who is stricter about this sort of thing would have closed a long position at that point, noting that the trend line had been broken. In this case, they would be wrong, as the trend continues upward from there. The second type of person would wait until the full body of a candlestick was over the trend line. In this case, that happens on the second green candlestick within the large circle I have drawn. The third and most moderate approach to interpreting the trend line is to assume that it has been broken when a candle opens or closes over the trend line. This happens on the first red candlestick in the large circle; that candlestick closes just beyond the trend line, so the moderate person would consider the trend line broken (Forex4Noobs).

4.2.2 Pivot Points/Camarilla Pivots

Support and resistance lines are calculated using the previous day's data. High, low and close prices are used. Typically there are 3 support and resistance lines each. There is also a middle line, called the price point, which is the average of the high, low, and close of the previous day. This is one method of calculating 3 support and resistance levels.

$$R3 = high + 2 * (pricepoint - low)$$

[20]

$$R2 = pricepoint + (high - low) = pricepoint + (R1 - S1)$$

$$R1 = (pricepoint * 2) - low$$

$$S1 = (pricepoint * 2) - high$$

$$S2 = pricepoint - (high - low) = pricepoint - (R1 - S1)$$

$$S3 = low - 2 * (high - pricepoint)$$

The higher the support or resistance, the more powerful it is; the price is less likely to break through R2 than R1, and even less likely to break through R3. If the price fails to break through, that line will rebound the price, so these lines indicate fairly strong movement one way or the other, it's just a matter of knowing which way the market will move(Lee, Forex Pivot Point Trading Tutorial).

A slight variation on normal pivot points, Camarilla pivots, developed by Nick Scott, offer more resolution in support and resistance levels. The main difference is that there are more Camarilla pivots than normal pivots. Sometimes the Camarilla pivots are better indicators than standard pivot points as they offer more resolution. The Camarilla pivot points also have a center line called a pivot point, which follows what the "typical" price would be.

$$R4 = C + Range * 1.1/2$$

$$R3 = C + Range * 1.1/4$$

$$R2 = C + Range * 1.1/6$$

$$R1 = C + Range * 1.1/12$$

$$PP = (high - low - close)/3$$

$$S1 = C - Range * 1.1/1$$

$$S2 = C - Range * 1.1/6$$

$$S3 = C - Range * 1.1/4$$

$$S4 = C - Range * 1.1/2$$

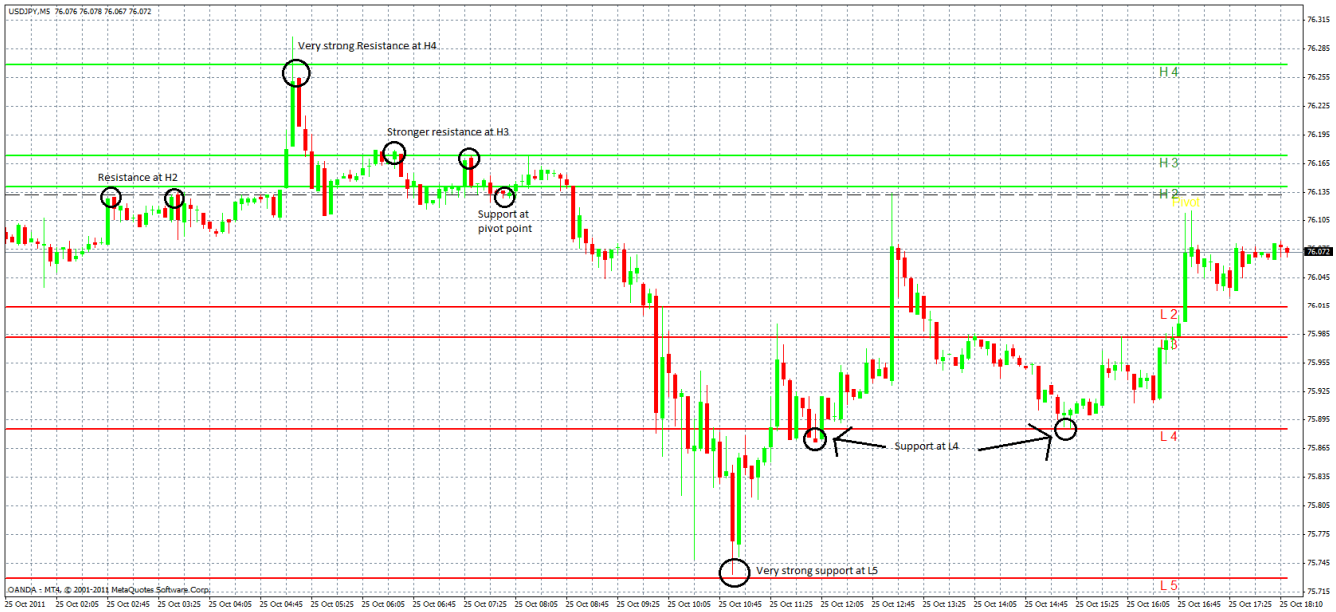

Figure 2: Camarilla pivots expressed as high and low pivot points

These pivots are used the same way as other pivot points. It's not a good idea to use these in conjunction with other pivots points as the chart will become cluttered, and the two sets of pivot points aren't necessary or helpful, and they may convey information in contradicting ways.

Above is the chart of USDJPY on a five minute period with four support lines and four resistance lines. The chart demonstrates how the higher pivot points give more support/resistance. At the far left, the price hits the H2 line twice and reverses both times. On the third attempt, the price breaks through H2, then H3, but the bodies of the candlesticks never reach the H4 line. The same happens on the lower side; when the price approaches L2, L3 and even L4, it breaks through, but L5 is never reached as it provides much stronger resistance.

The center pivot line can also act as support or resistance. When the price first starts to move down in this chart, it finds brief support at the center pivot. The same happens when the center line is tested from the other side. The center pivot is “weaker” than any of the other

support or resistance lines, but if the has little momentum, it can and will bounce from there (Camarilla Pivot Points).

4.2.3 Moving Average Convergence/Divergence

The Moving Average Convergence/Divergence (MACD), developed by George Appel, is a lagging indicator that consists of two exponential moving averages (EMA), and a histogram. The MACD line is a slower moving average of closing prices ranging from twenty-six days to twelve days, with the twelve day moving average being a reactive setting, and a twenty-six day moving average being a resistive setting. The other, the trigger line, is a faster EMA, typically 9 days. The histogram is the difference between the MACD line and the trigger (Lee, Forex MACD Indicator Explained). The MACD indicates trend in a basic manner. If the moving averages are above the zero line, the trend is positive, and if the moving averages are below the zero line, the trend is negative. The result of combining moving averages with a momentum calculation is that it can indicate market trends and market momentum. Important indicators that are produced by the MACD are crossover points and areas of divergence. A bullish crossover occurs when the MACD line crosses the trigger line, heading upwards. On the other hand, a bearish crossover occurs when the MACD line crosses the trigger headed downwards (Lee, Forex MACD Indicator Explained). It is recommended that when trading crossovers, a leading indicator, like the Stochastic Oscillator is used to determine the condition of the commodity. Then place an order if there is a crossover and the commodity is oversold/overbought (Lee, The MACD Crossover Trading Techniques). If both indicators are not indicating a reversal, a trader would put a lot of risk into placing a trade. In addition, if a strong trend is not established after the crossover, it is very likely that the market is more volatile, and risky to trade in. Divergence means that the price is showing a trend opposite that of the MACD. For instance, if the price is

reaching new highs, but the MACD is failing to surpass its previous highs, the MACD is exhibiting divergence. Trading divergence can be a bit trickier, as it requires a distinct trend in place. Once there is divergence, then it is important to either wait for either reversal patterns in the candlestick graph, or for a break in the trend line. Crossovers can also be used to provide an exit to a trade, as it could be a signal for an impending reversal (Lee, The MACD Crossover Trading Techniques).

4.2.4 Bollinger Bands

Bollinger Bands is an indicator that determines the volatility of the current market, originally calculated by John Bollinger. It is composed of two "bands," which are simple moving averages, one which adds and one which subtracts twice the standard deviation (Lee, Forex Bollinger Bands Explained). Sometimes, the simple moving average is plotted in between, typically at a value of twenty periods. The wider apart the two bands are, the more volatile the market is, while if the bands are close together, the marker is in a period of consolidation. In addition, the Bollinger Bands often act as a resistance and support level for the price (Lee, Forex Bollinger Bands Explained). Often, you can use this to your advantage, and trade the reversal when the price approaches the bands, as it tends to bounce off the bands. In addition, the Bollinger Bands indicate a breakout, when the bands diverge from each other after a period of consolidation (Lee, How To Use Bollinger Bands). Again, these techniques should be supported by other indicators. "According to Bollinger, the bands should contain 88-89% of price action, which makes a move outside the bands significant" (Bollinger Bands). Bollinger highlights an important fact, but these movements outside of the Bands are not signals, they are just areas of note, and could indicate a movement in the future. Two signals can be generated through Bollinger Bands; the W-bottom, and the M-top. The W-bottom occurs when the price has two

bottoms, and indicates a buy signal. The second bottom is lower than the first, but fails to cross or intersect with the lower Bollinger Band. An M-top occurs when there is a double peak, a head and shoulders, or a diamond pattern, and generates a sell signal (Bollinger Bands). Lastly, Bollinger Bands can be used for range trading by trading the long when the price approaches the bottom Bollinger Band, and shorting when it approaches the top Bollinger Band (Lee, How To Use Bollinger Bands). This should be done only in a period of consolidation.

4.2.5 Moving Averages

A very simple indicator, a Moving Average can be used to trade in a variety of ways. The simplest, and possibly the most useful, is as trend indicator. There are two types of moving averages, exponential and simple (Lee, Forex Moving Average Explained). A simple moving average weights every value the same, and is more resistant to sudden moves in the market. Exponential moving averages (EMA) weight recent prices more heavily, resulting in a moving average that is more reactive (Lee, Forex Moving Average Explained). When using moving averages in trading, a two hundred EMA can act as a long term trend line, and adding multiple moving averages with different time settings can allow the trader to better understand the current trend (Lee, How To Trade Using Moving Average). This can also be an indicator of the strength of the current trend. When the moving averages are bunched together, the trend is not very strong. However, when they spread out at a consistent angle, the trend is very strong. Finally, moving averages can be used as an entry or an exit signal, using a double or triple moving average crossover. When the fast moving average crosses the slow one (or both the slower ones) it is an indication of a reversal (Lee, How To Trade Using Moving Average). However, because of the lagging nature of moving averages, it is not very dependable, and can often produce a false signal, or only produce a signal after it would be ideal to get into a trade (Lee, How To Trade

Using Moving Average). Simple moving averages act as better support and resistance levels than EMA, mostly because of their resistance to movement. It is also important to note that because the MACD is calculated using EMA, it will not match up with a simple moving average, but will with EMAs (Simple and Exponential - Moving Averages). When a large trend is in place, price crossovers can be used to indicate a support or resistance level. A shorter moving average could provide support/resistance, while a longer moving average would provide the overall trend. When the price crosses the shorter moving average, if the trend is strong, buy if it drops below, and sell if it rises above, as this indicates a correction, but not a change in trend (Simple and Exponential - Moving Averages). However, this can be risky, as the moving averages are not always great support/resistance levels, and often the market moves too quickly for the price to drop or rise over a longer moving average.

4.2.6 Parabolic SAR

The Parabolic SAR is a leading indicator that is used to identify the end of a trend, or to identify entry or exit points. Originally calculated by Welles Wilder, it is a simple indicator, with the points plotted below the candlesticks if the trend is upwards, and the points plotted above the candlesticks if the trend is downward (Lee, Forex Parabolic SAR Indicator Explained). However, the calculation of it is complicated. The Parabolic SAR makes use of a number of variables, such as the prior SAR (the previous plotted SAR point), the Extreme Point (EP), which is the highest high or lowest low of the current trend, and the acceleration factor (AF) (Parabolic SAR). The AF is a value that starts at .02, and increases by .02 every time there is a new high in an uptrend, or a new low in a downtrend. The AF can reach a maximum value of 20 (Parabolic SAR). The rising Parabolic SAR is calculated by:

$$CurrentSAR(rising) = PriorSAR - PriorAF(PriorEP - PriorSAR)$$

[26]

It is important to note that the current SAR (rising) cannot be above the previous periods low or above the current low. If this is the case, the lower of the two is used (Parabolic SAR). The falling SAR is calculated by:

$$CurrentSAR(falling) = PriorSAR - PriorAF\ (PriorSAR - PriorEP)$$

The current SAR (falling) cannot be below the previous periods high or the current high. If either is the case, the higher of the two is used (Parabolic SAR). From these equations, the parabolic SAR's tendency to lag behind the current market values can be seen; this is because it uses the previous point's data in the calculation. From experience, it is necessary to use other indicators with the Parabolic SAR, as it produces a lot of false signals, often in a short period of time. Wilder himself notes that it is only useful in times of strong trend, which is about thirty percent of the time (Parabolic SAR). For the other seventy percent, it is prone to false signals. If the dots are steep and wide, the market is probably in a period of breakout (Lee, Forex Parabolic SAR Indicator Explained). Knowing the established trend before using Parabolic SAR is important, as trading against the trend using Parabolic SAR will likely cause repeated losses.

4.2.7 Stochastic

Another leading indicator, the Stochastic Oscillator, is an accurate indicator or oversold or overbought market conditions. Originally calculated by George Lane, it is comprised of two lines, the %K and the %D, the sensitivity of which can be altered to suit each trader's needs, with sensitivities usually falling within the categories of full, fast or slow, with either fast or slow being the most popular (Lee, Forex Stochastic Indicator Explained). The stochastic occurs between a fixed range of zero to one hundred, with levels of note being twenty and eighty. To calculate the fast %K of the Stochastic Oscillator:

$$\%K = \frac{currentclose - lowestlow}{highesthigh - lowestlow} * 100$$

The %D is the three day SMA of %K (Stochastic Oscillator). The slow stochastic uses the fast %K smoothed with a three period SMA, while the full Stochastic uses the fast %K smoothed with the period inputted (Stochastic Oscillator). When the Stochastic is above eighty, the market is overbought, while the market is oversold when the Stochastic is below twenty. When the Stochastic remains near or above eighty, the market is trending upwards, and when it is remaining at or below twenty, the market is in a downtrend (Lee, Forex Stochastic Indicator Explained). The crossover of the %K and %D lines is important when in overbought or oversold conditions, as this could indicate an impending reversal (Lee, Forex Stochastic Indicator Explained). When trading using the Stochastic, the idea is to buy or sell when the %K and %D cross, and the Stochastic moves out of oversold or overbought conditions. It can also provide an exit signal, much in the same way (Lee, Forex Stochastic Indicator Explained). Once the market enters the opposite condition that the trade was executed after, and the %K and %D cross, it is time to exit the trade (Lee, Forex Stochastic Indicator Explained). Stochastic divergence from the price trend can also be used to indicate an impending reversal.

4.2.8 Fibonacci Indicators

Fibonacci Indicators provide information about supports and resistances in the market. Although the Fibonacci sequence is a sequence of numbers, it is the ratio of these numbers that is used in trading. To use the indicator, a low area and a high area of a particular trend have to be defined. Once defined, the ratio lines will be drawn. The retracement levels, the most important of which are the ratios of 0.382, 0.500, and 0.618, provide strong support and resistance to the market price (Lee, Forex Fibonacci Indicator Explained). The Fibonacci extension levels of

0.618, 1.000 and 1.618 are the strongest levels of support and resistance for the extension levels (Lee, Forex Fibonacci Indicator Explained). Generally, if the market is on an uptrend, the lowest point is selected in the trend, and then the highest point is selected using the Fibonacci tool on the trading platform. This will draw the various Fibonacci ratios. To trade using these ratios, wait for the price to fall to the 0.382, 0.500, or 0.618 levels (Fibonacci Method in Forex). This should be the entry point, where the trader buys in an uptrend. Ideally, the price then rises to one of the extension levels, 0.618, 1.000, or 1.618 (Fibonacci Method in Forex). At this point the price is likely to stall, so one of these levels (depending on market momentum) would be the exit point. However, if the trader were a countertrend trader, a low risk trade would to trade opposite the current trend when the market price reaches one of these extension levels. The same steps apply to a downtrend in the market, except when setting the Fibonacci ratios, the high of the current trend is selected first (Fibonacci Method in Forex). The Fibonacci Fan is an indicator that uses Fibonacci ratios in conjunction with price to create future support and resistance levels (Fibonacci Fans). Often the price will continue to remain within the confines of the ratios created by the fan. However, breakouts are always possible, so a tight stop loss is advised, either just above the previous peak, or just below the previous low, depending on the trade being entered. False signals are always possible, so make sure to check with other indicators to minimize risk.

4.2.9 Relative Strength Index

The Relative Strength Indicator (RSI), developed by Welles Wilder, is used to indicate overbought and oversold markets, but it actually measures market momentum. The RSI has a set range from zero to one hundred (zero and one hundred being the absolute maximum values). The typical indication levels are thirty and seventy, where anything under thirty indicates an oversold market, and anything above seventy indicates the opposite (Lee, Forex Relative Strength Index

Indicator Explained). To calculate the RSI, divide the average gain by the average loss (Relative Strength Index (RSI)). The average gain and average loss are calculated by:

$$AverageGain = \frac{[(PreviousAverageGain) * 13 + currentgain]}{14}$$

$$AverageLoss = \frac{[(PreviousAverageLoss) * 13 + currentLoss]}{14}$$

Since the equations use the past average gains and losses, the first average gain and average loss are calculated as the sums of the respective average over fourteen periods, divided by fourteen (Relative Strength Index (RSI)). In trading, the RSI can be used to buy during a dip (when the price is trending upward, but the market corrects itself, bringing the price down for a short bit, before returning back upwards), or selling during a rally (Lee, Forex Relative Strength Index Indicator Explained). RSI can also be used for range trading, but it is important only to trade when the price is nearing a support or resistance level, and the RSI is indicating oversold or overbought. In addition to its uses as a buy/sell signal, the RSI indicates trends (Lee, Forex Relative Strength Index Indicator Explained). When the RSI is over 50, there is an uptrend. When it is below 50, there is a downtrend. However, this is more short term than most trend indicators, and is great for avoiding fake outs (when a price is dropped for the purpose of activating sell signals, only to be brought up rapidly, or the opposite). Finally, RSI divergence from the price can provide a warning as to when the market will reverse itself. When the price is setting highs higher than the previous highs, but the RSI fails to beat its own previous highs, there is negative divergence, with the opposite being true for positive divergence (Lee, Forex Relative Strength Index Indicator Explained). These often indicate that there is an impending reversal. However, it is risky to actually use this as anything more than an exit signal, as it could be a while of the market consolidating before the reversal occurs.

4.2.10 Commodity Channel Index

The Commodity Channel Index (CCI) has four levels of note, with each one indicating the strength of a trend. If the CCI is above positive one hundred, the trend is upwards, and if the CCI is above positive two hudnred, there is a very strong uptrend (Lee, Forex CCI Indicator Explained). On the other hand, if the CCI is below negative one hundred, the trend is down, and is very strongly so if it is below negative two hundred (Lee, Forex CCI Indicator Explained). The CCI calculation is:

$$CCI = \frac{(typicalPrice - 20\ periodSMAoftypicalprice)}{(0.015 * Meandeviation)}$$

$$TypicalPrice = \frac{high + low + close}{3}$$

Generally, when using the CCI during trading, a long position can be held if the CCI is above on hundred, and can be held until it returns back to that level, at which point the trade should be exited. The opposite is true for shorting a trade. The CCI can also be used to indicate a reversal. If a trend line is broken, the CCI can reliably report the direction the market is heading, and if it is heading towards a breakout (Lee, Forex CCI Indicator Explained). When the CCI diverges in trend from the price, it is a good indication of an impending reversal (Lee, Forex CCI Indicator Explained). Again, this should not be used to trade the reversal, but more as an indicator for exiting a trade. This indicator also reports overbought and oversold conditions well, as any market over either two hundred level is, if negative, oversold, and overbought if positive.

4.2.11 Ichimoku Kinko Hyo

Ichimoku Kinko Hyo is an equilibrium chart that is designed to provide quick information about an assets equilibrium behavior. The graph itself is composed of five lines: Tenkan-sen, Kijun-sen, Chikou Span, Senkou Span A, and Senkou Span B(Ichimoku Kinko

Hyo). The Tenkan-sen averages the high and the low over a period of seven to nine, and Kijun-sen uses the same formula, except it is calculated over twenty two periods(Ichimoku Kinko Hyo). Chikou Span plots the most recent closing, twenty two periods behind(Ichimoku Kinko Hyo). Senkou Span A averages Tenkan-sen and Kijun-sen, and is plotted twenty six periods ahead(Ichimoku Kinko Hyo). Senkan Span B averages the high and low over the last forty four periods, and is plotted twenty two periods ahead(Ichimoku Kinko Hyo). The difference between the Senkan Span A and B is the Kumo, or cloud(Ichimoku Kinko Hyo). Although this is known as a powerful tool in technical analysis, it can be a little tricky to use it in Forex trading because the markets do not close. A common solution is to use the NYSE's close time for the value of the close, as there is relatively little trading on the market that the time(Ichimoku Kinko Hyo). There are many ways to trade using this indicator. The Kijun-sen line can be used to indicate momentum, as if the price is above the Kijun-sen, the prices are likely to continue to increase(Ichimoku Kinko Hyo). In addition, when the Tenkan-sen crosses the Kijun-sen from below, it is an indication of a bullish market. The opposite is also true(Ichimoku Trading Strategies). If the Kijun-sen is above the price it is likely that the price will continue to move downwards and the market is bearish if the Tenkan-sen crosses the Kijun-sen from above. However, these indicators are only strong if they are generated above the Kumo(Ichimoku Trading Strategies). If they are generated within the Kumo, it is a normal indication, and if they are below the Kumo, they are weak(Ichimoku Trading Strategies). Tenkan-sen can be used to indicate trend. The direction of the Tenkan-sen indicates the direction of the price, while a flat Tenkan-sen means the market is in a consolidation period(Ichimoku Trading Strategies). Lastly, the Kumo acts as a support and resistance level, depending on whether it is above or below the current market price.

4.2.12 Relative Vigor Index

The Relative Vigor Index (RVI) is a volatility indicator, based on the assumption that in a bullish market, the tendency is for the closing price to be higher than the opening, and in a bearish market, the closing price is usually lower than the opening price (Relative Vigor Index (RVI)). To calculate the RVI:

$$RVI = \frac{close - open}{high - low}$$

The RVI is very similar to the Stochastic Oscillator, except it compares the close to the open, rather than the low(Relative Vigor Index (RVI)). Essentially, the RVI calculates an indicator for the volume of trades. It is not an indicator of when to trade, but it can be used to determine how fast the market is moving before and during a trade (Relative Vigor Index (RVI)). In addition, it can be used by the trader to predict how the market will react in the future. If a short moving average is added to the RVI, it can be used as a trigger to produce a buy or sell signal.

4.2.13 True Strength index

The True Strength Index (TSI) is a momentum indicator that is similar in many respects to the Relative Strength Index, and indicates oversold or overbought assets. It is calculated by taking the difference between the current asset price and a lagging asset price, and then a twenty five day EMA is applied to the difference, with a thirteen day EMA applied to that (True Strength Index (TSI) Definition). Finally, it is placed within a positive one hundred to negative one hundred range. A signal line is also plotted, typically as a seven day EMA (True Strength Index (TSI) Definition). This signal line is used to identify reversals in the market. When the TSI is above twenty five or below negative twenty five, the market is overbought and oversold,

respectively, and when the signal line crosses the TSI moving the opposite direction, it is a good time to sell and buy, respectively (True Strength Index). If a market is consistently remaining above twenty five or below negative twenty five, the market is likely in a breakout (True Strength Index). There is a possibility for the signals generated to be false, so it is best to combine the TSI with at least one other indicator.

4.2.14 Average true Range

Average True Range (ATR) is a volatility indicator, developed by Welles Wilder, which indicates both trends and valid breakouts, but provides no information about price movement. To calculate the ATR, the True Range (TR) needs to be found first, and it is defined as the greatest of the following:

$$TR = currenthigh - currentlow$$

$$TR = |currenthigh - previousclose|$$

$$TR = |currentlow - previousclose|$$

The absolute values are to ensure that the TR is a positive number, as it is a measure of distance, not direction (Average True Range (ATR)). The ATR is based on fourteen periods, and can be calculated from many times a day to a monthly basis. To calculate the ATR:

$$ATR = \frac{[(PreviousATR * 13) + CurrentTR]}{14}$$

It is important to note that since the TR and the ATR are based on absolute price changes, the ATR "reflects volatility at an absolute value" (Average True Range (ATR)). This means that the ATR is not on a scale, and ATR from different commodities are not comparable. A large ATR value indicates that the market is trending strongly, in either direction, or that you are in a valid breakout (Lee, Average True Range (ATR) Indicator Explained). The ATR only shows

market volatility, not direction. The safest way to use the ATR in trading is to only trade when both a trend line has been broken, and the ATR is showing a breakout.

4.2.15 Camarilla Equation

The Camarilla Equation is based on the idea that a market over time tends to revert to a mean. It calculates eight price levels that act as support and resistance, which are derived from the previous day's market opening, closing, and the high and low on the day. The lowest four generated levels are support levels, marked L1 through L4 (Camarilla Equation). The highest four are resistance levels, marked H1 through H4. The two strongest levels are H3 and L3 (Camarilla Equation). L3 provides strong support, and as the market approaches the L3 level, there is a likely hood that the market will reverse and turn upwards (Camarilla Equation). The H3 provides strong resistance, and suggest s that the market will reverse soon to lower prices (Camarilla Equation). The other levels of note are the L4 and H4 levels. If the market price exceeds either of these levels, the market is in a breakout, and the trend is likely to continue (Camarilla Equation). To calculate each level:

$$H4 = \left[1.1 * \frac{highfortheday - lowfortheday}{2}\right] + closefortheday$$

$$H3 = \left[1.1 * \frac{highfortheday - lowfortheday}{4}\right] + closefortheday$$

$$H2 = \left[1.1 * \frac{highfortheday - lowfortheday}{6}\right] + closefortheday$$

$$H1 = \left[1.1 * \frac{highfortheday - lowfortheday}{12}\right] + closefortheday$$

$$L1 = closefortheday - \left[1.1 * \frac{highfortheday - lowfortheday}{12}\right]$$

$$L2 = closefortheday - \left[1.1 * \frac{highfortheday - lowfortheday}{6}\right]$$

[35]

$$L3 = closefortheday - \left[1.1 * \frac{highfortheday - lowfortheday}{4}\right]$$

$$L4 = closefortheday - \left[1.1 * \frac{highfortheday - lowfortheday}{2}\right]$$

Trading accordingly using the support and resistance levels at H3 and L3, but it is important to wait for the reversal to happen before committing to a trade, as well as making sure other indicators are indicating a reversal (Camarilla Equation). In addition, you can trade breakouts with the Camarilla levels, as anything that moves beyond either H4 or L4 Is likely to continue moving in such a manner.

4.2.16 Average Directional Index

The Average Directional Index (ADX) is a strength indicator that uses two directional indicators, DI+ and DI-, which are derived from the directional movement index. This indicator was developed by Welles Wilder. The ADX has a complex calculation that requires the TR, + DM and –DM to be calculated first. These values are then smoothed, using Wilder's smoothing methods. The +DI14 and –DI14 that are plotted along with the ADX are calculated by:

$$+DI14 = \frac{smoothed\ +DM}{smoothedTR} * 100$$

$$-DI14 = \frac{smoothed\ -DM}{smoothedTR} * 100$$

The ADX can then be calculated by:

$$DX = \left|\frac{(+DI14 - -DI14)}{+DI14 + -DI14}\right|$$

$$ADX = \frac{[(previousADX * 13) + DX]}{14}$$

The ADX is a moving average of the directional index, usually over a fourteen day period, although this number can be specified by the trader (Average Directional Index (ADX)). [36]

The result is a line plotted across a range of zero to one hundred, although any value over forty is considered an indication that the market is very likely to keep moving in its current direction (Average Directional Index (ADX)). A value of zero would indicate that the market is equally likely to move in a positive direction as it is to move in a negative direction (Average Directional Index (ADX)). ADX is not an indicator that is used to make a trade, but it can be used to get in and out of a trade. When the ADX is above forty, it is safe to trade, because the ADX indicates strength in the current trend. When the ADX drops below forty, it would be a good time to exit a trade.

4.3 Fundamental Analysis

Fundamental analysis, at its heart, is about examining the "intrinsic value of an investment" (Kuepper). Applying fundamental analysis to Forex involves inspecting economic conditions and events and their effects on the values of various nation's currencies. The most apparent application of fundamental analysis available to Forex traders is the economic indicators released every month by governments or private organizations. Examining these reports can help investors get a better idea on whether the economy of a specific nation is advancing or declining (Kuepper). Most of these reports receive decent coverage from investing news sites, and many news releases can cause large movements in the markets around the time of release. Some of the important economic indicators are covered in this section. These economic indicators are not the only factors that are used in the fundamental analysis of a nation's currency, however. Macroeconomic issues, as well as inter-nation relations, can have a large impact on the markets. Often with fundamental analysis, the challenge is not finding the information; it is interpreting it in the correct manner.

4.3.1 Gross Domestic Product

The Gross Domestic Product (GDP) of a nation is considered one of the most far-reaching economic indicators, and is probably the most used economic indicator. The GDP of a country is the total value of all the goods and services produced within that country over a certain time period (typically one year), and is usually presented quarterly, as a real value, net of inflation(Gross Domestic Product (GDP) Definition). The total value of all the goods and services includes consumer spending, government spending, business's spending, and the net exports, which is the country's exports, less the country's imports(Gross Domestic Product (GDP) Definition). Thus, if the GDP of a country is rising, it has a strong economy, but if the GDP is falling, the nation might be in trouble, economically. In addition, the GDP is typically a good indicator of a country's standard of living. Economists agree that 2.5 to 3.5 percent growth of real GDP is the range of greatest benefit. This range maximizes corporate profit and growth, while minimizing inflation (Barnes, Economic Indicators: Gross Domestic Product (GDP)). However, there are a number of critics of using the GDP as an economic indicator. Some critics think that there are a number of transactions that go unreported due to their underground nature (Gross Domestic Product (GDP) Definition). Others think that the GDP is a measure of productivity, which is unrelated to the overall economic health of the nation in question. There is also an economic indicator called the GPI, which is based on the same consumption information as the GDP, but takes into account factors such as income distribution, education, durable goods, infrastructure, education, crime, resource depletion, pollution and environmental damage, living quality, defense expenditures, and dependence on foreign assets(Smith). The idea of the GPI is to evaluate a country's consumption and expenditures on whether they are beneficial to the economy and nation. For instance, pollution is viewed as a positive in GDP, as money has to be

spent in order to clean it up. However, in the GPI, pollution is viewed negatively. The education of a nation is not taken into account in the GDP, but it is in the GPI. There are a number of variables that limit the GDP's usefulness as an economic indicator for a nation. However, as long as the GDP is evaluated for what it is, the GDP can be a solid, but limited economic indicator of a country. In relation to the Forex market, the GDP has a direct impact, as is it is representative of money spent and earned. If a nation has a higher GDP, it is likely to push the currency's worth higher, as the country is sound economically. But if the GDP was falling, the country is not doing well economically, and the currency will trade lower. It is also important to note that if a nation has two successive quarters of GDP decline, the country is considered to be in a recession (which is probably the most important aspect of GDP). In addition, the GDP is released two months behind, so it is a lagging economic indicator.

4.3.2 Inflation/Deflation

The Forex market is also heavily reliant on a country's inflation to defining that country's currency's value. Inflation is the rate at which prices in an economy are rising (Forex Fundamentals: Inflation). Deflation, on the other hand, is the rate at which price in an economy are falling. Inflation can be cause by a variety of factors. Inflation occurs in good economic times, as people and businesses are taking their money out of banks and purchasing items (Forex Fundamentals: Inflation). Thus more money is required must be printed and circulated through the economy. In addition, because consumers now have more money and are willing to spend it, demand increases, and businesses are likely to raise prices. If unchecked, this can actually negate any economic growth, as people have more money, but it is worth less and can buy less than before (Forex Fundamentals: Inflation). Inflation can also be caused by prices of crucial items being volatile (Forex Fundamentals: Inflation). For example, if the price of oil were to increase

rapidly, most products prices would have to be raised, as oil is crucial in the production of plastics and transportation, which are widely used and very important to most businesses. In addition, consumers and businesses need to spend more on transportation, which decreases purchasing power. As will be discussed in the section devoted to interest rates, a country's main weapon against high inflation is raising interest rates, which are kept high when inflation needs to be minimized. Inflation is one of the largest factors to take into account when trading a currency, since it is the rate at which that currency is devaluing. Nobody wants to have capital in a currency that is devaluing, as, due to supply and demand, the currency will be worth less in comparison to other currencies.

4.3.3 Consumer Price Index

The Consumer Price Index (CPI) provides a benchmark for inflation in the US economy, drawing prices from a wide variety of goods that are commonly consumed or used by consumers (Barnes, Economic Indicators: Consumer Price Index (CPI)). The CPI provides information on increases in pricing of products in an economy, basically inflation. However, there are a number of variations in the CPI that alter its usefulness to investors. The CPI that most investors pay most attention to is the Core CPI, which is the CPI with food and energy prices removed (due to the high volatility in these areas), and it is presented with a seasonal adjustment, since markets and consumer spending can be volatile over time (Barnes, Economic Indicators: Consumer Price Index (CPI)). The Core CPI's base year is currently 1982, that is, the seasonal adjustments are based on 1982. The results of the Core CPI are presented as a percent change over the last CPI release, but they also are presented as a run rate, so as to give investors an idea of future inflation levels (Barnes, Economic Indicators: Consumer Price Index (CPI)). This run-rate can be very useful for investors who are looking to predict future interest rate changes, as the level of

inflation dictates whether or not the Federal Reserve needs to adjust inflation rates. This will be extrapolated further in the next paragraph. The seasonal adjustment is currently based upon The Chain-Weighted CPI, which is gaining popularity with investors, takes Consumer choice into account when reporting the CPI. Instead of simply recording a price increase, the Chain-Weighted CPI shows consumer patterns, unlike the Core CPI, by taking into account purchasing figures when a product receives a price hike (Barnes, Economic Indicators: Consumer Price Index (CPI)). If consumers stop buying, or buy a product less because of a price hike, that alters the Chain-Weighted CPI, which the Core-CPI would simply show a price hike. The CPI typically allows Forex traders to gain an idea of current inflation levels, which are useful in themselves to predict possible interest rate movements by the Federal Reserve. This is probably the second most influential indicator behind GDP in the United States, as it often impacts other indicators, and could possibly change the movement of the markets in the future. In addition, the CPI is often used by the government to make adjustments to common economic-dependent mechanisms like Medicare, cost of living adjustments, and insurance policies (Barnes, Economic Indicators: Consumer Price Index (CPI)). The CPI remains vital to predicting interest rate movements in the future, due to its accuracy in both reporting and predicting inflation.

4.3.4 Interest Rates

Interest rates of a nation also have a direct effect on the value of a nation's currency. This is due to interest rates being related to inflation. Interest rates are the rate at which borrowing money costs over a period of time (Interest Rates 101). For instance, if money is put into a bank account, the bank is essentially borrowing that money, and they pay interest on that money. In the same manner, if a business needs to borrow money to finance a product, new equipment, or a new building, they borrow money, and pay interest on that money at a rate agreed upon when

they borrowed the money, until they pay back the money, plus the interest. In economically prosperous times, it is accepted that inflation is higher, as a direct byproduct (Interest Rates 101). In economically prosperous times, the interest rates will be raised so as the prevent inflation, as the higher interest rates will encourage people and businesses to save more and borrow less. However, when a country is stumbling economically, interest rates will be lowered in order to promote spending, which should reinvigorate the economy. The impact on the Forex market is that countries with higher interest rates typically have higher valued currencies, mainly due to the potential for inflation being much less (Interest Rates 101). In addition, a currencies worth is not likely to rise the entire time the country has high interest rates, due to the interest rates being high, but rather the market quickly adjusts when the change in interest rates happens (Interest Rates 101). This means that the current interest rates are not as important as future interest rates. When considering Interest rates in trading, the popular method is to use interest rate differentials. The idea is to compare a pair of currencies by taking the difference of their interest rates, and the country with the higher interest rate is likely to have the stronger currency (Interest Rates 101). Obviously, this is not used in day to day trading, as the market is likely to have already accounted for the interest rate differential, but when interest rates are changing, the interest rate differentials are important, especially if the two countries interest rates are moving in the opposite direction, which often produces huge swings in value. In Forex, the interest rate of focus is that of which the central bank sets, as it is the rate at which banks can borrow from the treasury of that nation. These interest rates help define a currencies value.

4.3.5 Retail Sales

Retail sales is a coincident economic indicator ("changes in the levels of these indicators usually reflect similar changes in overall economic activity") in that it reflects the general state

of retail sales for the past month (Barnes, Economic Indicators: Industrial Production). It uses a sample size of various retail companies, small and large, and those that have stores and those that do not, in order to "track the dollar value of merchandise sold" (Barnes, Economic Indicators: Retail Sales Report). Consumer spending occupies a large amount of the GDP (about two-thirds of the US GDP), and provides a great indication of the health of the retail industry, as well as the economy as a whole, which makes it very useful to traders (Barnes, Economic Indicators: Retail Sales Report). The retail sales report typically contains two numbers, the total sales figure, and the figure "ex-autos," whose large price and seasonal movements can throw off the report (Barnes, Economic Indicators: Retail Sales Report). For traders, interpreting the retail sales report is important, because the release often cause high volatility in the market. If the report is abnormally high, then the possibility of an interest rate hike increases, which in turn would drive down a currency's value. However, if the news is better than expected in tough times, it is likely that the currency in question would rise in value upon the news release. If the retail sales numbers are weak, this could be a possible sign of a recession, and the currency in question is likely to weaken if the news is consistently poor, as consumption plays a large part in most economies (Barnes, Economic Indicators: Retail Sales Report). It should be noted that in a country that consumes little, but exports much to other countries, these reports are likely to have less of an impact. The most important figure of a retail sales report might even be the number that is the consensus among traders (Barnes, Economic Indicators: Retail Sales Report). If the report is above this number, than the value of the currency is likely to increase, but if it is below it the currency is more likely to decrease in value, even if the news is still positive. Even though the report covers the previous month, and is typically released two weeks after the month that was covered, the report is subject to revisions the following months, and these revisions can be

quite large (Barnes, Economic Indicators: Retail Sales Report). This can make trading on news of the retail sales report difficult. However, the retail sales report can be a fantastic short term indicator of the economy in question.

4.3.6 Unemployment Rates

Unemployment rates are an important indication of the strength of a nation's workforce, and by extension, the strength of the economy as a whole. However, unemployment rates have a tendency to be resistant to change, so it is not the best leading indicator. The rate includes both businesses and households, in order to be as accurate as possible (Employment Indicators - Forex Fundamental Analysis). The unemployment rate also consists of data such as hours worked, hourly pay, payroll, and total hours worked. This allows the indicator to show not only how large the current workforce is, but how well paid they are, which is an indication of the quality of life by the workers in the economy. Unemployment is relatively simple indicator. If the rate is falling, it is an indication of stronger economic times ahead (Employment Indicators - Forex Fundamental Analysis). If the rate is rising, it is likely that the economy is about to go through a period of contraction (Employment Indicators - Forex Fundamental Analysis). If the rate is holding steady, there is a good chance the economy is currently in a peak or trough (indicated by whether the rate is low of high) (Employment Indicators - Forex Fundamental Analysis). Related to the unemployment rate, nonfarm payrolls also do a good job of reporting the state of the workforce in the economy, and because it is measured in the number of jobs created or lost on the past month, it is usually an easier number to gauge the health of the economy with (Employment Indicators - Forex Fundamental Analysis). Often this report results in as much volatility in the Forex market as the unemployment rate report. There are other related reports, such as the weekly unemployment insurance claims, and average weekly hours (Employment

Indicators - Forex Fundamental Analysis). The unemployment insurance claims report is an economic indicator that works the same as the unemployment rate, but it is considered to be more sensitive, and is often looked to first when economic conditions worsen (Employment Indicators - Forex Fundamental Analysis). However, it can also be misleading over long periods of weak economic conditions, as one can only stay on unemployment insurance for a certain period of time. Average weekly hours is a combination of several other employment indicators, and reports the average weekly hours sent to payroll by manufacturers (Employment Indicators - Forex Fundamental Analysis). This is one of the more sensitive employment indicators, as employers have a tendency to reduce workforce hours before laying workers off. When considering these indicators in trading, the lower the unemployment rate, the more that currency should be worth(Employment Indicators - Forex Fundamental Analysis). However, since most of the time these rates are already factored into the market price, a change or an unexpected change in either direction typically is the most important news that causes the markets to move. These reports are subject to revision though, so, like most economic indicators, the data should be taken with a grain of salt.

4.3.7 Industrial Production

Industrial Production measures the change in output in the industrial sector of an economy (which contains factories, mines, and utilities, in addition to the businesses of newspaper, periodical, and book publishing), and, because the industrial sector typically has a large impact on a country's GDP, is very useful in predicting changes in GDP (Barnes, Economic Indicators: Industrial Production) (Fundamental Major Currencies: Industrial Production (Euro Zone)). This makes it a useful coincident indicator. Often the industrial production of an economy is seen as a representation of the expansion and contraction that will

be reported in the GDP, in the future. In addition, the industrial production often provides a preview to inflation levels, as it is understood by investors that inflation manifests first at the industrial level (Barnes, Economic Indicators: Industrial Production). This is because of the rise in costs occurring first at the raw goods level, which eventually gets passed on until the consumer is purchasing higher cost products. The industrial sector of the economy historically sees the most volatility from economic peak to economic trough (Barnes, Economic Indicators: Industrial Production). Large changes in industrial production usually are a good indicator of a strengthening or weakening economy because of this. A positive change from month to month or year to year typically means that the economy is strengthening, which would result in the currency strengthening. A negative change would mean that the economy is weakening, and would probably result in the currency losing value in relation to other currencies. This usually has an effect on the volatility of the Forex market in the short-term, after the report is released, and the change in the market is usually more dependent on whether the report met, exceeded or failed to reach expectations (Barnes, Economic Indicators: Industrial Production). However, the industrial production reports can also be used as a gauge as to how healthy an economy is, in the long-term. It is also important to note how dependent on industry the economy in question is, as this will determine how much of an effect industrial production has in indicating the health of the economy. For instance, industrial production is a weaker indicator of economic health for the United States than it has in the past, because industry plays as smaller role in the US economy, which relies heavier on consumption now. However, its timely release and historical relation to a nation's GDP, as well as its early glimpse of inflation make it a very useful indicator to predict economic health.

4.3.8 Consumer Confidence Index

The Consumer Confidence Index (CCI) is a private, monthly release from the Conference Board, which is well regarded by both investors and the government. The CCI itself is comprised of survey results from a sample size of more than five thousand households across the United States (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). There are three parts to the CCI: Index of Consumer Sentiment, Current Economic Conditions, and Index of Consumer Expectations (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). The Index of Consumer Sentiment is a gauge for how the average consumer feels. Current Economic Conditions reports how the average consumer feels about the current state of the economy, while the Index of Consumer Expectations is how they see the economy and themselves in half a year. When the CCI is strong, it typically means the consumers are happier. The CCI has a privately released counterpart, the Michigan Consumer Sentiment Index, provided by the University of Michigan. However, they are very similar in their methods, and some investors choose to average the two in order to get a stronger result (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). This generally means that standards of living are improving, and thus they are willing to purchase more goods, and usually those purchases are larger (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). This typically points to a stronger economy, which in turn increases the value of the US Dollar when compared to other currencies, as a USD with a strong economy behind it is worth more than a USD with a weakening and stagnant economy. On the same note, consumer spending, which has a tendency to trend with consumer confidence, comprises two thirds of the United States' GDP, which makes the CCI an important indicator in forecasting future GDP (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). However, due to the subjective nature of surveys, and the complete

lack of hard data, the results can be skewed. In addition, the public often is not fully informed as to the current state of the economy, and therefore larger news headlines can create bias that paints a picture of a different economic situation. “There are no real data sets here, and people are not economists, so they cannot be counted on to realize that, for example, because gas prices may only represent 5% of their expenses, they should not sour their entire economic outlook” (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). Often, moving averages over longer periods of time act to smooth the data, and provide a more reliable outlook that can be used in predicting future economic movement (Barnes, Economic Indicators: Consumer Confidence Index (CCI)). Generally, consumer confidence rises and falls with retail sales, and consumer spending patterns, which means the CCI remains a strong economic indicator of GDP and economic strength, despite its faults.

4.3.9 ISM Manufacturing Index

The Institute for Supply Management (ISM), a private research group, maintains the ISM Manufacturing Index (formally known as the Purchasing Managers Index), which reports changes in conditions for the supply and manufacturing sectors of businesses. A set of five weighted sub-indicators comprise the ISM Index, and it is collected by surveying more than four-hundred purchasing managers around the nation (Barnes, Economic Indicators: Purchasing Managers Index (PMI)). The questions in the survey are all answered with either “better”. “same”, or “worse”, and the calculation of the Index is the percentage of the purchasing managers that answered “better”, plus half of the percentage of those who answered “same”. (Barnes, Economic Indicators: Purchasing Managers Index (PMI)) The ISM Index is reported as a number between zero and one hundred, with fifty being an equal number of “better” and “worse” reports. This is a sentiment indicator that provides a glimpse into the manufacturing

sector of the US economy. Although manufacturing is no longer a large part of the US GDP, it remains an important indicator, simply because the manufacturing sector has a history of being one of the first areas of the economy to feel either recessions or expansion in the economy (Barnes, Economic Indicators: Purchasing Managers Index (PMI)). Typically, if manufacturing is expanding the economy is also expanding, which means the ISM Index is a good indicator of future GDP movement (Barnes, Economic Indicators: Purchasing Managers Index (PMI)). When interpreting the ISM Index, a value of fifty typically is the tipping point. Anything above indicates expansion in the industry, while anything below would indicate contraction. However, when using it to evaluate future GDP, any value over forty-two is considered GDP expansion. ISM Index levels lower than forty two can indicate recession if they remain below for a long enough period of time (Barnes, Economic Indicators: Purchasing Managers Index (PMI)) However, when using the ISM Index to trade in Forex, it is important to keep in mind the rate of change. If the ISM index is over fifty, but the rate of change is negative, there is a good change that the USD will weaken in comparison to other currencies when the report breaks. The market consensus is also important in determining whether the USD will strengthen or weaken over the release of the report, as well. However, the ISM Index has its faults, as well. Due to the nature of the survey, the results are subjective (Barnes, Economic Indicators: Purchasing Managers Index (PMI)). In addition, the report covers only the manufacturing sector of the economy, and therefore might not be indicative of the economy as a whole. The ISM Manufacturing Index is an indicator that has had a lot of value in the past, but has lost some value of late. However, because of the manifesting industry's importance to the economy, it remains a powerful indicator that can provide volatility to the markets upon its release, and can be used to great effect to predict future GDP movement when combined with other economic indicators.

4.3.10 Interpreting Macroeconomic Issues

"Macroeconomics is the study of the behavior of the economy as a whole" (Heakal). Much of macroeconomics is tied with the economic indicators discussed before this, but often these issues can provide a quicker analysis than the monthly or annual indicators releases. In addition, relations between nations can strengthen or deteriorate, which can have a strong effect on a nation's currencies. However, it can often be challenging to interpret the macroeconomic issues correctly, and the market does not always react in a manner consistent with analysis. As an investor, it is important to pay attention to the macroeconomic issues in order to better protect investments, and to better understand the markets as a whole.

Lately, there has been a lot of news about countries, and their respective debts. But what does this mean to the value of a countries currency? There is no easy answer to this, as debt is a very complex issue. However, it is almost universally agreed on that some government debt is a good thing (Johnson and Kwak). It is expected that the government will go further into debt during a recession, when it should be lowering taxes and increasing spending, in order to jump start the economy (Johnson and Kwak). However, many would say that it is also the government's obligation to balance the budget again during good times (Johnson and Kwak). However, this obviously does not happen, or the United States would have had a balanced budget by the end of the boom in the 90's. The reason that the budget doesn't actually get balanced during these times is because that would be incredibly difficult to do. Even if a large government completely froze spending, it would be a number of years before tax revenue would pay off the national debt. Instead, during good times, the government aims to reduce the debt to GDP ratio, by reducing spending enough so that the national GDP grows faster than the national debt (Johnson and Kwak). As long as the GDP is growing faster than the national deficit, there

will be a sustainable level of debt (this is due to the GDP being representative of the tax base) (Johnson and Kwak). Now debt has a definition, and understand why some debt is acceptable, and sometimes encouraged, the impact of debt on the value of currencies can be explored. Generally, debt is not a statistic that garners a lot of attention in the Forex markets. However, the markets pay full attention when there is either an upgrade or a downgrade in a countries credit rating. The credit rating of a country represents the "credit worthiness" of a government (Credit Rating). This is evaluated by three main credit rating agencies, Standard & Poor's, Fitch, and Moody's. These rating agencies issue a sovereign credit rating, as well as an outlook for the future. Typically, a AAA rating is the best possible (for Moody's a Aaa rating is the best) (List of Countries by Credit Rating). Notable levels of ratings are BB+ for Standard & Poor's and Fitch, and Ba1 for Moody's (List of Countries by Credit Rating). Any rating below these levels is considered a speculative grade bond (commonly referred to as "junk" bonds) (List of Countries by Credit Rating). Stable outlooks indicate no impending change to the credit rating, while a negative outlook indicates that it is likely that the rating will be downgraded in the future (List of Countries by Credit Rating). A positive outlook indicates that the rating is likely to be upgraded in the future (List of Countries by Credit Rating). Both a rating change and an outlook change can have an impact on the Forex markets, although it is likely that a change in rating will have a greater impact on the markets than a change in outlook. Upgrades and positive outlooks are very likely to cause an increase in value for the corresponding currency of the nation with the change in rating/outlook. On the other hand, downgrades and negative outlooks are likely to cause a decrease in value for the currency corresponding to the nation with the change in rating/outlook. Outside of a ratings or outlook change by one or more of the rating agencies, debt is a statistic that is largely ignored, as the ratings agencies are known to provide reliable reports.

Political events can also have a large impact on the Forex markets (How Global Events Affect the Forex Market). One of the most common, and periodic political events is elections, which occur in most countries. Depending on the election, it is possible that investors will see the elections as time of instability in the government (How Global Events Affect the Forex Market). Generally, this means that the nation's currency will reflect this psychology by being more volatile as well (How Global Events Affect the Forex Market). However, with modern media, the outcome of elections is typically not all that surprising. Not that there are not close races, but rather it is rare to see a true dark horse candidate anymore, one that nobody expects to win. However, the markets can also react to a change in government, especially when there is a significant change in policy (How Global Events Affect the Forex Market). The most impactful of the policy changes if the fiscal policy. If the markets see the incumbent's policy as better for the economy, the value of the currency is likely to increase, but if the markets think that the incumbent's policy will be detrimental to the economic health of the nation, the nation's currency is likely to devalue. In addition, civil unrest, or unexpected elections can also cause sharp responses in the value in a nation's currency. It is very rare that the instability of civil unrest or the removal of a political figure from power would increase the value of a currency (How Global Events Affect the Forex Market). Until there is stability in the government, the currency is likely to devalue.

Natural Disasters can have a huge impact on the economic state of a country, causing damage to infrastructure and morale, as well as loss of life. It is the infrastructure that is focused on most by the markets, because damage in this area can severely limit or handicap the economic output of a nation (How Global Events Affect the Forex Market). In addition, the government needs to appropriate extra funding to cleanup efforts and rebuilding (How Global Events Affect

the Forex Market). It is quite common that the morale impact that a natural disaster has on a nation will lower consumer confidence, thus reducing consumer spending (How Global Events Affect the Forex Market). The combination of these factors shows how significant of an impact natural disasters can have on the economic condition of a country. It is almost impossible to have a natural disaster and have a nation be economically stronger because of it. The economic damage caused by natural disasters is likely to devalue a nation's currency.

Military conflicts between countries often have a similar impact on the currencies of the nation's involved. Probable infrastructure damage will hurt the economic output of any country, and the nation usually will have to borrow money in order to make up for the loss in "economic viability", as well as for the immense cost of being in the war itself (How Global Events Affect the Forex Market). In addition, the uncertainty of future expectations involved with being in a war, and the drop in consumer confidence creates a very volatile environment in the currency market (How Global Events Affect the Forex Market). The rebuilding effort after a war is likely to be financed by "cheap capital", which results from lowering interest rates, causing inflation (How Global Events Affect the Forex Market). Obviously there is a large economic downside to being involved in a military conflict with another nation. However, there is some economic upside to war. Often times, the increase in manufacturing will create an economic boom. A great example of this is the United States' involvement in World War II. After entry into the war following the bombing of Pearl Harbor, the nation was pulled out of the Great Depression (How Global Events Affect the Forex Market). However, I would also like to note that the United States joined World War II, and, after Pearl Harbor, had no further loss to infrastructure within the fifty states, as all of the fighting took place in either islands in the Pacific, or in Europe.

Obviously, war should never be used as a tool for bringing a country out of economic recession, but there is some economic upside to war, especially if it is not being fought on home soil.

These are only a couple general examples of macroeconomic issues, and each situation is unique enough that it can be difficult to make predations solely based on the macroeconomic issue at hand. However, it is very important to pay attention to macroeconomic issues as an investor, as they can have a significant impact on the markets. They are important even in technical analysis, as the markets can be extremely volatile during news periods, or when news breaks. When news breaks and the impact on the currencies involved is unknown, or not immediately apparent, it is probably best to stay out of the market until the period of volatility passes. Generally, this is the safest tactic when trading around news times.

4.4 Programming and Robot-Based Trading

Programming what are called “robots”, which are essentially automatically trading programs, is a large sector of trading in the Forex market (and investing as a whole). With the rapid emergence of computers in the last twenty years, and with personal computers becoming quite powerful machines with relatively low investment, this sector has opened up to more people than ever before. There are quite a few differences between discretional trading and robot based trading. The most important is the complete lack of a human element. This can be a really good thing, or it can be detrimental. For instance, a robot will not go into a trade just because it looks really good. It will only get into a trade if specific programmed conditions are met, and only then. However, it is also is never able to read a market and understand that it is not a good day for trading, or make instinctual trades. Generally this means that the most successful robots are less successful than their human counterparts. However, robots have the advantage of consistency, as well as the ability to be optimized towards the user’s preferences. There are also

other options when programming as an investor, like creating a custom indicator to let you know when conditions have been met. The options when it comes to creating custom indicators are vast, and the usefulness of certain options depends on trading strategies.

Generally when programming, the program will revolve around the entry point. This is the set of conditions that will cause your program to enter a trade. Generally, it is best if a robot has at least two or three conditions that must be met in order to enter into a trade. If too few conditions are set, than the robot is likely to trigger at an undesirable time. By using multiple conditions, the risk is limited, and as long as the conditions work from a profitability standpoint, the robot will make more winning trades than losing trades. Obviously, every programmer is going to have different ideas regarding entry conditions, but some conditions to consider are the crossing of different MACDs, support and resistance levels, and momentum indicators. It is important not to use the same type of indicator for each entry condition, as they could all show a false entry point. Instead, try to use indictors that won't necessarily trigger all at the same time.

The exit point of the program is also very important, although some programs won't use an exit point at all. The other option is using only combination of stop losses (trailing, or not), and take profits. When using exit conditions, it is most likely they will reflect your initial conditions no longer holding, indicating that the pattern that had the program get into a trade has disappeared. However, exit conditions could be completely unrelated to your entry conditions. The programmer needs to settle on a couple promising exit conditions, and work out the best condition in the optimization process. It is unlikely that the best exit condition for the program will be found without testing and optimizing thoroughly. Finally, a stop loss or a take profit could be added to the program in order to keep losses or profits in greater control. Losses could be limited greater by a trailing stop loss. It is also possible to not use any exit conditions, and use

only trailing stop losses and take profits, instead. The robot will be more sensitive to movements will smaller levels of take profits and stop losses, but is also more likely to keep a profit once a trade is profitable. Generally, the robot will be better off using exit conditions, as it is a more mature method of exiting a trade, and will show that the program follows an actual market pattern if it works correctly. It is also possible to use simple stop losses and take profits in order to test and optimize the entry conditions, as they are a good base exit position that is not variable. When designing a robot, it is important that it is designed around the needs and desires of either the client, or the trader. The amount of time being allotted to running the program, the available capital, and the risk tolerance are all very important considerations when designing a robot (Michael J. Radzicki).

It is also possible to maximize profit and minimize losses through a leveled entry and exit. For example, if a robot enters a trade with one standard lot, and it remains profitable for ten pips, the robot could add another standard lot. This is a rather large step, and many smaller steps will prove to be less risky. The same could be done with exiting a trade. Once a certain level is reached, or some unfavorable condition trips, the robot could pull out fifty percent of a trade, securing profits. It could then let the trade continue to run until another condition or profit level trips, in which another twenty five percent trips. The robot could then let the rest of the trade run until it hits a stop loss or a take profit. This method of levels of entry and exit should minimize risk, as it helps to secure profits. It is recommended that this is developed and optimized after entry and exit levels have been developed and optimized due to the heavy reliance on them by the entry and exit levels.

When optimizing certain parts of the robot, it is important to only alter a single factor of the robot per test. This allows the monitoring of the quality of the robot on a per-factor basis. If

more than one factor is changed per test, the optimizer will not know what factor is causing the robot to be more profitable of not. Going into optimization, realistic expectations should be set. Before optimization, it should be known how quickly the robot should be trading, and for how long trades should be running, the desired win/loss ratio, and what level of risk the robot should be running at. If being used for a single trader, these should be set to personal preferences. However, when trading for a client, the risk management should be tailored to their needs. Note that it should not be tailored specifically to what they request. As the trader, it is up to you to understand what your clients actually need in risk management. Most clients want you to be more risky with their money, but immediately question large losses. Most clients will be uncomfortable with the probable losses associated with risking a larger amount of their capital. Obviously, this should not mean that the clients are left out in the cold, but are helped through to the correct decision.

Optimization is typically done using past market data, as it is accessible, and requires little time to use. Testing a robot on previous market data is called back testing, and is important when optimizing the robot. Optimizers are simply algorithms that are used in order to find the best solution to a specific problem. There are two common types of optimizations; exhaustive, and probabilistic (Michael J. Radzicki). An exhaustive optimization will run the data on every possible value for a factor, which is a method of using brute processing force (Michael J. Radzicki). This will result in what is likely to be a series of results that provide the highest profit or win/loss ratio for the robot. However, using an exhaustive search is only recommended for a factor with few possible values. If exhaustive optimization is used on a factor with many possible values, the optimization will take a very long time to complete. This is where probabilistic optimizations come in; they provide good results while limiting the amount of time that the

optimization will run. There are three types of probabilistic optimizations: genetic, swarm, and neural (Michael J. Radzicki). A genetic optimization is based on algorithms that mimic evolution. “The evolution usually starts from a population of randomly generated individuals and happens in generations. In each generation, the fitness of every individual in the population is evaluated, multiple individuals are stochastically selected from the current population (based on their fitness), and modified (recombined and possibly randomly mutated) to form a new population. The new population is then used in the next iteration of the algorithm. Commonly, the algorithm terminates when either a maximum number of generations has been produced, or a satisfactory fitness level has been reached for the population.” (Genetic Algorithm) Swarm optimization is different, in that the best known value of each factor (or particle in swarm optimization) directly effects the optimization as a whole. With each iteration of the algorithm, the particles are altered based not only on the particle’s best known position, but also by the swarm’s (all the other particles) best known position (Particle Swarm Optimization). Both of these types of optimization are readily available to use, and do not require extra or more powerful hardware. However, Neural optimization, called a neural network, usually would require a very powerful computer, or much more likely, access to a supercomputer. Thus this type of optimization is just not available to most people. As a general overview, it is designed after biological neural networks (like the human brain), and uses artificial neurons to adaptively find the optimized result, or the possible results (Artificial Neural Network). These optimizations should be used if the number of possible values for a factor causes the exhaustive optimization to exceed the expected amount of time to produce a response. All of these optimizations will produce multiple possible results that will reach a different maximum. Generally, when reviewing the results, one wants to avoid data that is over-fitted to the back testing period. This is

when a robot provides unrealistic and over optimistic results of its performance over the back testing period. This means that the robot is being fitted to the noise, rather than the fundamental behavior (Michael J. Radzicki). In addition, a robot should be tested in a number of different market conditions, so it does not get optimized to one specific market (Michael J. Radzicki). This reduces its usefulness when the markets do not match the condition optimized in. Finally, the optimizations will sometimes return what are called "telephone poles"; one specific value that performs well, but nearby values do not perform nearly as well (Michael J. Radzicki). These are values that are unlikely to perform well when the robot is actually used in trading.

As an investor that uses programming to trade, it is important to have multiple working robots, or systems, available for use. This creates a "system of systems", which is designed to be used in order to maximize success (Michael J. Radzicki). No single robot will work consistently well in every market. This means that certain robots will perform better than other, depending on the market condition. It is important to use the best-performing systems on any given trading day, and to keep the systems that are not currently working well from trading. All systems should be monitored, and even the systems that are not performing well should be monitored by having them trade on simulation (Michael J. Radzicki). When a system that was not performing well out performs a robot that is actually trading for a certain period of time, it is probably time switch in the performing system, and switch out the poorly performing system.

Programming robots, as well as custom indicators, can be very useful for investing in all markets, as well as the Forex market. When programming a robot, it is important to keep the desired risk management, win/loss ratio, and the amount of capital being traded in mind. The entry and exit conditions are the part of the robot that are typically the most important, and that will require the most optimization. Once developed, the optimization process will produce results

of the better performing values for the variable being maximized/minimized. Finally, if using robots, or systems, to trade, it is better to use a “system of systems” in order to have the best performing robots trading each day.

4.5 Important Resources

There are a large amount of resources available to investors, and wading through these resources trying to find the most useful can be a daunting task. Here, some common and helpful resources will be highlighted, and how they should be used. This is by no means a comprehensive guide, and investors should not stick this short list exclusively. This is simply a personal list of resources that the authors find the most useful when investing. Each investor is encourages to seek out their own personal resources, as every investor is different.

The Gartman Letter is a daily letter written by a notable investor and his staff, Mr. Dennis Gartman. It is a comprehensive investing resource with extremely up to date news and recommendations. The Gartman Letter is an extremely reputable source, which justifies the investment to subscribe. Mr. Gartman is located on the east coast of the United States, and sends the letter out at five or six in the morning, Eastern Standard Time. Although this is a newsletter that is not specifically tailored to investing in the Forex markets, they are covered in the newsletter, and the newsletter covers very important macroeconomic issues that usually have an impact on the Forex market, and tend to be important when trading on the Forex markets. It is important to note that Mr. Gartman usually has a long term view on investing, and therefore his recommendations are not always wise in the short term. As with all resources however, it is recommended that investors use their own judgment when researching investments. Mr. Gartmanhimself is quick to admit his mistakes, knowing that all investors are wrong at one point

or another. However, all in all, Mr.Gartman provides a solid summary of the conditions of most investment markets each morning, and an invaluable resource for investors.

One of the best resources for breaking news and its effects on the Forex markets is Forex Factory. This is a website that provides a comprehensive schedule of news releases, and the impact that they are likely to have on the Forex markets. In addition, they provide information such as the previous report, the forecast, and after news is released, the actual numbers. In addition, the forums can be very useful for both new and seasoned investors. However, as the forums are set up in a typical internet fashion and some advice can be dodgy, especially when originating from members without reputations. That being said, Forex Factory provides a great educational environment for investors to discuss current issues and trends, and provides a top-notch news schedule that is an extremely useful reference for Forex traders.

These two resources are invaluable to Forex investors, and they come highly recommended as resources. However, there are many more reputable resources out there. Take the time to explore and find the most valuable resources, as there will be resources that some investors find more useful, due to the many different trading strategies out there. This is just a starting resource list for the Forex investor.

4.6 Starting an Investment Company

4.6.1 Location

When starting a money management company, the first thing to consider is location. In general, there are two choices, US-based and off-shore. Despite the fact that there are many countries one could base a company in, the US sticks out the most because of differences in regulation and tax laws. So what are the pros and cons of a US-based company vs. an off-shore one?

The US enforces more strict tax laws than most countries, which means both the company and the clients end up having to pay more per trade than they would if the company was in a different country. The flipside of this is that foreign based companies have trouble attracting US customers due to the non-resident alien tax(Internal Revenue Service). The internal revenue service taxes any company or person engaged in trade in the US, so if an off-shore company wants to have us customers, they must pay additional taxes for each of these customers, making it hard to justify. The US company can have US customers with no extra taxes, so despite the higher base tax, it's better for US customers to work with US companies. The reason this is so important is that the US has a large portion of the world's traders, and by starting an off-shore company, one essentially cuts out those traders from the start.

So why would an off-shore company be better. If you're in the US, it makes sense to start a US-based company, because you will have to pay the taxes no matter what as a US citizen. However, if you're not in the US, it makes no sense to start a US based company, because of the higher taxes, and this company would still need to file for non-resident alien taxes. Another possible advantage of an off-shore company is the lack of regulation. This can be a good or bad thing depending on how honest the company is. The US has many regulatory agencies for Forex trading (SEC,CFTC,FINRA), but in other countries, Forex trading is much more hands-off.

So where to start a company? The country of origin is almost always the logical choice; if the founders of the company are in the US, start the company in the US, as the taxes will be more favorable. For the same reason, if the founders live outside the US, it makes little sense for them to start a company in the US. This is a broad generalization of the issue and there are more fine points that complicate the matter somewhat, but for a brief overview, this covers the main important points.

4.6.2 Legal Structure

When structuring a company, one of the biggest questions is, who is liable in the event that something (or everything) goes wrong? The three main categories are sole proprietorship, partnership, and corporation. The main difference between these three is liability, though there are other differences that are equally important.

A sole proprietorship is run by one person, who assumes all liability. There may be more than one person helping to manage the company, but the owner assumes all responsibility for debt and losses as well as profits. The obvious disadvantage to this approach is that if anything goes wrong in the company, all blame rests on the sole proprietor. There is no legal difference between the individual and the company. This has its advantages too though. As the only responsible entity in the company, the owner can make all the decisions without consulting anyone else(Sole Proprietorship).

A partnership can be divided into three sub-categories. A general partnership is one step away from a sole proprietorship. Instead of one person assuming all responsibility, two or more people evenly split the liability and the profits. All decisions in the company are voted and agreed upon by a majority. Other than the shared responsibility, there is little difference between a general partnership and a sole-proprietorship(General Partnership).

A limited partnership takes this one step further and adds a new member, the limited partner. Unlike a general partner, the limited partner is not responsible for all the company's debt, only as much as the capital they have in the company. The limited partner has no voice as a shareholder of the company; all decisions are made by the general partner(s). Also, there need only be one general partner, unlike the general partnership. Effectively a limited partnership can

function like a sole proprietorship where the investors are limited partners. The only practical difference between those two would be less liability on the owner(Limited Partnership).

The third type of partnership is limited liability. Limited partners assume responsibility for their own liability much like in a limited partnership. Also like a limited partnership, the LLP needs at least one general partner to assume responsibility for the company's liabilities. In the US, a LLP is usually seen in the form of a limited liability company which is a hybrid between a LLP and a corporation(Limited Liability Partnership).

A corporation is the only legal entity whose liability is entirely separate from that of its members (i.e. there is no general partner). There is no person or persons who must assume responsibilities. In order to earn this full limited liability, the corporation must be registered with the state and/or federal governments and thus it is subject to more strict regulation than a partnership or sole-proprietorship. An important distinction with a corporation is that the company is legally required to add something to their title that informs the public of their legal status (e.g. Ltd., LLC, Inc.)(Corporation).

As for which legal entity is right for an emerging company, the first issue to consider is size. If the company is only one person, the only option that makes sense is a sole proprietorship. For two or more individuals who are still a small group, a partnership is the most sensible option; the liability can be shared equally among all members, and it necessary, the company can be expanded to include limited partners. Generally a corporation is not the best idea unless the company is much larger, as it imposes much more regulation on the company.

4.6.3 Important Regulatory Authorities

There are a few important regulatory entities which deal with trading in the US, and all companies, regardless of size, are required to comply with them. The Securities Exchange

Commission (SEC) and the Commodity Futures Trading Commission (CFTC) are the major government bodies in charge of these regulations. The Financial Industry Regulatory Authority (FINRA) is another, which is independently run.

Created in 1934, The SEC was originally designed to regulate corruption in the stock market following the collapse in 1929. The SEC requires all companies to submit quarterly reports so that they may take steps to prevent fraud and other financial infractions. While the SEC is responsible for upholding the legal structure of a company, they do very little to regulate the actual currency trading(U.S. Securities and Exchange Commission).

This is handled by the CFTC. "Congress created the Commodity Futures Trading Commission (CFTC) in 1974 as an independent agency with the mandate to regulate commodity futures and option markets in the United States." (CFTC website) Basically all trading in the US (excluding the stock market) is regulated by the CFTC. They seek to make markets run smoothly, competitively, and with minimal fraudulent activity(Commodity Futures Trading Commission).

FINRA is non-government agency that operates in a similar manner to the CFTC. FINRA also oversees companies involved in securities trading to ensure that they are operating with their clients' best interest in mind. FINRA evolved from the National Association of Securities Dealers, Inc. (NASD), which was intended to watch over and regulate securities trading under the supervision of the SEC. after NASDAQ (National Association of Securities Dealers Automated Quotations) disbanded from NASD, NASD was reformed into FINRA as an independent regulatory authority(Financial Industry Regulatory Authority).

4.6.4 Licensing

There are a number of licenses granted by the FINRA for trading purposes. Concerning Forex trading, there are a few to look out for, the series 7, series 34, and possibly the series 3. All or none of these may be necessary depending on how a company operates.

The series 7 is a general license for any kind of securities trading. The only thing one can't do with a series 7 license is trade commodities; there is a separate license for that. While a series 7 license may not be strictly necessary for your company, it is probably a good idea anyway. At the very least it will increase the company's credibility. "[The series 7 exam] focuses on investment risk, taxation, equity and debt instruments, packaged securities, options, retirement plans, and interactions with clients such as account management." (Investopedia).

The series 34 license and exam focus more heavily on Forex, but require either a series 3 or 32 first. Topics covered on the series 34 exam include "Forex terminology, forex concepts, Forex regulations, Forex trading computations and the risks of Forex trading." (investopedia, series 34). Proficiency in series 34 material implies a much greater understanding of the Forex market than the series 7(Investopedia).

A series 3 license is not required for Forex trading or directly relevant to the market. Its primary function is to allow the holder to trade commodities, as mentioned previously. However, it can be a prerequisite for the series 34 license. If one wishes to obtain a series 34 license, a series 3 may be a good one to pursue as well(Investopedia).

4.6.5 Performance Indicators

Now for the most important question, how do you tell if a company is doing well? A company could post annual returns of over 20%, but only be able to claim a 55% success rate. A different company could have annual return well under 10%, but a success rate of 95% (please

note that these are exaggerated cases). If this is the case, it's only a matter of how much risk the client can handle, but what if these two cases above are two accounts of the same company. This makes the issue a little more complicated. Luckily there are performance indicators which can quantitatively tell how well a company is doing.

The Sharpe ratio is one of the most commonly used Forex performance indicators. The ratio calculates the difference between the actual and a theoretical return with no risk. This expectation is measured against the standard deviation. The formula is as follows:

$$S = \frac{E[R - R_f]}{\sqrt{var[R - R_f]}}$$

The Sharpe ratio is one of the most important performance indicators because it can measure whether or not a client is being adequately rewarded for the risk they are taking(Sharpe ratio).

Other than the Sharpe ratio, there aren't very many universally used performance indicators. Like any company, a Forex based company will have key performance indicators to measure their particular goal of success. If a company's main goal is growth, one of their KPIs will be a ratio of annual returns or number of customers from year to year(Investopedia).

5. Results

5.1 Trading Strategy

5.1.1 Devin Kehler

My trading strategy has undergone many changes since its inception in early November 2011. I started out using a combination of trend lines and MACD divergence to predict and trace reversals. The moving average convergence divergence indicator is a pair of exponential moving averages (14 day and 26 day). When watching for divergence the most important points in the MACD are the peaks and valleys. If the peaks or valleys of the MACD are moving one way and the peaks and valleys of the price are moving the opposite direction, this is known as divergence. The image shown below has an example of negative divergence.

Figure 3: Negative divergence is the setup; the trend line break triggers the trade

[68]

The peaks of the MACD get smaller while the price peaks simultaneously get larger. Shortly after, the price reverses from an uptrend and begins to decline. The MACD is only a setup indicator in this case; I need a trigger to tell me when to enter the trade, which is what the trend line is for. In the chart above, I have drawn a trend line to monitor where the price is moving. In this case, I've done a pretty good job of drawing an accurate trend line; the price hits it a number of times and bounces off before finally crossing.

This was a fine strategy on paper, but what I soon realized was that my whole plan hinged on whether or not I drew a reliable trend line. In the above example, the trend line is very accurate and therefore very useful, but in a market with little to no trend, trend lines are of no use. If that's the case, I need a different strategy.

After a few weeks of playing around with MACD divergence and trend lines, I noticed an interesting pattern in some of the other indicators I had open, in particular the CCI and stochastic. It seems that reversals can also be traced by watching the oversold and overbought indications presented by the CCI and stochastic. In the chart below, we can see two points where both the CCI and stochastic are showing that the currency pair is overbought, and almost immediately following this is a swift drop in price.

Figure 4: Illustration of how CCI and stochastic peaks mimic price peaks

In both those cases, the price continues to move with the trend, which is expected most of the time given a strong enough trend. The more interesting point on this chart is near the end when both stochastic and CCI indicate that the currency is oversold, and in this case, the price breaks the trend line and moves upward.

This is still essentially the same strategy as before, except that now I have more options to look at if the MACD isn't showing me the right signals. The problem still persists that if there is no trend, or if I misread the trend, then both of these strategies are useless. The advantage of the CCI/stochastic method is that it doesn't necessarily require an actual trend line, so it's easier to program into a robot.

5.1.2 Gabriel McCormick

I have used a number of different trading strategies, since the project started. Initially, I was using the stochastic to trade reversals. This involved watching the stochastic indicator and the Commodity Channel Index (CCI) until one or both were in the overbought or oversold region. This was done on the one minute time interval. I chose this just because it was the fastest moving, and I thought I could glean the most information from it. Once I saw a condition I liked, and the market showed small signs of reversal (maybe a couple solid bars of the reversed trend), I would enter into a trade. At this point I would just watch the market until I no longer thought it was safe to be in a trade, and then get out, hopefully with a profit. I say hopefully because this trading strategy never really worked for me. I found that it was too variable to be an effective trading strategy, probably because I was trading against the trend, which I have come to realize is just not a good approach.

Following this, I started using the MACD to trade, but more often than not I found myself just watching trends and trading based off those. Yes, it was blind trading, but it was going better than my previous strategy, so I kept at it. It soon dropped the MACD all together, and just kept a couple moving averages on the chart to show me the current trend. I continued to trade on the one minute timeframe as well. Eventually I realized that trading blind, although it was working, was not ideal, and that I should develop a trading strategy with more discipline. I started to look for an indicator that would fit with my current trading strategy.

I ended up finding Fibonacci's, which worked very well with my current strategy, as they served to enhance my ability to read the current trend, and when the trend might fall back to before continuing. This was about the time that I switched over to the five minute timeframe, as the one minute timeframe is too noisy to discern the trend. The noise on the one minute

timeframe is too much, and it can be very difficult to extract the real market movement from the noise. My method of using Fibonacci's is relatively simple. Each period of trading, I look at all the charts, and identify the trends that I see with Fibonacci indicators. This gives me support and resistances levels that I am able to trade around. In addition, I add my own support and resistance levels that are important values, values I have seen the price bounce off of multiple times before. These are much higher levels of support and resistance. I wait until I see a price retracement that has hit one of the levels I have set, and then has moved with the trend for at least three or four solid bars. This is an indication to me that the trend is reestablishing itself, and it's likely that this will be a movement with the trend. Now, this doesn't work all the time, and it takes a little experience to understand when the market will and will not continue moving with the trend, and it is important to identify important patterns in the price movement, like railroad tracks, and double peaks/valleys. Once I am into a trade, if I am losing, then I get out of the trade only if I know that the resistance line I have been trading is broken. There is a fine line between waiting a trade out, and closing a trade because there is no profit to be made.

Generally, I always open a trade with a ten pip stop loss, and a twenty pip take-profit. I can't decide whether I should raise this stop-loss, or keep it conservative. On one hand, I think that the conservative stop-loss gets me out of bad trades early. However, I also think that a larger stop loss would give me greater flexibility in my trades, as long as I am able to make good decisions in getting out of the correct trades. However, I have stuck with the ten pip stop loss, and I don't really plan on changing it. I rarely every open a trade with more than one standard lot, at a leverage of fifty, unless the trade looks exceptional. This uses two and a half percent of my one hundred thousand dollar account, approximately.

As a general trading strategy, I always make sure to identify the current market trend, and then trade with it. I will never open a trade that is against my defined trend. This is just insurance; it makes me trade when I have more information about the market. My other main rule is to remind myself that I never have to trade, and should never feel compelled to get in a trade, by anything else other than my indicators and market patterns. If the market is not moving, I just don't trade. Never should a trader feel like they need to trade, for forced trades usually do not end well.

5.2 Company Parameters

Our company is a US-based Forex company. As mentioned previously, as US citizens, we don't need to pay any extra taxes to work with US citizens, and we would receive little to no tax breaks for having an offshore company. In addition, while we might dodge regulations by moving offshore, we would lose most of the US customer base, because of the Non-resident alien tax. Our company is structured as a Limited Liability company. This is a hybrid of a limited liability partnership and a corporation. This allows us the freedom of a limited liability partnership coupled with the limited liability for *all* partners that is granted to corporations(Limited Liability Company).

The focus of the company is robot based trading. All our trades are executed by a Forex bot. This makes them more consistent, and much faster than most human traders. We have a variety of trading styles to suit the amount of risk a client wishes to take on, from conservative to very aggressive. Generally, a more conservative investment plan will have a robot that trades with less risk, and will try to have many small profits, as well as fewer small losses. A more aggressive plan will have larger profits at the expense of larger drawdowns (drawdown is the maximum loss on the account over a specified investment period). No client will be allowed to

start at an investment level that is above moderate. Once the client is with us for more than six months, we will consider moving them up a risk level if they desire to. This will allow us to greater judge the client's needs.

For the conservative plan, we will aim for five percent annual gain on the account. There will be a maximum drawdown per trade of two and a half percent, and a maximum drawdown on the account of five percent. In order to keep the risk level low, a maximum leverage of ten will be used, which means that an account of one hundred thousand dollars will have a maximum purchasing power of one million dollars. This does not mean that a leverage of ten will be used all the time, as it is likely that a leverage of ten will only be used in optimal market conditions. If the account reaches the maximum drawdown, all currently open trades would be closed, and the account would be closed. All other clients on the same trading plan would be notified, and the trading plan would be suspended until the conservative strategy has been re-optimized, at which point trading will resume, and clients will be once again notified. If a trade reached the maximum drawdown per trade, than the client will be contacted, and the position will automatically be closed.

The moderate plan will aim for an annual gain of ten percent on the account, with a maximum of ten percent drawdown on the account. The maximum drawdown per trade will be five percent. The same rules for reaching the drawdowns will apply. In order to reach this gain, the account will use a maximum leverage of twenty, which means that an account of one hundred thousand dollars will have a maximum purchasing power of two million dollars. Again, it is unlikely that robot will trade at that leverage at all times, that is just the maximum leverage allowed.

The aggressive plan will aim for an annual gain of fifteen percent, with a maximum drawdown of fifteen percent on the account. There is a maximum drawdown of seven percent on each trade on the account. The same rules for reaching the drawdowns apply. This plan will use a leverage of forty, giving a maximum purchasing power of four million dollars on a one hundred thousand dollar account.

The very aggressive plan will aim for a gain of twenty percent, with a maximum drawdown of twenty percent. The maximum drawdown on a single trade is ten percent. The same rules for drawdowns apply. This account will use a leverage of fifty, giving an account of one hundred thousand dollars purchasing power of five million dollars.

As a company initially, it would be counterproductive to do any public marketing. Not only are the rules of marketing an investment company rather complex (there will be lawyer later on to handle that), but it is hard to advertise an investment company with absolutely no established reputation. This means that we will need to establish credibility with family and friends initially, and then provide service that earns us recommendations. We might even be able to incentivize this by providing a drop or removal of performance fees.

6. Conclusion and Recommendations

Upon completion of this project, our group has laid the foundation of knowledge for starting an investment company. We have explored potential locations, and the advantages and disadvantages of each, as well as various governmental regulations associated with each location. In the end, we elected to locate our company within the United States, as it seemed to be the best fit with the company's needs. The company itself will be structured as a Limited Liability company (LLC), which removes the individual traders from liability, but still has enough accountability so that the clients are not left out in the cold. As for trading strategies, our group will use our robots to created tiered risk levels, with the lower levels offering consistent, but less profits. The higher levels will offer more profit, but at greater risk, and higher drawdowns. Each trader will develop and maintain a couple levels of risk. In addition, clients will be unable to start above a moderate risk level, and will only be able to move above this moderate risk level after six months, when we will be able to greater understand the client's needs.

Our trading strategies have also evolved heavily over the course of this project. We started out using too many indicators, and we did not fully understand any of them. Each week, we evaluated our trading strategies, and eventually we found that we focused on a couple of choice indicators that stood out as being useful and reliable to trade with. In addition, we found that each trader was improving as a trader, having more experience with the market and common movements. Sometimes, we would try out a completely new strategy, and there would be an adjustment period before we would decide whether this new strategy worked better than the previous. Although we each had our own strategy by the end, our trading strategies will continue to evolve, reflecting the importance of experience in the market.

Our project had an increased focus on programming, as the group saw more potential in programming robots based on our trading strategies than actively trading. Each group member designed a single robot to start, individually, that reflected their own trading strategy. These will be back tested and optimized before being used to trade for the investment company. In addition, our group used the programming experience to develop an indicator that measures relative currency strength, which is calculated as the percent change of the currency on the day, multiplied by the volume. When the indicator is used on a graph in MT4, it displays all the currencies and their respective strength, on a scale of negative ten to ten. This works on all time frames, although it was designed for the hour four timeframe. We plan on continuing the development of this indicator, adding external variables that can be changed, as well as a scale for the currencies involved.

One challenge that we were met with during the project was the exiting of a group member. We definitely noticed that losing a group member meant that individually, we would be doing more work. In addition, we lost a third perspective on trading and the strategies involved. However, in the end, I don't think this affected the final outcome of the project in a significant manner.

As for recommendation on future Investment and Trading IQP's, I think it will be important to have a more static project description throughout the project. Our group found that each term, the focus would change, and it became a little distracting, as we were never quite sure what the final project would represent. If we were provided initially with what we would be expected to present as our final project at the beginning of the IQP, we would have had an easier time with certain aspects. In addition, we do not think that the term papers that were assigned over a- and then b-term breaks were detrimental to the project. I think a better method would be

to replace the weekly papers with assigning certain parts of the paper to be due each week. Then the large paper could be compiled and presented at the end of each term. Our group found that the time commitments over breaks were excessive, and as a result our writing suffered. Our group hopes that these recommendations are taken into consideration for future IQP's.

7. Bibliography

Artificial Neural Network. 15 February 2012. Wikimedia Foundation Inc. 21 February 2012. <http://en.wikipedia.org/wiki/Artificial_neural_network>.

Average Directional Index (ADX). n.d. StockCharts.com. 6 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:average_directional_index_adx>.

Average True Range (ATR). n.d. StockCharts.com. 18 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:average_true_range_atr>.

Barnes, Ryan. *Economic Indicators: Consumer Confidence Index (CCI)*. n.d. Investopedia ULC. 22 October 2011. <http://www.investopedia.com/university/releases/consumerconfidence.asp>.

—. *Economic Indicators: Consumer Price Index (CPI)*. n.d. Investopedia ULC. 21 October 2011. <http://www.investopedia.com/university/releases/cpi.asp>.

—. *Economic Indicators: Gross Domestic Product (GDP)*. n.d. Investopedia ULC. 21 October 2011. <http://www.investopedia.com/university/releases/gdp.asp>.

—. *Economic Indicators: Industrial Production*. n.d. Investopedia ULC. 20 October 2011. <http://www.investopedia.com/university/releases/productioncapacity.asp>.

—. *Economic Indicators: Purchasing Managers Index (PMI)*. n.d. Investopedia ULC. Document. 21 October 2011. <http://www.investopedia.com/university/releases/napm.asp#axzz1bGBhQLUI>.

—. *Economic Indicators: Retail Sales Report*. n.d. Investopedia ULC. Document. 21 October 2011. <http://www.investopedia.com/university/releases/retailsales.asp#axzz1bGBhQLUI>.

Bates, Trudy. *Online Forex Trading Bid and Ask Price and the Bid Ask Spread*. n.d. 16 February 2012. <http://www.fxinfo.com/bid-ask-price.html>.

Bollinger Bands. n.d. StockCharts.com. 18 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:bollinger_bands>.

Camarilla Equation. n.d. BabyPips.com. 6 October 2011. <http://www.babypips.com/forexpedia/Camarilla_Equation>.

Camarilla Pivot Points. 2011. Web site. 29 02 2012.

Commodity Futures Trading Commission. 04 02 2012. Web Page. 23 02 2012.

Commodity Futures Trading Commission. *Mission and Responsibilites*. 2012. Web Page. 23 02 2012.

Corporation. 20 02 2012. Web Page. 23 02 2012.

Credit Rating. 21 February 2012. Wikimedia Foundation Inc. 21 February 2012. <http://en.wikipedia.org/wiki/Credit_rating>.

Employment Indicators - Forex Fundamental Analysis. n.d. Capital Market Services, LLC. 20 October 2011. <http://www.cmsfx.com/en/forex-education/online-forex-course/chapter-2-fundamental-factors/fundamental-analysis/employment-indicators/>.

Fibonacci Fans. n.d. Forexfibonacci.com. 18 October 2011. <http://www.forexfibonacci.com/fibonacci_fan/02/>.

Fibonacci Method in Forex. n.d. Forexfibonacci.com. 18 October 2011. <http://www.forexfibonacci.com/>.

Financial Industry Regulatory Authority. 04 02 2012. Web Page. 23 02 2012.

Foreign Exchange Market. 23 February 2012. Wikimedia Foundation Inc. 23 February 2012. <http://en.wikipedia.org/wiki/Foreign_exchange_market>.

Forex Fundamentals: Inflation. n.d. Capital Market Services, LLC. 19 October 2011. <http://www.cmsfx.com/en/forex-education/online-forex-course/chapter-2-fundamental-factors/fundamental-analysis/inflation-indicators/>.

Forex Lot Sizes and Risks. n.d. 16 February 2012. <http://forexbeginners.net/lot-sizes-and-risks>.

Forex4Noobs. *Using Trend Lines*. 2012. Web site. 29 02 2012.

—. *What are Trend Lines?* 2012. Web site. 29 02 2012.

Fundamental Major Currencies: Industrial Production (Euro Zone). n.d. GoLearnForex.com. 20 October 2011. <http://www.golearnforex.net/fundamental-analysis/2266-fundamental-major-currencies-industrial-production-euro-zone.html>.

General Partnership. 15 02 2012. Web Page. 15 02 2012.

Genetic Algorithm. 14 February 2012. Wikimedia Foundation Inc. 21 February 2012. <http://en.wikipedia.org/wiki/Genetic_algorithm>.

Greenburg, Michael. *Finally the Brokers Guide explaining what Marker Maker, STP and ECN broers really are: Part 1/2*. 23 June 2009. Forex Magnates Inc. 17 February 2012. <http://forexmagnates.com/finally-the-brokers-guide-explaining-what-market-maker-stp-and-ecn-brokers-really-are-part-12/>.

—. *Finally the Grokers Guide explaining what Market Maker, STP and ECN brokers really are: Part 2/2*. 24 June 2009. Forex Magnates Inc. 17 February 2012. <http://forexmagnates.com/finally-the-brokers-guide-explaining-what-market-maker-stp-and-ecn-brokers-really-are-part-22/>.

Gross Domestic Product (GDP) Definition. n.d. Investopedia ULC. 19 October 2011. <http://www.investopedia.com/terms/g/gdp.asp>.

Hassam, Ahmad. *What is Forex Margin Call?* n.d. 16 February 2012. <http://www.forexpros.com/education/beginners/what-is-forex-margin-call%2520-37374>.

Heakal, Reem. *Explaining The World Through MacroEconomic Analysis*. 7 January 2011. Investopedia, ULC. 18 February 2012. <http://www.investopedia.com/articles/02/120402.asp#axzz1mlgdSk2x>.

History of Futures Trading. n.d. 23 February 2012. <http://www.futures-trading-mentor.com/history-of-futures-trading.html>.

History of Investment Banking in the US and Britain - An Overview. n.d. 23 February 2012. <http://shrewd-investment.com/history-of-investment-banking-in-the-us-and-britain-an-overview/>.

How Global Events Affect the Forex Market. 13 June 2011. Investopedia, ULC. 22 February 2012. <http://www.investopedia.com/articles/forex/11/international-events-affect-forex.asp#axzz1nA2jqXkN>.

Ichimoku Kinko Hyo. n.d. BabyPips.com. 6 October 2011. <http://www.babypips.com/forexpedia/Ichimoku_Kinko_Hyo>.

Ichimoku Trading Strategies. n.d. IchiWiki. 6 October 2011. <http://www.kumotrader.com/ichimoku_wiki/index.php?title=Ichimoku_trading_strategies>.

Interest Rates 101. n.d. BabyPips.com. 19 October 2011. <http://www.babypips.com/school/interest-rates-101.html>.

Internal Revenue Service. *Taxation of Nonresident Aliens*. 05 12 2011. Web Page. 23 02 2012.

Investopedia. *Key Performance Indicators*. 2012. Web Page. 23 02 2012.

—. *Series 3*. 2012. Web Page. 23 02 2012.

—. *Series 34*. 2012. Web Page. 23 02 2012.

—. *Series 7*. 2012. Web Page. 23 02 2012.

Johnson, Simon and James Kwak. *National Debt fro Beginners*. 4 February 2009. NPR. 21 February 2012. <http://www.npr.org/templates/story/story.php?storyId=99927343>.

Kuepper, Justin. *The Fundamentals of Forex Fundamentals*. 17 March 2010. Investopedia ULC. 18 Fwbruary 2012. <http://www.investopedia.com/articles/trading/04/031704.asp#axzz1mlgdSk2x>.

Lee, Kelvin. *Average True Range (ATR) Indicator Explained*. 13 August 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/average-true-range-atr-indicator-explained.html>.

—. *Forex Bollinger Bands Explained*. 7 January 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-macd-indicator-explained.html>.

—. *Forex CCI Indicator Explained*. 16 May 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-cci-indicator-explained.html>.

—. *Forex Fibonacci Indicator Explained*. 17 March 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-fibonacci-indicator-explained.html>.

—. *Forex MACD Indicator Explained*. 13 December 2009. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-macd-indicator-explained.html>.

—. *Forex Moving Average Explained*. 10 February 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-moving-average-explained.html>.

—. *Forex Parabolic SAR Indicator Explained*. 11 March 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-parabolic-sar-indicator-explained.html>>.

—. *Forex Pivot Point Trading Tutorial*. 24 05 2010. Web Site. 29 02 2012.

—. *Forex Relative Strength Index Indicator Explained*. 18 April 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-relative-strength-index-indicator-explained.html>.

—. *Forex Stochastic Indicator Explained*. 2 June 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/forex-stochastic-indicator-explained.html>.

—. *How To Trade Using Moving Average*. 29 September 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/how-to-trade-using-moving-average.html>.

—. *How To Use Bollinger Bands*. 8 February 2010. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/how-to-use-bollinger-bands.html>.

—. *The MACD Crossover Trading Techniques*. 13 December 2009. Best Forex Indicator. 29 September 2011. <http://www.forexindicator.org/the-macd-crossover-trading-techniques.html>.

Leverage Definition. n.d. 29 August 2011. <http://www.investopedia.com/terms/l/leverage.asp>.

Limited Liability Company. 23 02 2012. Web Page. 23 02 2012.

Limited Liability Partnership. 22 02 2012. Web Page. 23 02 2012.

Limited Partnership. 17 01 2012. Web Page. 23 02 2012.

List of Countries by Credit Rating. 20 February 2012. Wikimedia Foundation Inc. 21 February 2012. <http://en.wikipedia.org/wiki/List_of_countries_by_credit_rating>.

Long (or Long Position) Definition. n.d. 29 Aug 2011. <http://www.investopedia.com/terms/l/long.asp>.

Michael J. Radzicki, Ph.D. "Creating a Personal Robotic Trading System." Worcester, 12 January 2012.

Parabolic SAR. n.d. StockCharts.com. 18 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:parabolic_sar>.

Particle Swarm Optimization. 16 January 2012. Wikimedia Foundation Inc. 21 February 2012. <http://en.wikipedia.org/wiki/Particle_swarm_optimization>.

Pip. n.d. 16 February 2012. <http://www.investopedia.com/terms/p/pip.asp#axzz1mbgsP0jK>.

Relative Strength Index (RSI). n.d. StockCharts.com. 18 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:relative_strength_index_rsi>.

Relative Vigor Index (RVI). n.d. BabyPips.com. 6 October 2011. <http://www.babypips.com/forexpedia/Relative_Vigor_Index>.

Relative Vigor Index (RVI). n.d. MetaQuotes Software Corp. 6 October 2011. <http://ta.mql4.com/indicators/oscillators/relative_vigor_index>.

Sharpe ratio. 16 01 2012. Web Page. 23 02 2012.

Short (or Short Position) Definition. n.d. 29 August 2011. <http://www.investopedia.com/terms/s/short.asp#axzz1mbgsP0jK>.

Simple and Exponential - Moving Averages. n.d. StockCharts.com. 18 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:moving_averages>.

Smith, Lisa. *High GDP Means Economic Prosperity, Or Does It?* n.d. Investopedia ULC. 19 October 2011. <http://www.investopedia.com/articles/economics/08/genuine-progress-indicator-GPI.asp>.

Sole Proprietorship. 21 02 2012. Web Page. 23 02 2012.

Stochastic Oscillator. n.d. StockCharts.com. 18 October 2011. <http://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:stochastic_oscillator>.

Stock Market. 2012 February 2012. Wikimedia Foundation, Inc. 23 February 2012. <http://en.wikipedia.org/wiki/Stock_market#History>.

Stop-Loss Order. n.d. 16 February 2012. <http://www.investopedia.com/terms/s/stop-lossorder.asp#axzz1mbgsP0jK>.

Take-Profit order - T/P. n.d. 16 February 2012. <http://www.investopedia.com/terms/t/take-profitorder.asp#axzz1mbgsP0jK>.

True Strength Index. n.d. BabyPips.com. 6 October 2011. <http://www.babypips.com/forexpedia/True_Strength_Index>.

True Strength Index (TSI) Definition. n.d. Investopedia ULC. 6 October 2011. <http://www.investopedia.com/terms/t/tsi.asp>.

U.S. Securities and Exchange Commission. 17 02 2012. Web Page. 23 02 2012.

U.S. Securities and Exchange Commission. *Investment Company Registration and Regulation Package*. 02 04 2009. Web Page. 23 02 2012.

Using Trend Kines. n.d.

Appendix A: Trading Journal

A.1 Gabriel McCormick

Date	Time	Type	Size	Currency	Pips	profit
11/07	9:36 AM	long	1 lot	AUDUSD	9.7	$97
11/09	9:45 AM	short	1 lot	AUDUSD	10.2	$102
11/09	10:26 AM	long	1 lot	USDCAD	-7.2	-$70.50
11/10	9:16 AM	long	1 lot	AUDUSD	-12.8	-$128
11/10	9:37 AM	short	1 lot	EURUSD	0.7	$6
11/10	9:51 AM	short	1 lot	EURUSD	20.3	$210
11/15	9:43 AM	long	1 lot	AUDUSD	3.7	$36
11/16	9:42 AM	long	1 lot	EURUSD	11.8	$118
11/17	9:09 AM	long	1 lot	EURUSD	-11.7	-$117
11/17	9:16 AM	long	1 lot	EURUSD	-12.9	-$129
11/18	9:45 AM	short	1 lot	EURUSD	8.2	$82
11/21	10:39 AM	long	1 lot	USDCAD	18.5	$177
11/23	11:06 AM	long	1 lot	USDCAD	2.1	$20.03
11/29	9:05 AM	short	1 lot	EURUSD	-12.2	-$122
12/02	11:03 AM	short	1 lot	EURUSD	-7.6	-$76
12/07	8:45 AM	short	1 lot	EURGBP	6.8	$106
12/08	9:47 AM	long	1 lot	USDCAD	-11.6	-$111
12/09	9:51 AM	long	1 lot	EURUSD	-13.2	-$132
12/09	10:40 AM	long	1 lot	USDCAD	-11.4	-$109
				Totals	-8.6	$59.5

Table 1: Gabriel McCormick's Trades

11/07/11: AUD/USD

BUY: 1.03774

CLOSE: 1.03871

PROFIT:$97, 9.7 pips

This was my first trade using trade station, so I was still trying to figure out how trading worked on the platform. I actually opened the trade, and the price dropped a little, and I went to go and get out of the trade before realizing that I didn't know how to close the trade. However, by the time I had called on of my partners to find out how to close a trade, I had made a good amount of profit, and I noticed that the price had neared my ten pip limit, but hadn't quite hit it, and was

now retracing, so I got out. I did not use any indicators for this trade, except for my ever-present two long term EMA's that serve as trend lines, the rest was just market analysis on the fly. From this trade, I learned that if you decide to enter a trade, it can often be profitable to wait a little to let the market react in the way that you hope. Had I known how to close a trade upon entering this trade, I probably would have exited much earlier, with a loss.

11/09/11: AUD/USD

SELL: 1.01941

CLOSE: 1.01839

PROFIT: $102, 10.2 pips

I entered this trade by evaluating the market, and using my two trend-indicating long term EMA's. I traded because the USD was strong on the day, and that was pushing down on EURUSD and AUDUSD, among others. I ended up being knocked out by my limit, but I was happy to have the profit upon close. The market soon turned around, so had I stayed in, there is a possibility that I could have lost some of that profit. In hindsight, if I had traded EURUSD instead of AUDUSD, I would have made more f4rom this trade, as EURUSD has more liquidity. However, I am not disappointed, as this was a good trade, and I followed my guidelines, and the current trend.

11/09/11: USD/CAD

BUY: 1.03197

CLOSE: 1.02125

LOSS: $70.50, 7.2 pips

I entered this trade because the price had recently bounced off the Fibonacci retracement lines I was using, and there were a number of strong bars, indicating that the price was likely to continue upward when I entered. However, there appeared to be a lot of downward pressure, and the price came down to within a tenth of my stop. When the price went up a little more than two pips, I exited, thinking that it was a good idea to lose as little money as possible. However, a bar after I exited, the price went up another 15 pips or so, which was disappointing, but I know that were I in the same position, again, I would have made the same decision. I don't think I did anything wrong, and was pretty happy that I managed to get out with as little loss as possible. I think the best lesson to be learned from this trade is to cut your losses when you are not confident in the trade, do not go in, for it is very likely that you will be disappointed.

11/10/11: AUD/USD

BUY: 1.01910

CLOSE: 1.01782

LOSS: $128, 12.8 pips

I was taken out by my stop loss on this trade, which was the largest loss on this account so far. I entered this trade because the trend was strongly upward, with little indication that it was going to retrace. However, the price did exactly that, and took out my stop/loss pretty quick. This was not a smart trade, as I never waited for an indication that the price was going to continue upward, I just assumed that the price would continue on the current trend. Had I waited, I would have seen that the price was in a reversal. Obviously, I should not have entered the trade before waiting to see three or four strong green bars. What I need to learn from this trade is not to just

jump into a trade because it looks good. Instead, I need to wait for the trade to have the correct criteria, in order to become a disciplined trader.

11/10/11: EUR/USD

SELL: 1.36053

CLOSE: 1.36046

PROFIT: $6, 0.7 pips

I got into this trade because I notice that the market was in full reversal, and I wanted to catch a couple pips on the retracement. However, as I entered, the market went into a small period of consolidation. Getting worried, I exited the trade shortly after, knowing I had to get ready for class. In hindsight, I should have trusted my trading instinct, as well as my stop/loss and my take profit. However, I can't say that I did anything totally wrong, as I exited without losing anything. Although I can't fault myself for getting out, because a small profit is much better than losing anything, I need to be more disciplined and wait my trade out, letting it evolve. Otherwise, I won't make any money at all.

11/10/11: EUR/USD

SELL: 1.35895

CLOSE: 1.35692

PROFIT: $210, 20.3 pips

The last trade of the morning, and the sixth of the week, I noticed the price of EURUSD continued to fall, and I shorted at 1.35895, and got taken out of the market by my take profit at 1.35692. I made 210 dollars on this trade. I was very happy with this 6trade, since it was the first

time I have entered into a trade and then left for class, putting complete trust in my stop/loss and take profit. I used the Fibonacci retracement lines using a 30 minute period per bar to get a picture of how far the market would likely fall. I saw that I could make 20 pips before the price would reach the 50% retracement line. I entered into the trade and left, and it went perfectly. The price fell, hit my take profit, and then continued down to just below the 50% retracement line, at which point it bounced back significantly. I was very happy with this trade, but I did realize that there was some risk in entering this trade, as the market could have bounced off the 38.2% retracement line, which is also a relatively strong support.

11/15/11: AUD/USD

BUY: 1.01836

CLOSE: 1.01873

PROFIT: $36, 3.7 pips

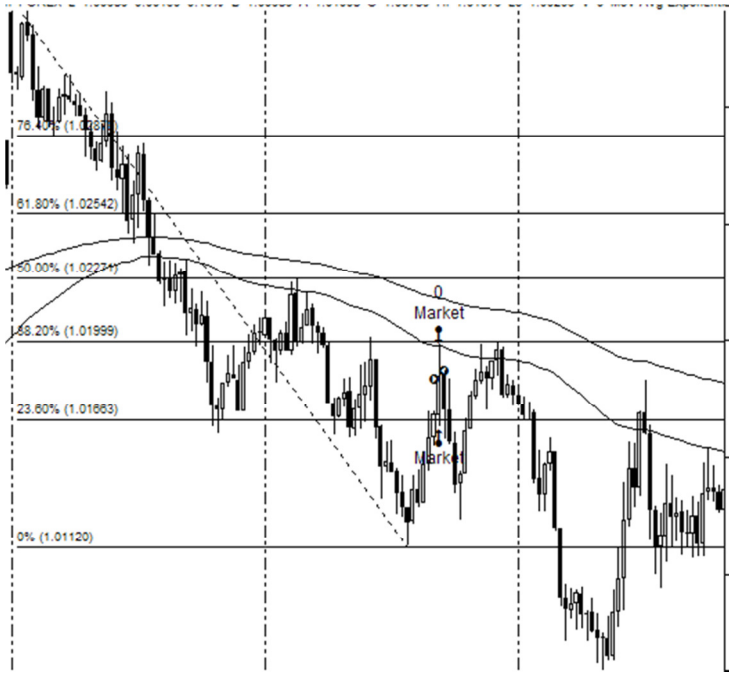

Figure 5: GM 11/15/11Trade 1

When I entered this trade, I saw that the market was in retracement, and I saw a trend that was strong enough for me to trade comfortably. I was about to leave the trade and go to class, thinking that I would hit my take profit and make out with about twenty pips, as the price had already gone up about 14 pips since I entered the trade. Me being very cautious, I checked my Fibonacci's and saw that the price was nearing the thirty six percent retracement line of the strong downward trend that was being retraced. The price came back almost immediately, and I exited with whatever profit I had at the time, knowing the price would continue to drop. When I came back from class, I checked to see if I had made the right decision, and I had. The price fell a good twenty or thirty pips after I exited. I was happy with this trade, but I should have added the Fibonacci's before entering the trade and I could have made out with 14 pips, instead of 3.7 pips. The Fibonacci's I drew were not showing up on the one minute timescale for some reason, so I have included the thirty minute timescale of the same trade.

11/16/11: EUR/USD

BUY: 1.35036

CLOSE: 1.35154

PROFIT: $118, 11.8 pips

Figure 6: GM 11/16/11 Trade 1

I initially bought EURUSD because it was in a string uptrend, as the price had broken through the 50% retracement line with little resistance, and I made sure to wait a couple solid green bars before entering the trade. As soon as I entered the trade, I was very worried, because the price fell, and more importantly, it fell through the 50% retracement line. However, I decided that the market was acting indecisive, and there seemed to be pretty strong movements in both buyers and sellers. I really wanted to get out of the trade, but I convinced myself to stay in, even though the price was about one pip away from my stop loss a couple times (it is these times that I wish that I had a larger stop loss, but I think the two to one ratio is good for my trading). I was rewarded with a movement upward, and I got out at the exact right time, as can be seen on the included figure of the trade. From this trade, I think I can take away that I was acting more disciplined at this point in time, as I was able to stay with my trade, even if I was not very

comfortable with how the outcome was looking. From this trade, I should definitely wait for a more reliable signal for the price moving upward, as it was obvious that the market wasn't going to move upward after I got in.

11/17/11: EUR/USD

BUY: 1.35351

CLOSE: 1.35234

LOSS: $117, 11.7 pips

I was trading with a strong uptrend. I got in hurriedly, and without waiting to see how the market would react. Before I made the trade, I was watching the market because I noticed it was nearing a strong resistance. However, the price shot through the resistance, and I bought at 1.35351. The price hit my stop loss at 1.35234 for a loss of 11.7 pips and 117 dollars. As soon as I bought, the price fell, and knocked me out very soon after. I should have waited for a couple more bars to see if the trend would hold after breaking the strong resistance. Obviously, it did not. I was not happy with this trade, and it is possible that that emotion might have carried over to the next trade, when I bought EURUSD very soon after. This was the first of two trades I made this day that knocked me out for the day because I reached my maximum loss per day.

11/17/11: EUR/USD

SELL: 1.35278

CLOSE: 1.35149

LOSS: $129, 12.9 pips

This time, I waited for three strong green bars before getting into the trade. I bought at 1.35278 and was knocked out by my stop loss at 1.35149, for a loss of 13.9 pips and about 129 dollars. I made a big mistake with this trade. I did not realized that the resistance had not been broken, and the price was about to reverse. Because I am on the one minute scale, I didn't realize how small the movement over the resistance actually was. The price actually was reversing, and I got into a trade against that reversal. The price fell, and took out my stop loss. I should've realized that the trend was not going to continue, especially since I was watching the area of resistance so closely. Hopefully, I will be smart enough not to repeat this mistake. In addition, it was at this point in time I realized the value of trading on the 5 minute timescale, as opposed to the one minute timescale, and adjusted my trading strategy accordingly.

11/18/11: EURUSD

SELL: 1.35422

CLOSE: 1.35504

LOSS: 8.2 pips, $82

Figure 7: GM 11-18-11 Trade 1

This was a very disappointing trade for me, as it was a very good trade. I got in when I noticed a strong downtrend, and the price had clearly broken the 50% retracement line from the previous uptrend. After I got it, the price fell 19 pips (my take profit was at 20), and I figured that I would just wait for my take profit to take me out of the trade, as the trend was strong enough that I did not see a retracement taking out my stop loss. I was comfortable enough with my trade that I began messing around with trailing stop losses in TradeStation. I couldn't figure out how to move the stop loss all the way up to my break-even point, but I did manage to move it up a pip or two. However, there was a retracement, and I watched as the price moved all the way up to the exact pip of my stop loss, taking me out of the trade in the process, before plunging 30 pips. Last week I promised I would not trade too quickly after trading, so I sat tight while I watched the trend move strongly down to the support I had drawn. Obviously, I was in the position to profit greatly from this trade, but my low stop loss took me out of the trade

prematurely. I don't think I have much to learn from this trade, other than good decisions sometimes turn into bad trade because of how unpredictable the market is.

11/21/11: USD/CAD

BUY: 1.03818

CLOSE: 1.04003

PROFIT: 18.5 pips, $177

Figure 8: GM 11-21-11 Trade 1

This was my first profitable trade in three trades, so it was a relief to finally get a good trade under my belt. I traded in a strong uptrend, and got into the trade as soon as I noticed three strong green bars in a row. I then rode the price up until my take profit took me out of the trade.

This was fine, as there were only about five more pips to be made before the price retraced. I was very satisfied with this trade, as it was a good decision to get in, and I made it out with the maximum profit possible with my 20 pip take profit.

11/21/11: USDJPY

BUY: ~77.210

CLOSE: ~77.310

PROFIT: ~ 10 pips, ~$109

Figure 9: GM 11-21-11 Trade 2

Although I made a decent profit off of this trade, I do not consider it to be a good trade. I was on my computer, and glanced over to see that USDJPY was moving very strongly, with the current trend. After two strong green bars, the third was moving upward rapidly, so I decided to take my chances and get in while the price was still moving. I followed the price up another ten pips or so before I got nervous enough to take myself out of the trade. I exited near the peak of the price movement, so it was a good decision to get out when I did. However, I think this was a much more risky trade than what I usually will trade on, and I'm not sure the risk was worth it. It was a quick decision, and I went in rather blind. In the future, I think I would like to stick to the sidelines when I see a movement like this. The reason why the data at the top is all estimations is because TradeStation has no record of me making this trade. It's very odd, but the only indication that I have on my account that I made this trade is an unaccounted for 109 dollars in my account this week. I'm not sure why this is.

11/23/11: USD/CAD

BUY: 1.04841

CLOSE: 1.04862

PROFIT: 2.1 pips, $20.03

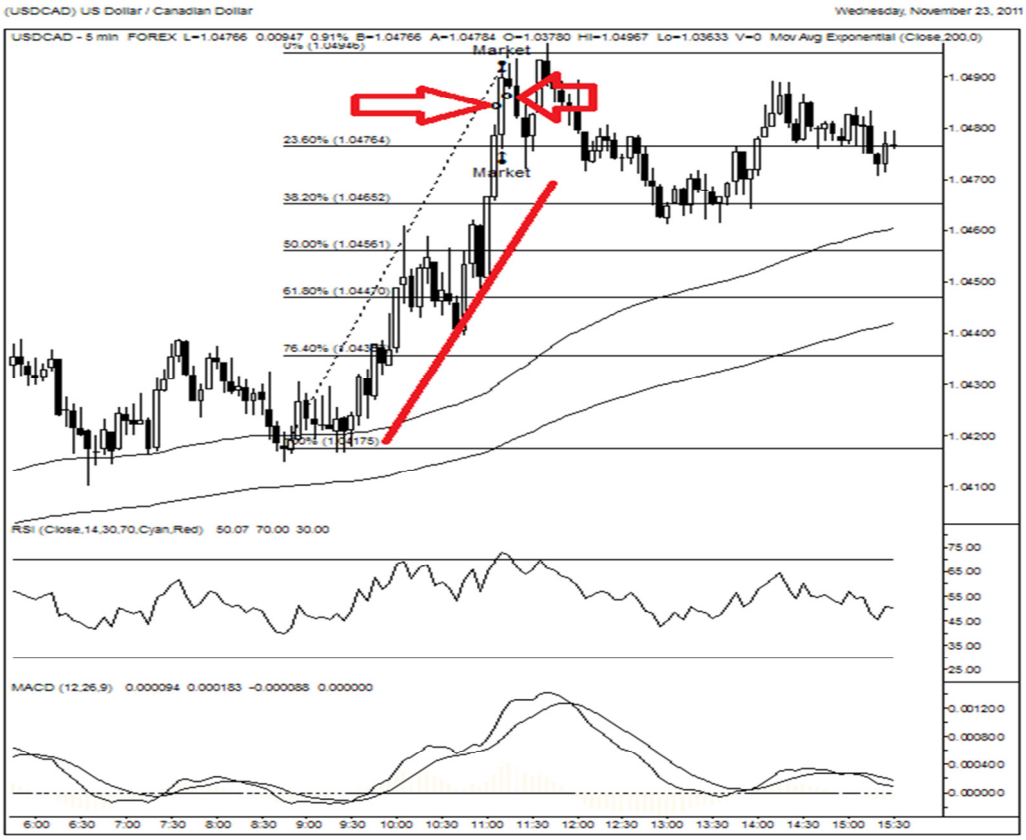

Figure 10: GM 11-23-11Trade 1

I got into this trade very hesitantly, and got out very quickly because I decided I just wasn't okay with trading in a market that was unpredictable. I had been watching USDCAD all morning, but it wasn't moving very much. The price then moved up almost twenty pips, but I wasn't comfortable getting into a trade when I noticed the movement, most because I was worried that I would get into a trade and the price would retrace, taking out my low stop loss. It then made another twenty pip movement that I was reluctant to get into again. The price then retraced 50 percent, and shot up. I watched two strong ten to fifteen pip green bars (I trade on the 5 minute timescale), just wishing I had gotten in on the retracement. However, I couldn't bring myself into the trade, as I kept thinking to myself that the price was bound to retrace soon. However, each time, it did not. Finally, I got fed up and decided to enter the trade. Once in the trade, I regretted the move immediately, as it was obvious the price was not moving as strongly

as before. Because I was not comfortable, I got out, and the price raised another three pips before retracing. I think I should have had the sense just to stay out of the trade, especially if I was uncomfortable with it. In addition, I think I should have been able to recognize that there was a great trade opportunity, as the benefits obviously outweighed the risks, as the market was in a very strong uptrend.

11/25/11: EURUSD (group account)

SELL: 1.33015

CLOSE: 1.33137

LOSS: 12.2 pips, $539

Figure 11: GM 11-25-11 Trade 1

This was a large loss because I was trading with four standard lots. This was a trade I made simultaneously on the group account and my personal account. I made this trade because [102]

the Euro was moving very strongly downward, quickly, and I waited until there was a definite movement after a small retracement. In addition, I did not see any large supports within twenty pips, so I figured this would be a good trade. However, it obviously was not. A little after I got into the trade with both accounts, the price started to reverse. I had prepared myself that with my strategy of waiting for a movement until I get into the trade, there was a possibility of a retracement before the price continued to fall. Unfortunately, this was not a retracement, it was a reversal. Not too long after I got into the trade, my stop/loss took me out, and the price continued upward from there. I think this trade was a loss because I waited too long to recognize the movement and get into the trade. I was kicking myself over this trade because it was such a huge loss because of the group account, and also because the trend had been apparent for a while, it just seemed like there was never a good time to get into a trade. In the future, I will avoid trading these quick movements, because they have proved to be unhealthy for my account.

12/2/11: EURUSD

SELL: 1.33897

CLOSE: 1.33973

LOSS: 7.6 pips, $76

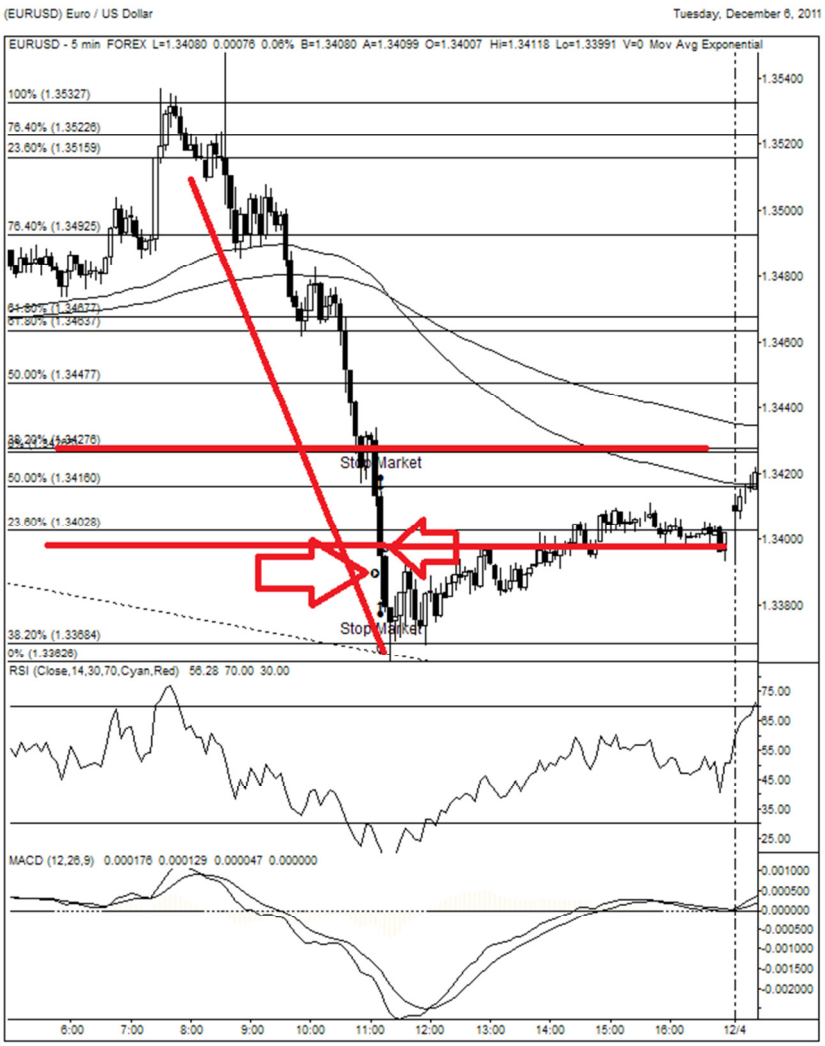

Figure 12: GM 12-2-11 Trade 1

For this trade, I was experimenting with using support and resistance lines to create future trades. I found a heavy support level, and set a stop limit at approximately 30 pips below the level (it was a big move). Not too long after, I noticed the price was moving quickly, and sure enough, it broke through the support. I look special interest in watching the price, because I did not know how to set stop losses when using a stop limit trade. This is something I have to figure out if I am going to continue to trade this way. However, I watching when my stop limit got me into a trade. However, I noticed that since the price was moving so quick, there was a lot of movement each way. Soon after placing my stop loss and my take profit, I realized that my 10

pip stop loss was likely to take me out of the trade. This is exactly what happened, and the price continued to fall for a bit even after I got out. Interestingly enough, I think I placed my stop limit too far away from the support as well, as the movement didn't continue too long after I was out of the trade. I probably should have a maximum distance of about 25 pips. In addition, when trading this way, I should alter my stop loss to respect the quick movements that are possible when trading in this manner. In addition, the RSI was indicating oversold when I got into the trade. I should pay for attention to this, as even with big movements, this typically indicates an impending reversal.

12/7/11: EURGBP:

SELL: 0.85510

CLOSE: 0.85442

PROFIT: 6.8 pips, $106.31

Figure 13: GM 12-7-11 Trade 1

This trade was a good trade. I got into it because I noticed a strong downward trend, and RSI that was not yet indicating oversold. In addition, the price was not too near any support levels I had for this currency pair. One thing I noticed when I got into the trade was that there was not a lot of liquidity in the market, and the price was not moving as fast as I expected, coming from high liquidity currency pairs such as EURUSD or USDCAD. I stuck with it anyway, and I decided that I was satisfied with my profit when I got out of the trade. I got out because the price was approaching overbought levels in my RSI. In addition, I had to leave for class soon, and I was not sure that the trend would continue without a reversal. I was happy I got out because the price started to go up after I exited. Upon looking back at the end of the day, I

see that there were more pips to be made from the trade. Nevertheless, I am happy that I was able to get out with a profit, and when I was ready to get out of the trade.

A.2 Devin Kehler

Below is a chart of all the trades made between 11/02/11 and 12/07/11. Trades made before this point are insignificant, and there were no trades made afterwards. Detailed analysis for the first 3 trades has been omitted, as those trades were never properly documented.

Date	Time	Type	Size	Currency	Pips	profit
11/02	8:41 PM	long	1 lot	EURUSD	1.5	$15
11/02	8:50 PM	long	1 lot	AUDUSD	-8	-$80
11/06	7:37 PM	short	1 lot	AUDUSD	-10	-$100
11/06	7:54 PM	short	1 lot	EURUSD	-12.8	-$128
11/07	9:10 AM	long	1 lot	EURUSD	7.9	$79
11/07	9:11 AM	long	1 lot	EURUSD	1.8	$18
11/07	9:17 AM	long	2 lots	EURUSD	1.2	$24
11/07	10:07 AM	short	1 lot	EURUSD	-10.7	-$107
11/07	10:25 AM	short	1 lot	EURUSD	0.6	$6
11/07	10:25 AM	short	1 lot	EURUSD	0.1	$1
11/07	10:26 AM	short	1 lot	EURUSD	4.5	$45
11/08	10:46 AM	long	1 lot	EURUSD	-20.2	-$202
11/10	9:35 AM	short	1 lot	EURUSD	5.2	$52
11/11	10:11 AM	long	1 lot	USDJPY	0.4	$5.19
11/11	10:45 AM	short	1 lot	USDJPY	-6.5	-$8.42
11/15	10:12 AM	short	1 lot	AUDUSD	1.1	$11
11/16	10:03 AM	short	1 lot	EURUSD	11.4	$114
11/17	9:20 AM	short	1 lot	EURUSD	5.1	$51
11/18	9:56 AM	long	1 lot	AUDUSD	10.8	$108
11/21	10:03 AM	long	1 lot	AUDUSD	-10.1	-$101
11/21	11:25 AM	short	1 lot	EURUSD	0.1	$1
11/22	11:08 AM	long	1 lot	EURUSD	-12.9	-$129
11/29	10:05 AM	short	1 lot	AUDUSD	-9.8	-$98
12/01	10:10 AM	short	1 lot	AUDUSD	9.7	$97
12/02	9:50 AM	long	1 lot	EURUSD	-8.8	-$88
12/07	10:14 AM	short	1 lot	EURUSD	-8.5	-$85
				Totals	-56.9	-$494.39

Table 2: Trades made on $100K account from 11/02/11 to 12/07/11

11/06 7:54 PM

Short EURUSD, 1 lot

Open 1.37787

Close 1.37915

Profit -$128

At this point, I was fairly new to the trading game. My biggest mistake here was in my trading strategy. The nature of my trading strategy was quite risky; it involved trading against a trend and trying to catch reversals. My first few trades were big losses because I had trouble spotting real reversals. At this point I was using the MACD divergence and my own trend lines to help predict where a trend would reverse.

11/07 9:10 AM

Long EURUSD, 1 lot

Open 1.37737

Close 1.37816

Profit $79

The following day I started trading in the mornings instead of the evenings. I figured the increase in market movement, especially in EURUSD, would help me find the trends and use them to my advantage. Though this one, and my next few trades were more profitable than the previous week had been, in the long run trading in the morning versus the evening made little, if any, difference. The problem I was having was in my trading strategy.

11/07 9:11 AM

Long EURUSD, 1 lot

Open 1.37774

Close 1.37792

Profit $18

Fueled by my temporary success, I made another trade immediately. This was probably a mistake, but it turned out alright in my favor. After two successful trades in a row, I truly believed that switching to the morning trading session had made a significant difference, so I kept trading.

11/07 9:17 AM

Long EURUSD, 2 lots

Open 1.37674

Close 1.37686

Profit $24

This trade was mostly unintentional. I was experimenting with limit orders and accidentally two lots instead of one. I panicked and closed the order as soon as I could. The good news was that I managed to close with some profit, so I hadn't lost anything to this experiment, but I probably should have stopped trading for the day after that.

11/07 10:07 AM

Short EURUSD, 1 lot

Open 1.37949

Close 1.38056

Profit -$107

As mentioned previously, I probably should have stopped before this trade and been happy with my daily winnings. Unfortunately, I was greedy. Also I wanted to understand this pattern I'd stumbled across. In my quest for "understanding" I lost about $100, but the day didn't end there.

11/07 10:25 AM

Short EURUSD, 1 lot

Open 1.37758

Close 1.37752

Profit $6

This trade, as well as the next few, was an attempt to get back what I'd lost that day, even though at this point I was still up $21 for the day. Another thing to note is how quickly each of these trades were opened and closed. I lacked patience at this point in the game.

11/07 10:25 AM

Short EURUSD, 1 lot

Open 1.37736

Close 1.37735

Profit $1

I doubted each trade I mad at this point, closing them as soon as they made any profit at all. I should have realized that this trading pattern was a recipe for disaster. At the very least, I should have quit when I saw that I was making little to no profit on these trades.

11/07 10:26 AM

Short EURUSD, 1 lot

Open 1.37733

Close 1.37688

Profit $45

Finally, after 7 trades, I was done for the day, and thankfully, I had made $66, which met my daily goal. Still, this didn't reflect well on my control when trading. I should have realized that I needed to take a break. Unfortunately, I was back the next day, with a whole new batch of bad ideas.

11/08 10:46 AM

Long EURUSD, 1 lot

Open 1.38071

Close 1.37869

Profit -$202

Normally, this kind of trade would never happen. This day was different however. My typical stop-loss is 10 pips, and it's mainly because of trades like this that I stick to it so strictly now. As the price approached my stop loss, I became convinced that the trend would reverse just outside of the 10 pip stop loss, so I moved it to 20. This was a huge mistake, and the result was an additional $100 loss.

11/10 9:35 AM

Short EURUSD, 1 lot

Open 1.36089

Close 1.36037

Profit $52

I took a break for a day after my devastating loss. I returned refreshed and ready to try again. This trade was one of the only times I successfully charted a reversal and profited from it. Below is a chart with the trend line I drew. As one can see, the price was respecting this line, so I knew that I had to wait for a strong break before I entered.

Figure 14: November 10, 2011 9:35 AM, 1 lot EURUSD

The peaks of the MACD declined while the peaks of the price increased. In a strong trend this negative divergence can be a very good sign of a reversal. This reversal starts as soon as the price breaks the trend line. I waited until a few red candles had formed beyond the trend line to open my position. As soon as I opened the position I set a 10 pip stop loss and 10 take profit. Neither were used, as I closed the trade myself after I reached my target of 4 pips.

11/11 10:11 AM

Long USDJPY, 1 lot

Open 77.229

Close 77.233

Profit $5.19

The next day I decided to try something completely different, and not very logical. I opened a couple positions (this trade and the next) in USDJPY for a change, despite what should have an apparent lack of movement for that currency. USDJPY moves very little even in the Asian session in the evening. I should have known that this wouldn't end well.

11/11 10:45 AM

Short USDJPY, 1 lot

Open 77.065

Close 77.130

Profit -$84.20

My first trade with USDJPY probably gave me false hope that I could gain small amounts of profit per trade. This loss of almost $85 showed me that I was sorely mistaken in that respect.

11/15 10:12 AM

Short AUDUSD, 1 lot

Open 1.01656

Close 1.01645

Profit $11

After my troubles with USDJPY, I decided to stick with more volatile currencies. I have since only traded AUDUSD and EURUSD. This week, I was very lucky and all 4 of the trades I made turned a profit. I was still using trend lines and MACD divergence to chart reversals, as it hadn't occurred to me yet that this might not be the best strategy.

11/16 10:03 AM

Short EURUSD, 1 lot

Open 1.35045

Close 1.34931

Profit $114

On this Wednesday, I noticed something that could change my trading strategy. Whenever both the stochastic oscillator and the commodity channel index peaked, it marked a peak in the price movement. This can be used to chart reversals as well verify ahead of time that the price will respect a trend line. In the chart below, I circled a few key points where the absolute value of the CCI is over 200 and the stochastic oscillator is outside the 20-80 range. The third point I've circle is the reversal that I opened a trade on.

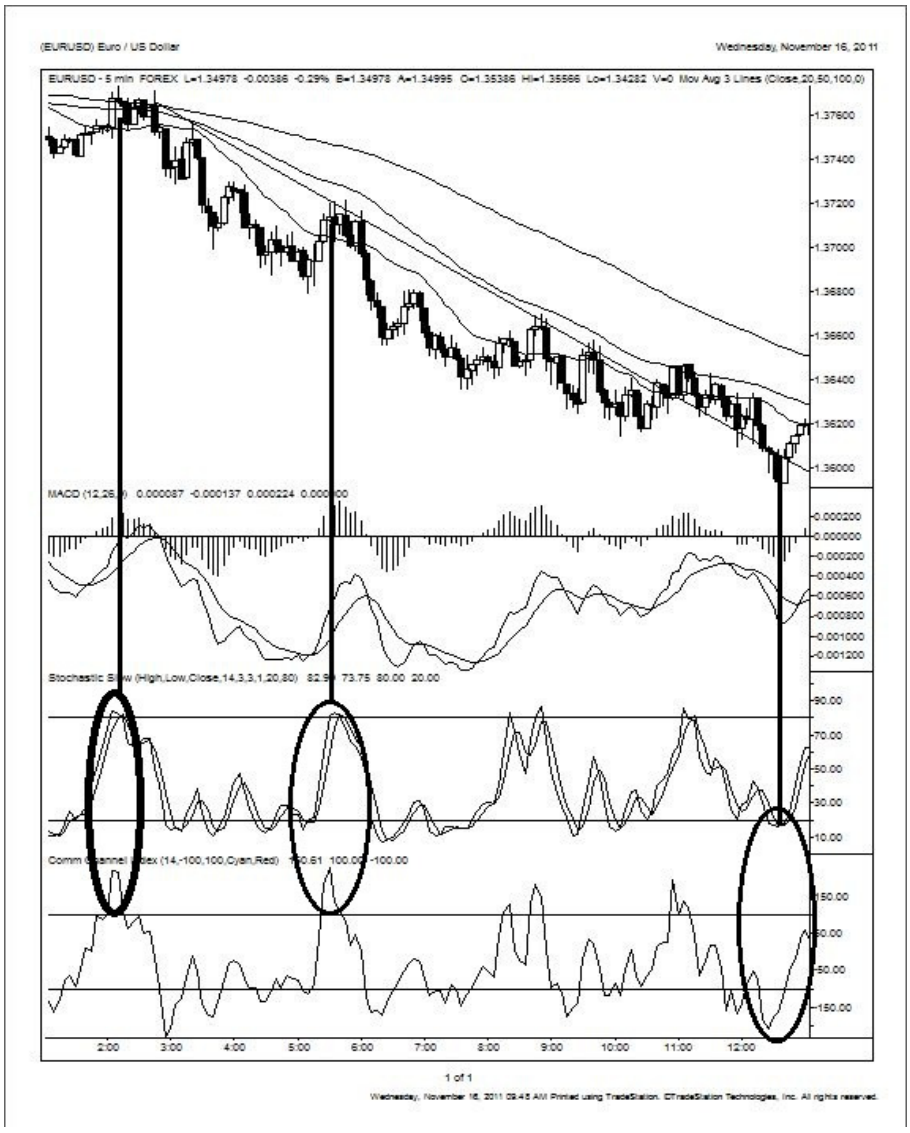

Figure 15: November 16 2011, 10:03 AM, 1 lot EURUSD

11/17 9:20 AM

Short EURUSD, 1 lot

Open 1.35155

Close 1.35104

Profit $51

For The next few days, I tried out my new trading method, and it seemed to work quite well. I would watch the CCI to see when it peaked, and if that peak was outside +/-200, then the

stochastic oscillator would be the trigger to open a trade. As soon as the stochastic peaked and reversed, I would open a trade. Below 20 means oversold, so I would buy; over 80 means overbought, so I would sell.

11/18 9:56 AM

Long AUDUSD, 1 lot

Open 1.00397

Close 1.00505

Profit $108

This was another good trade. It seemed that this new method was working quite well. I was still sticking to only trading with EURUSD and AUDUSD. It's easy to follow just those two as they seem to share many of the same trends.

11/21 10:03

Long AUDUSD, 1 lot

Open 0.98515

Close 0.98414

Profit -$101

Of course even with my new seemingly bullet-proof strategy, some days I just can't win. This week was shorter because of the Thanksgiving holiday, but I still incurred some big losses.

11/21 11:25 AM

Short EURUSD, 1 lot

Open 1.35069

Close 1.35068

Profit $1

A lesson I still hadn't learned at this point was that I shouldn't trade to make back what I had lost. I only made back $1 of the 101 I lost an hour ago, and thankfully I think this convinced me not to try again that day.

11/22 11:08 AM

Long EURUSD, 1 lot

Open 1.35094

Close 1.34965

Profit -$129

This trade was no better than the one's I'd made the previous day, and I began to question just how good my new trading strategy was. With two days of pretty heavy losses, I left for the Thanksgiving break with mixed feelings about this new strategy.

11/29 10:05 AM

Short AUDUSD, 1 lot

Open 1.00092

Close 1.00190

Profit -$98

It had been a week since I'd last traded, but not much had changed. I was definitely on a losing streak, but I wasn't convinced that it was time to quit yet on this my new trading strategy. Still, with more heavy losses piling up, I began to be discouraged and I traded less as a result.

12/01 10:10 AM

Short AUDUSD, 1 lot

Open 1.02531

Close 1.02434

Profit $97

A couple days later, I traded again and had a good win. This gave me confidence that my combination CCI and stochastic method may have some merit to it after all. The only reservations I had at this point were whether or not I was actually using these indicators to trade against a trend properly. If the price movement had no trend, my method would be quite useless. I began work on a robot to test the effectiveness of this strategy over a broader period of time.

12/02 9:50 AM

Long EURUSD, 1 lot

Open 1.34740

Close 1.34652

Profit -$88

The week came to a close with a net loss of almost $100. I decided I needed to trade less until I got my robot working and could test my trading method. The next week I only traded once, and since then I haven't traded at all.

12/07 10:41 AM

Short EURUSD

Open 1.33704

Close 1.33789

Profit -$85

Over the course of my final few trades, I noticed a disturbing pattern. I was trading according to the signals I was interpreting from the CCI and stochastic, but with no indication of which way the trend was moving. I previously suspected that this strategy might not work on a chart with no trend, but I now suspected that it also might not work very well as a stand-alone

way to predict reversals. I looked at some of my previous trades and concluded that most of the money I'd made had not been trading on reversals, but trading with the trend. When I trade counter-trend, as in this trade pictured below, most of the time I lost money.

Figure 16: December 7, 2011, 10:41 AM, 1 lot EURUSD

It's clear at this point that if my strategy is ever going to work consistently, I need some way of determining which way the market is moving.

Appendix B: Programming Projects

B.1 Group project

For our group project, we have decided to create an indicator that measures the strength of a currency. The main concept behind this indicator will be the volume of the market and the percentage change based on precious closes. However, the indicator will not be an evaluation of the current currency pair, but rather of a specified currency. The indicator will then evaluate the percentage closed against various currency pairs. These currency pairs will be selected simply by how important they are in the Forex market. We imagine the currencies we have for this indicator for would be USD, AUD, EUR, CAD, NZD, JPY, GBP, and CHF. It shouldn't be too hard to add currencies in the future either, but those are the currencies we plan on starting out with. In addition, it is important that we weight the currencies that are associated with each other. For instance, the AUD and NZD are very closely related, so we will probably give them an 80/20 split in favor of the AUD, just because it is a more traded currency. We will have to do a significant amount of research into how associated certain currencies are with each other. Long term data will really help here, because we are not planning on altering these as data is processed. However, it might be beneficial to use the association of currencies as a coefficient of one currency and then subtract that association from one and use that as the coefficient of the other related currency. The volume will be calculated as the number of ticks in the chart over a certain time period. It is possible that we will use a moving average of the volume in order to get a smoothed out result. Initially, we had the indicator figure out the current currency pair, and then display the two currencies involved, and their strengths. However, we decided that it would be more informative to the user to have all the currencies and their strengths displayed. Farther into the future, we might want to add an indicator or two in order to increase the usefulness of

trading with this indicator. A possibility I have considered is adding all of the momentum indicators, and having the number or line change colors when one, two or three of the momentum indicators go into an overbought or oversold region.

Currently, as written, the indicator is able to compute the strengths for all currency pairs of the seven currencies listed in the previous paragraph. When the indicator is used on the chart, it displays all of the currencies and their respective strengths. The strength values are calculated by multiplying each percentage change of each currency pair of that currency by the volume of each currency pair. Then, the strength values are set to a scale that ranges from -10 to 10. This scale is based off of the hour four time period, and is calculated via the equation:

$$\frac{\log(\frac{Avg(perc\ change * volume)}{91.168882})}{\log(1.727958)} = Scale\ of\ a\ currency$$

Next, we also would like to weight associated currencies so that using percentage changes from all major currencies will not hurt the legitimacy of the strength indicator.

Figure 17: Group Programming Project

B.2 Gabriel McCormick's Robot

After much deliberation, I decided I will create a robot based on my current trading strategy. I think this would be best for both my trading and for the robot. My trading will benefit because (hopefully) I will develop my strategy further, and will likely come out with a much more systematic approach. As of right now, my trading strategy consists of mainly using support and resistance lines, most notably the lines created by Fibonacci retracement lines. In addition, I make heavy use of moving averages, mainly as an indication of the current (and past) market trends. I make it a point to not trade against the trend, as I find that it incurs more risk than necessary. In order to convert this trading strategy to a robot, I need to define exactly when the robot will go into and get out of a trade, among other important aspects. First, there will be an if-statement over the entire buying/selling code that ensures if the robot is going to trade, it is trading with the current trend. If it is not or if the trend is not strong then the robot should not trade. Because this is one of my most important evaluations of a trade, I think it needs to be prominent in my code as well. In addition, if there is not an established trend, the robot should not trade. This is the most important risk analysis that the robot will be doing. To define when the trend is not strong enough, I will need to define some condition, whether it be a slope of a specific moving average, or maybe even when the slopes of two moving averages, one slower and one faster, Obviously this is the type of thing that will need to be back tested (and forward tested), but it is important to have a couple of options in place. As for actually getting into a trade, I think I will have the robot operate on the 15 minute timeframe. Then, the robot will identify the high and low points of the market. If the low (or high) point in the market is within a set number of bars, the robot should ignore it. But once the high point (or low) moves outside this set area, there is probably a period of retracement occurring. The robot should then

concentrate on two important values, the 61.8% and the 50.0% retracement area. The stronger level is obviously the 50% retracement line, but in strong trends, the price often will not retrace to these levels, which is why both should be monitored by the robot. Once these areas are neared, the robot should start monitoring for a reversal. I think the best bet would be to look for a certain number of strong bars (small wicks) in a row. This is another point where I'm not sure what will work best. It is possible that I could use a couple of short term moving averages to provide the best indication. It's possible that adding a couple more indicators will come in the future as I refine the robot itself. One problem I foresee is that huge market movements could probably throw the robot off, as it will see a strong trend coupled with a large retracement. However, the market is not very likely to move upward after huge movements.

Symbol		EURUSD (Euro vs US Dollar)			
Period		15 Minutes (M15) 2011.01.02 23:00 - 2011.10.10 00:30 (2011.01.01 - 2011.12.01)			
Model		Every tick (the most precise method based on all available least timeframes)			
Parameters		takeProfit=20; Lots=1; TrailingStop=10;			
Bars in test	13058	Ticks modelled	8402238	Modelling quality	90.00%
Mismatched charts errors	90				
Initial deposit	10000.00				
Total net profit	124.82	Gross profit	124.82	Gross loss	0.00
Profit factor		Expected payoff	15.60		
Absolute drawdown	1038.18	Maximal drawdown	1121.18 (11.12%)	Relative drawdown	11.12% (1121.18)
Total trades	8	Short positions (won %)	5 (100.00%)	Long positions (won %)	3 (100.00%)
		Profit trades (% of total)	8 (100.00%)	Loss trades (% of total)	0 (0.00%)
	Largest	profit trade	21.82	loss trade	0.00
	Average	profit trade	15.60	loss trade	0.00
	Maximum	consecutive wins (profit in money)	8 (124.82)	consecutive losses (loss in money)	0 (0.00)
	Maximal	consecutive profit (count of wins)	124.82 (8)	consecutive loss (count of losses)	0.00 (0)
	Average	consecutive wins	8	consecutive losses	0

Figure 18: Back testing results for one year

Currently, after back testing, my robot is making profitable trade one hundred percent of the time. However, I back tested the robot over the course of a year, and the robot only made 8 trades, which is obviously not ideal. Unfortunately, I think I am running into an issue with my history, as when I test I get errors in the month of March (notice the mismatched chart errors in the previous figure. I think these errors are causing the back test to quit, which would explain the

low volume of trades. The robot made a total of 124.82 dollars, using a trailing stop loss of 10 pips, and a take profit of 20 pips. Out of the eight trades that the robot made, two of them hit the trailing stop loss, one mak8ing a small profit, and the other breaking even. The other six trades all hit my take profit and earned twenty dollars.

My robot, in its current state, is very similar to how it is describing in the preceding paragraph. However, there are still a number of features that I have yet to add. Currently, there is no exit strategy to a trade except for a twenty pip take profit and a stop loss. I would really like to increase the take profit, and then add an exit strategy that will detect a variance from the current movement. This should allow me to earn much more than what I was previously earning. Farther into the future, in order to maximize my profit, I would also like to add in a weight to each trade and have the robot adjust the lot sizes that it enters into the trade with accordingly. The robot right now is completely dependent on the 50% retracement lines, and I would also like to add in some code that would allow the robot to trade on the 61.8% retracement lines as well. I would probably have to add strength criteria to the current market that would evaluate whether the 61.8% retracement lines should be traded, or if the robot should wait until the price falls to the 50% retracement line.

B.3 Devin Kehler's Robot

I designed my robot around a trading strategy I developed a few months ago. The CCI and stochastic oscillators both show indications of a currency pair being overbought or oversold. Originally, I used this to trade against the trend and try to catch a reversal. What I realize now is that, despite the fact that successfully catching a reversal would give me quite a bit of profit, the chances of doing so are hardly worth it. The better strategy is to use the CCI and stochastic

indicators to predict retracement. If the trend is strong enough, the price is more likely to respect a trend line and continue in the same direction, than reverse direction.

This of course begs the question, what is strong enough, and how do we measure that? When I first conceived of this idea with CCI and stochastic, I was drawing trend lines to help anticipate the price movement. Unfortunately, the task of getting a robot to reliably draw those same trend lines is something I haven't figure out yet. An alternative is to use 3 moving averages (I chose 20day, 50day and 100day EMA); the closer the lines are to parallel, the stronger the trend, and this is something that's much easier for a robot to measure that where to draw a trend line.

Since I realized that this would inevitably be a very complicated robot, I broke it into stages. The first stage is a simple bot that buys and sells according to two moving averages, 14 day and 26 day; I chose the 14 and 26 day EMAs to mimic the MACD as an entry signal. Before even adding the CCI and stochastic indicators, I wanted to make sure that I could develop a robot that could buy and sell. However, due to some difficulties in downloading from the history center, I've been unable to properly back-test my robot. After many attempts and reinstallations of MT4 software, I still have no results for my robot's performance. Below is the script for my robot, which I believe should work.

```
//+------------------------------------------------------------------+
//|                                                Devin Robot.mq4 |
//|                                                   Devin Kehler |
//|                                                                |
//+------------------------------------------------------------------+
#property copyright "Devin Kehler"
#property link      ""

//--- input parameters
extern double    takeProfit=20.0;
extern double    Lots=1;
extern double    stopLoss=10.0;
//+------------------------------------------------------------------+
//| expert initialization function                                   |
//+------------------------------------------------------------------+
```

```
intinit()
  {
//----

//----
return(0);
  }
//+------------------------------------------------------------------+
//| expert deinitialization function                                 |
//+------------------------------------------------------------------+
intdeinit()
  {
//----

//----
return(0);
  }
//+------------------------------------------------------------------+
//| expert start function                                            |
//+------------------------------------------------------------------+
int start() {


    // check to see if there are enough bars o run the program
if (Bars<100){
Print("Bars less than 100");
return(0);

  }

if(cross() == 1)
buy();
else if (cross() == -1)
sell();

return(0);
}

  //checks  to  see  if  moving  averages  cross,  returns  buy/sell
instruction
int cross(){

doublemaShort=iMA(NULL,0,14,0,MODE_EMA, PRICE_CLOSE, 0);
doublemaLong=iMA(NULL,0,26,0,MODE_EMA, PRICE_CLOSE, 0);

doublediffCurrent = 0;
doublediffPrev = 0;

inti = 0;
intretValue;

while(i<2){
diffPrev = diffCurrent;
if(maShort>maLong){
diffCurrent = 1;
         }
else
```

```
diffCurrent = -1;

i++;
     }

if(diffCurrent>diffPrev){ //moving average cross up, buy
retValue = 1;
     }
else if(diffCurrent<diffPrev) { //moving average cross down
retValue = -1;
     }
else
retValue = 0; // do nothing

return(retValue);
  }

void buy(){
int ticket;
   ticket       =       OrderSend(Symbol(),       OP_BUY,Lots,Bid,3,Ask-
stopLoss*Point,Ask+takeProfit*Point,"Robot buy",1234,0,Green);

if(ticket>0)
   {
if(OrderSelect(ticket,SELECT_BY_TICKET, MODE_TRADES))
Print("BUY order opened : ",OrderOpenPrice());
   }
else
Print("Error opening BUY order : ",GetLastError());

 }

void sell(){
int ticket;
   ticket                       =                       OrderSend(Symbol(),
OP_SELL,Lots,Bid,3,Ask+stopLoss*Point,Ask-takeProfit*Point,"Robot
sell",1234,0,Red);

if(ticket>0)
   {
if(OrderSelect(ticket,SELECT_BY_TICKET, MODE_TRADES))
Print("SELL order opened : ",OrderOpenPrice());
   }
else
Print("Error opening SELL order : ",GetLastError());

}

//+------------------------------------------------------------------+
```