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Forex Trading and Investment

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Forex Trading and Investment

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Abstract

Trillions of dollars every day go through financial district of New York. Many of the wealthiest people in the United States and the world attribute their fortune being made in the financial markets. After realizing that there is plenty of money to be made, it poses the question how does one learn to trade? While people can be taught terms, indicators, and general knowledge, there is a type of mentality and talent that one needs to have to be a good trader. If one can create a great program or have a great strategy to make money in the financial district, then starting a company and managing money for other people is not far off in their future. The focus of our IQP is learning how to trade in the forex market and seeing how realistic it is to start a company off of what we learned.
Section 1: Introduction

The physical trading of goods and commodities has been around for thousands of years and impacts everyday lives. Back then it was the trading of clothes and food, while today people trade on a wide range of food, clothes, electronics, and much more. No matter where anyone goes, their lives are defined by trading for necessities. From this idea, the formation of the financial district was born. As mankind progressed, so did their systems for trading, and from this, Wall Street was born. These economic markets were created as a central hub for all trades to be made on a large scale for major companies and countries. Foremost, countries around the world depend on these economic markets for stability, growth, and above all else wealth. The modern age and the streamlining of information has brought investments and trading to a personal level as never before. People are able to form jobs and companies from their own homes based off of strong ideas and hard work. This paper will look at how the foreign exchange and stock market can be analyzed and made into profit. While this paper focuses on the foreign exchange market in particular, a good understanding of how the stock market works can provide a trader with a strong fundamental analysis of their own countries relative strength.

Stock markets are the major source for companies to raise money and act as public trading forum for traders. By subdividing companies into multiple shares, it makes it possible for people to gain money off of newly established companies. While some people see this as a gamble, it is merely an investment in a particular idea. By performing proper analysis and research into what the consumer wants and how much they are willing to spend, people can easily invest in a company knowing that they will succeed. The stock market offers a unique service for people to make a fortune by giving money to new companies. While this is a risky business, it is one that has thrived since its creation. The modern age has allowed for the trading between countries on a global scale, which has given rise to a new type of market.

The foreign exchange market, which shall henceforth be referred to as forex market, is a new type of trading system that trades currencies. This is a specialized system that puts two currency pairs together and judges the relative strength between the two. The beauty of this market system is that it allows people with very little money to be able to participate in the financial district. Other markets such as stock, commodities, and futures, requires a large surplus of funds before investing to see any real profit in a reasonable amount of time. However, the risk
attached with this market is more in-depth than any other market. The fundamental analysis of the stock market involves looking into the background of companies, while the fundamental analysis of forex requires one to look into the background of countries. This analysis can be much trickier and harder to determine a pattern, which could potentially result in a loss of the initial capital invested. However, similar to any market, one must develop a system which follows some parameters and not just trade blindly. While this market definitely poses more risks than others, it is not at all the same as gambling. With a strong sense of economics and a good strategy using a combination of technical and fundamental analysis, one can be prosperous in this market.
Section 2: Background Information

The following subsections go through the information needed to grasp the basics of this IQP. By understanding the basics of the economic markets and how they were formed, one will understand how to navigate them. While not all of this information is used in our methodology, all of it was used to create a system that worked best. Specifically, the fundamental and technical analysis has lots of useful information that can be used to create multiple strategies for trading, but not all of it will be used in each strategy.

2.1: Economic Markets

Major countries around the world depend on economic markets for stability, growth, and above all else wealth. Whether it is through stock, forex or commodities, markets such as these are very important to countries. As we saw in the Unites States during the 1929 stock market crash, which signaled a 10-year great depression. These markets are vital to the world economic structure, but that is not their only purpose. Whether it is forex or stock, both markets can be used for individual gain if one has a strong system or process to follow. Both of these markets will be explained in greater detail in the following sections.

2.1.1: Stock Market

Stock is an entity of a company or an organization representing the investment of its founders in the business. It is a share of ownership in a company. The amount of shares a person holds represents the percentage of his/her (for the sake of space and simplicity, the personal pronoun of he will hence forth refer to as neutral gender pronoun including both males and females) ownership of that company. Technically, as an owner, he has the right to a percentage of the companies’ materials but also the partial earnings and a vote to elect the board of directors in the company meetings.

Being an owner as a stock holder does not mean that he has to stay at the company and order the employees what to do or suggest the managers what actions they should take. Moreover, the investors cannot exploit the company’s properties as their own. In fact, a shareholder has a one vote per share to elect the board of director who will act as a head and look out for the prosperity of the company. If the director is not performing well, the shareholders have the right to remove the management by calling a company meeting. However, the shareholders who have enough shares have the right to attend company meetings and express
their choices of management. Otherwise, there will be millions of people in the company meeting casting their votes and it will be chaotic. Most of the time, shareholders are not accountable for the debts of the company. However, if the company goes bankrupt, the stockholders are paid back partially (or none at all) after creditors and bondholders get their investment back.

Stock is risky because there is no guarantee that the shareholders will be paid off dividends even though they have the claim to the earnings of the company. Stock is usually traded by shareholders for its appreciation in the market, i.e. investors anticipate the increase in value of the stock in the market over time. Investors have more interest in stocks than other securities because of the better return from taking such a risk. It should be noted that stock does not necessarily represents a company’s value. The value of a company is its stock price multiplied by the number of shares. Therefore, a $50-per-share company with 1 million shares is worth more than a $100-per-share company with 100,000 shares. Furthermore, the price of the stock does not portray the company’s current value; it only reflects the investors’ expectation of the company’s growth in the future.

There are two major types of stock: common stock and preferred stock. Common stock is the stock which people mostly trade and those who own common stock has the partial ownership of the company and the right to receive dividends from the company as described above, whereas preferred stock owners are assured a fixed dividend for certain amount of time and are reimbursed before the common stock owners.

People trade stocks on stock exchanges, places where investors meet one another to buy and sell stocks. Most celebrated stock exchanges are London Stock Exchange in England and New York Stock Exchange (NYSE) in USA where people physically meet with one another to decide on the prices. Another type of stock exchange is a virtual stock market where people trade stocks on the World Wide Web. With the advancement in technologies, the internet is accessible by most people and virtual stock exchanges become more popular than the physical ones. Trading online is much simpler and effortless because there is no need to yell and wave to the sellers or brokers and trading is just a few mouse-clicks away. For instance, (National

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Association of Securities Dealers Automated Quotation) NASDAQ in USA offers virtual trading which is also called over-the-counter (OTC) market and most technology giants are listed on NASDAQ. The stock market opens 24 hours a day, except weekends. NYSE opens from 9:30AM to 4:00PM EST and other stock exchange markets in their respective countries open at certain times such that an investor can trade 24 hours a day\(^2\).

Stock exchanges exist to assist buyers and sellers exchange securities smoothly. Because of such markets, there is no need to find buyers and sellers around the nation or other countries. If a person from England wants to buy Microsoft stock, he does not have to go to the company which is situated in USA. Thus, stock exchanges are linkers between buyers and sellers, which provide the investors ability to trade stocks of the companies listed on the respective exchanges.

There are two kinds of investors: average and professional. Average people are those who have little or no knowledge in investing but have an urge to invest and get rich by doing so. Because of the lack of knowledge in the field, they are, most of the time, swindled by professionals. An interesting fact in investing is that people are portrayed as animals.

Average people are sometimes referred to as chickens and pigs. Chicken are so afraid to lose anything that most of them go out of investing business early and do not profit a single penny. They do not dare to take risk, an important psychological factor to achieve great returns from stocks. Another kind of average investors is called pigs, the portrayal of greedy, impatient and emotional beings. They tend to follow high-risk investments without any research or knowledge in the trading environment, buy or sell the stocks so early that they profit less and lose much, and they trade stocks by their feelings for a particular company or a firm. For instance, Apple product users loves the product so much that they desire to own a share in the company only to encounter later with the decline of company’s stocks due to the resignation of the co-founder.

2.1.2: Forex Markets

Forex is short for Foreign Exchange market. It is also called currency exchange market. Forex is the biggest market in the world with numbers reaching as much as 4 trillion dollars. To do forex trade, a person buys one currency and sells the other currency at the same time. For

example, a notion of EUR/USD = 1.4402 means that one Euro is exchanged with 1.4402 US dollars. The trade happens in pairs with major currencies such as US Dollar, Canadian Dollar, Australian Dollar, Japanese Yen, Euro, British Pound, and Swiss Franc. Forex trade is an OTC market with traders mostly speculating rather than an actual trade. Actual trade includes payments of foreign companies to its employees, currencies needed to buy and sell products, and conversion of earnings from foreign branches of a company. Speculating means traders trying to profit from the difference between bid and ask price of the currency pair. Such a difference is called spread. For instance, if EUR/USD changes from 1.4402 to 1.4422, it can be said that there spread is 20 pips. A pip is the smallest unit in the currency exchange which stands for percentage-in-points and it refers to fourth decimal point. It can be also understood as 1/100 of 1%. It should be noted that a pip stand for 1% which is the second decimal point in Japanese Yen. Forex trade is a 24-hour market which opens from Sunday 5PM EST to Friday 5PM EST3.

Currency is unique in many different ways. Unlike other trading securities, currency fluctuates rapidly. Therefore, it is the major choice of speculators who prefers to bet on the spread. Currency has no limit, meaning that a person can buy or sell as much as he wants. It is has easy entry and exit points because trading is 24 hours a day and can be done within a few mouse-clicks. Since the currency market is OTC one, it is not controlled by any governing body and has less rules than the stock market.

As mentioned above, average people trade forex with emotions, greed and impatience. With the ability to trade instantaneously and the requirement of big volume of money to profit a little (i.e. playing on spread), average investors lose a lot of money very quickly if they have no systematic way of controlling himself. Professionals, on the other hand, analyze the fluctuations of the currency with technical analysis, read the reports such as non-farm payrolls, Purchasing Managers Index (PMI), Consumer Price Index (CPI), Retail sales, and Durable goods, interpret the political conditions of countries. Most people believe technical analysis is more relevant with forex than stock market. Since technical analysis is used prevalently in currency market, a complete understanding of indicators mentioned above would offer success in trading. As always, trend is an investor’s friend. Using indicators ascertains a potential trend is a good

practice. Currencies are subject to follow a trend because of outside factors such as capital flows and economic factors of the world. Therefore, a combination of both analytical tools provides much more information and insight to the investors.

With this general background knowledge of stock and forex markets, one can now delve deeper into the world of investments. While knowing terminology and basics is very important, there are more topics to understand over the horizon. Fundamental and technical analysis is the double edge sword that investors use to defeat the market. By knowing the background information of companies and countries one can make educated long term trades about which way the market will move over months at a time. Technical analysis can also be used for people like day traders that wish to stay in the market for short periods of time and make quick small amounts of money that will add up to massive amounts over time. The next couple of sections go through multiple techniques for analyzing forex currency pairs. These techniques include different fundamental values to look into and different technical analyses to use to evaluate and predicted the strength of the market.
2.2: Fundamental Analysis in Forex Trading

Fundamental analysis of the forex market takes a wider scope of economics into account when analyzing a currency. Technical analysts suggest that the price of a currency pair and its previous prices is enough information on which to trade. Fundamental analysts insist that more macroeconomic issues must be taken into consideration. In fundamental analysis, the strengths of the economies of the nations involved in the trade are scrutinized. The value of a currency and the decision to trade are ascertained by the strength of that nation’s economy from economic measures and indices. Important announcements and events can also be used in fundamental analysis. Even news of a speculation of a change can shake up the forex market.

2.2.1: Gross Domestic Product

A widely used indicator of economic strength is the gross domestic product (GDP). The GDP of a nation measures all of that nation’s expenditures. It is calculated by the sum of the government spending, consumption spending, imports, and investment spending. Anything within the borders of the nation of consideration is considered part of its GDP. This value serves to summarize the value of the products and services generated in this economy for this given year.

The GDP is the primary indicator of the strength of a nation’s economy. A growing economy has a positive change in GDP (GDP is increasing) from year to year. During such a period, businesses are typically expanding, thus employment is growing. A growth rate of about three percent per year would reflect this kind of expansionary period. This is considered a “healthy” growth rate. Higher rates of growth can actually suggest negative effects on the economy such as inflation, which is discussed later. This indicates that the growth of the economy is slowing down. A decrease in GDP from year to year can suggest a recessionary period or even depression.

In forex fundamental analysis, the GDP of a nation can be used to gauge the strength of its currency. In a nation with a “healthy” annual GDP growth rate, this suggests to traders that this nation’s currency is strong. In general, this increases the demand for that currency, in turn contributing to an increase in value. A high GDP can also incite more nations to export to this

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country\textsuperscript{5}. The result can lead to an excess of imports compared to the nations imports, and consequently devalue its currency.

The forex market can also be affected by announcements of GDP. In many countries, including the United States, the GDP is reported quarterly. The quarter’s GDP is weighted to reflect a full year’s GDP—much like a “forecast” of the actual GDP at the end of the year. Oddly enough, the strength of a currency is related to the expectations of the GDP rather than the GDP itself. In general, if the reported GDP meets the expectations of traders or better, the currency will gain strength and if it is worse than expected the currency will instead lose strength\textsuperscript{6}.

2.2.2: Interest Rates

Another major factor in forex fundamental analysis is interest rates. Some consider this measure to be even more important to forex than GDP. Interest rates dictate how costly it is for borrowers to borrow money from banks. Consequently, they control the amount of money allowed to flow within an economy, greatly influencing the value (or the apparent value) of a currency on the global market.

In general, low interest rates create expansionary periods. Businesses do not have to spend as much in interest and will be more inclined to take out loan. This loan money allows businesses to grow and expand without suffering severe penalty. As a result, more money is allowed into the economy. With higher interest rates, it is more difficult to take loans, as more money must be paid back at a later time. This is encourages potential borrowers to hold onto their money, halting the addition of money into the economy. The perceived strength of a currency tends to follow the interest rate of a currency and as a result there is greater demand for this currency. When the rate is high, the currency is perceived to be strong and appreciating. However, low interest rates suggest that the currency will devalue in time.


Adjusting the interest rates is one of the most important tasks of any central or reserve bank\(^7\). Such a role is fulfilled by the Federal Reserve Bank for the United States and the European Central Bank for the European Monetary Union (EMU). These institutions are tasked with ensuring the desired strength and stability of the nation or union’s currency. These actions to do so are part of monetary policy—a primary duty a central bank.

One key use for the manipulation of interest rates is to manage the effects of inflation. While inflation is normal part of economic growth, too much can have negative repercussions on a nation’s economy instead. Previously, it was stated that low interest rates stimulated economic growth, allowing for easier loan. Consequently, this introduces a greater need for money and results in the printing of new money to put in circulation. The result of this is inflation. The central bank can use higher interest rates to discourage borrowers from bringing more money into the economy, and thus slowing the unset of inflation. This protects the nation’s currency from suffering devaluation.

The nation’s interest rate can be viewed as a double-edged sword. While increasing the interest rate checks the unset of inflation it can simultaneously stifle the growth of the nation’s businesses. As previously stated higher interest rates make taking loans unattractive and instead make holding money more attractive. It is very difficult for businesses to grow and expand without additional capital that can be obtained from borrowing from banks. The image in Figure 1 from babypips.com summarizes these phenomena of interest rates. It crucial for the central bank of any nation to strike a healthy balance with its monetary policy as to not impede to the growth of business (and the whole economy) but at the same time keep a handle on the development of inflation. It should be noted that central banks tend not to alter the interest rate often.

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Like with GDP, the more significant indicator with interest rates is how they change. The particular rate at a given time is already factored into the price of the currency. Like the GDP, traders are more focused on the expectations of the interest rate. Rates are typically changed at the beginning or end of a cycle of monetary policy. Actions in the market are taken to match the expectations of the way the interest rate will be moved.

Another way traders can use the interest rates of currencies is through *rate differentials*. This value measures the difference between the interest rates of two different currencies. The rate differential can be used to predict how the exchange rate between the two will change in time. If the differential is increasing—the gap is widening—then the traders are more inclined to long the currency of the higher rate. This is especially true when the two interest rates are moving in opposite directions, ensuring an increasing differential. With a decreasing differential, traders are more inclined to short the currency of the higher rate.

Trading on the cusp of a change in interest rates (or during expectations of change) carries a good deal of risk. While the central bank will try to ease in the change to the interest rate, speculations surrounding it as well as economic reports regarding it can create volatility,

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and even result in violent changes in the prices. Purchasing on speculation can even act to drive to the interest rates in opposite direction that had been intended.

2.2.3: Inflation

Another indicator in fundamental analysis is the inflation of a currency. Inflation measures the amount that prices are changing over time. When a currency is becoming inflated, this suggests that purchasing same product will cost more than it did previously. In general, as a currency becomes in more inflated, it loses value. This is why it is so important for central banks to keep inflation in check.

The definition of inflation alone may be enough to suggest that inflation is bad for an economy and its currency. However, inflation is a normal part of economic growth. When an economy grows, more money is being spent and thus more is borrowed. To put more money in the economy, the nation must print more money to supply to its banks, which will in turn lend to growing businesses and other banks. As more money is printed, the value of the currency is decreased. This is why a single dollar bill does not buy as much as it did several decades ago. When discussing GDP, it was established that healthy economies grow with about a +3% GDP increase per year. The result of this growth and increase in GDP is the phenomenon of inflation—an unavoidable consequence of economic growth.

A currency’s inflation rate is considered by to be an important measure in fundamental analysis, especially when the currency is already weak. Inflation is directly related to a nation’s purchasing power, as it dictates how much the currency can buy. Inflation also carries into the forex market as well. Speculators watch the interest rates in relation to the inflation rate desired by the nation’s regulators—the central bank. If inflation overshoots the goal, speculators will buy this currency in anticipation of monetary policy to raise the interest rate as a means to slow inflation. As a result, the currency gains value from an increase in demand and the investor makes a profit from longing it.

Inflation can be measured by observing the change in prices over periods of time. Several economic measures can be used to make this observation. One such indicator is the

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GDP, which reflects the total spending in the entire economy. Another measure is the Consumer Price Index (CPI)\textsuperscript{11}. The CPI is determined by the average price of a group of certain goods and services called a \textit{market basket} that are bought by consumers. When the CPI indicates that prices on market baskets goods and services are rising, this is an indicator that inflation is likely taking effect. The CPI is particularly good indicator of inflation in the United States, as it has a more consumer and service-oriented economy.

When considering inflation in a trade, it is important to look at how certain resources and commodities are faring. Some economies rely on quite a bit on a particular import (or export for that matter). If a country’s economy relies on this import and it becomes scarce or delayed, the prices of this commodity or product will increase with its drastic drop in supply\textsuperscript{12}. If the economy is dependent on this import, inflation can ensue. A later section elaborates this topic further with specific examples.

2.2.4: Unemployment

The state of unemployment in a nation can affect its strength of its currency. Unemployment is used to measure the strength of the nation’s economy\textsuperscript{13}. This represents that number of people in the working force out of work and still seeking employment. When the economy is struggling, a rising in unemployment is seen. Typically a fall in unemployment is indicative of an economic recovery. For this reason, some traders watch the unemployment rates to judge the nation’s strength.

Various unemployment reports are used by forex traders to trade the US dollar. The US government issues a monthly report for the non-farm employment. Changes in employment from can be observed by comparing the current month’s employment number to previous months’ numbers. A rise in non-farm employment suggests that economic conditions are improving and new jobs are being creating. This brings more people in the US back to work, allowing them to again contribute more consumption in the economy. Overall, this suggests a stronger economy and thus a stronger currency.

Another report issued by the US government is the number of unemployment insurance claims. This report is issued weekly and provides a faster indication of change than the non-farm payroll. A rise in the number of unemployment insurance claims suggests that more people are out of work. This offers the opposite signal to the non-farm employment indicator. A fall in the number of unemployment claims suggests better economic conditions or recoveries. However, this number is not necessarily the best indicator, as one who is unemployed does not have to receive unemployment benefits. Some of the unemployed may not appear in this statistic if they do not qualify for benefits or do not apply for them.

Speculation on unemployment contributes to its effect on the forex market and on the strength of a nation’s currency. The most significant changes arise when the unemployment figures move outside of speculators’ expectations. Favorable movements in unemployment (decreases) tend to make the nation’s currency stronger while unfavorable movements weaken it. High market volatility occurs when the unemployment figures are significantly outside of the market’s expectations. The value of the currency in question typically experiences a sharp increase if the figures are much better than expected or a sharp drop if they are much worse than expected.

2.2.5: Resources and Commodities

Another area of interest of fundamental analysis in the forex world is the prices of resources and commodities. These commodities prices can at times be an accurate indicator of the price of a related currency. A nation’s currency tends to follow the pattern of a major or important resource or commodity. The more the nation relies on this commodity, the more likely its currency will respond to changes in the commodity’s price.

One key example of such a relation is that between the Australian dollar and the price of gold\(^\text{14}\). Australia is known for being a large supplier of gold. Consequently, Australia exports considerable amounts of gold. When the price of gold rises, Australia stands to gain more from its exports. As a result, the value of the Australian dollar strengthens with increase in price. In other hand, if the price of gold falls, the value of the Australian dollar can be expected to fall as well.

Another example is the Canadian dollar’s relation to the price of oil\(^\text{15}\). Canada is a major exporter of oil—and actually the largest oil provider to the United States. With a rise in oil prices, Canada will make greater profits from selling oil. As a result, the value of the Canadian dollar will increase alongside the price of oil. When trading a currency pair involving the Canadian dollar, a good strategy would be to watch the movement of oil prices. For instance, when trading USDCAD and oil prices rise or are rising, one could reasonably expect the value of the USDCAD to decrease, as the CAD will appreciate in value. This could equally affect the value of the USD as well.

While a rise in price of oil is has a positive effect on the value of the Canadian dollar it can have a negative effect on the value of the US dollar. The United States’ economy is largely based on the price of oil, as the US is a major importer of oil. Where Canada favors from the profits from high oil prices, this can be a stress on the US economy. High oil prices increase domestic, business, and government spending as transportation, energy, and heating utilities become more expensive. Another consequence of this rise in prices is unset of additional inflation.

The price changes in these commodities or resources can usually be traced by to the laws of supply and demand. When quantities of a commodity are low its price tends to rise as there is now more competition for the same goods. Likewise, commodities in high demand command higher prices, as there is not enough supply to meet the market’s demand. Supply in a market can be affected significantly by events and disasters. Inventories of a commodity can be lost to destruction by weather conditions, accidents, or even acts of terrorism and war. The significant loss of supply with the same demand can have great influences on the increase in prices for importers.

2.2.6: Political and Economic Events, News, and Announcements

One of the most critical aspects of fundamental analysis in the forex market is watching major political events, announcements, and situations. Such announcements pertaining to a nation’s policy—of either the political or economic nature—can offer insight to traders into new policies that could affect the value of a nation’s currency or economy.

Governments like that of the United States issue periodic reports on the status of the nation’s economy, typically by means of some measure or indicator. Such reports include GDP, CPI, and unemployment figures. Speculation and anticipation on these typically weekly, monthly, or quarterly reports drives much movement in the forex market. As traders begin speculating on the movement of these indicators, volatility occurs when the reports are released, either confirming or refuting the speculation. These periods around the release of expected government or another firm’s report on such an economic indicator is a highly unstable time in the market, as traders and investors will be jumping in line to make the first move, pushing the market every which way. Trading at such a time is a mere roll of the die. There comes no certainty in unstable conditions brought about by over-speculation. To make a trade is a gamble, for there is no perceivable way to conclude how the market will be driven. It is wise for a trader to be aware of the release dates and times of important economic indicators like those previously mentioned to avoid entering this high-stakes gamble, in which he or she could only succeed by sheer luck.

A nation’s politics also serve to move the forex market. Typically, a nation’s currency on the market is stirred by shifts of power or political instability. In modern democracies, shifts of powers are more typically achieved by elections. During national elections, the strength of a nation’s currency can be reflected by the international community’s confidence in the new leader or leaders in the running16. When other investing nations support the candidates in the running, they will be more willing to continue investing the in success of this nation. The demand on the currency keeps it strong. If they do not have confidence in the new leadership, these nations may seek better investments elsewhere. As a result, the falling demand for the currency can result in reducing its value. It is important to note that little meaningful movement in currency prices occurs during the early progression of an election. They do not cause notable trends, but possibility transient activity characterized by swift changes and movements. No “steady-state” trend is truly established until the candidate fully expresses and develops his or her plans for economic and political policies, which ultimately sways the investment community’s response to the election.

Other major events such as natural disasters and war can also move the forex market and a nation’s currency\textsuperscript{17}. A natural disaster like an earthquake or flood can cause serious death and destruction in an entire region of a country or countries. The loss of life, production, and even infrastructure has significant effect on the strength of the nation’s economy and productivity. This fall in productivity can result in consumers inside the country spending less as well foreign investors shying away from this nation’s currency to find a safer option. Consequently, the value of this currency will most likely fall alongside its demand.

The effects of war on a nation’s currency can be varied. War can have similar repercussions as natural disasters if the nation suffers damages within its borders. War can incur the same loss of life and infrastructure that disaster can. In fact, war may be more effective, as major production centers can be strategically targeted. A normal consequence of war can be high volatility in the nation’s currency. War is not always a negative factor on a nation’s economy. Sometimes war encourages production, such as munitions, like in the United States preceding World War I and during World War II.

2.2.7: Save Havens and Stability

Investors of all kinds, whether they are nations or traders, seek some form of stability in their trades. Good investors will take measures to find safer currencies in which to invest to avoid the risks associated with unstable securities or investments. Currencies that carry this kind of reliability are called \textit{save haven currencies}\textsuperscript{18}. These currencies are usually very commonly traded and also kept as reserves by foreign nations as a means of keeping their money safe. Safe haven currencies are generally very stable even in unstable times, such as during political crises, adding greatly to their reliability.

Investors’ willingness to invest in a particular currency is greatly derived from the strength on the stability of the nation itself. Countries like the United States are considered to be very stable. Power is transferred peaceably between opposing parties. Discontented citizens voice their opinion to representatives and in the media. With the majority of citizens living well,


there is little need for citizen to incite civil unrest. This is not the case for all countries, however. In some nations, there is a high degree of political instability. Countries where fighting and violence are a common problem are not viewed by the world as stable countries. Also, instability from major regime changes can put a country out of the consideration for investors seeking stable currencies.

Another factor contributing to the strength of a currency and its status as a safe haven is the perceived power of a country. For country with a strong military, there are not usually many countries willing to engage in war with it. Countries like the United States with a large, well-funded military are certainly a force to be reckoned with amongst their enemies. For this reason, they tend not to have many enemies. This puts the nation in a better position to trade with others. More so, diplomatic success can weigh on this situation as well. Strong currencies tend to come out of nations that have good foreign relations with the rest of the world. This makes trade negotiation much easier and smoother, allowing the nation’s currency to benefit from the abundant trade with its allies and friends.

2.2.8: Why Use the Gartman Letter

Many traders attempt to contest the merits of either fundamental or technical analysis. Some of these traders consider only one and not the other. For instance, a trader may be inclined to trust only the price data in predicting market movements. In reality, it is very important to consider both fundamental and technical analysis to trade successfully.

In our project we were encouraged to use the The Gartman Letter as our main source of fundamental analysis. This daily news letter is released each morning with that day’s important economic news, such as the release of unemployment figures, and world news. The author Dennis Gartman, an expert trader and fund manager, offers a detailed summary of the day’s events and in-depth analysis of the impact of these events, typically with a greater focus on the implications to the forex market.
2.3: Technical Indicators

Important aspect of technical analysis is indicator. This concept is given special attention because the indicators are most of the time confusing due to their variety and yet they provide unique point of view on the direction, momentum, and strength of a price action. An indicator is derived from a series of price data by using a formula, simple or complex, on the data set of an investment. Price data includes data from any period of time on any day of the week. By using series of data, past and present price levels can be compared. The indicators are presented on the graphs as well as price data for the convenience of evaluating data. Indicators are used for their ability to act as signals, fortify the interpretations from other technical analysis tools, and predict the future of price action of a security. There exist two main types of indicators: leading and lagging indicators. Leading indicators are implemented to lead the price trends and they display the momentum of fixed period of time in the past. Popular indicators include Relative Strength Index (RSI), Momentum, and Stochastic Oscillator, which uses complex algorithms to create the signals\(^\text{19}\). Lagging indicators produces signals, when market develops a strong trend, which will help traders to benefit from such a trend. Lagging indicators are easy to use because there is less subjective interpretation compared with leading indicators\(^\text{20}\). As all analysis tools, indicators are not perfect, but they serve as great tools for predicting the trends of a security.

2.3.1: Simple Moving Average

Perhaps the simplest and most popular family of forex indicators is that of the moving averages. In general, moving average indicators produce smoother lines on the price plots. Of the moving averages, the simple moving average (SMA) is the simplest (as its name would suggest). The simple moving average is computed by averaging the price of each bar over a given period. This operation sums these values over the specified period of time and divides by that quantity. The formula would resemble that in Equation 1.

\[
MA_j(n) = \frac{\sum_{i=j-n}^{j} P_i}{n}
\]

Equation 1: A mathematical representation of the simple moving average.


Moving averages in general are suitable for indicating trends in price data. If the moving average is increasing, it is reasonable to expect that the price is trending upwards. Similarly, with the average decreasing, one can expect the price to decrease as well. It also serves to “smooth” out the choppy spikes and peaks that do not contribute to the underlying trend; much like a low-pass filter would do for an electrical signal.

This indicator can provide signals to traders. In general, the trader is signaled to buy when the price line crosses above the moving average. That is, the price is now currently greater than the average price. On the other hand, when the price falls below the moving average, this indicates a possible sell signal. These rules are just generalizations, however. There is not much reliability in naively following these simple rules. Since the simple moving average only takes into account a certain time frame, other time frames may be more indicative of that trend. For that matter, better insight can be achieved by seeing the moving average in various time frames. Consistency amongst them would suggest a better likelihood that this movement is a trend, not just some ephemeral change.

Another potential flaw of the simple moving average is that each time unit is equally weighted. In the computation, each price data point is summed indiscriminately. For longer periods of the simple moving average the older, more distant data points account for as much of the average as the newer data points. As a result, the SMA may not respond to price changes quickly. In fact, the longer period SMAs typically stray away from the price of a currency pair, like in Figure 2. This may not necessarily be a disadvantage to traders. Longer period SMAs are not as subject to random fluctuations, thus are less likely to deceive traders to believe a new trend is forming or and old trend is ending. On the contrary, shorter period SMAs tend to follow the price value quite closely are much more susceptible to sporadic noise than longer ones.
For those with a single processing background, it is interesting to note that the simple moving average is by implementation a finite impulse response system. That is, when the price data is considered to be a discrete-time signal, the simple moving average is a system that depends only upon the system’s inputs (both present and past). It is finite rather than infinite since it does not have feedback and thus does not rely on previous values of the SMA (the output).

2.3.2: Exponential Moving Average

The exponential moving average (EMA) is more complex than the simple moving average. Where the simple moving average simply takes the last specified number of prices in the price’s history and averages them, the exponential moving average using exponentially-decreasing weight factors for each successive value. The formula for calculating the EMA is shown in Equation 2. In this method, more recent data is favored over old data. While old data can be useful in seeing the “macro” level of the trend, newer data indicates where the prices are now, and perhaps where they are going. This method is less naïve than the simple moving average, where all data within the interval is equally weighted.

---

\[ \text{EMA}_j = \frac{2}{1+n} (P_j - \text{EMA}_{j-1}) + \text{EMA}_{j-1}, \text{ where } P_j \text{ is the current price}\] ^{23}

Equation 2: Formula for the exponential moving average (EMA).

As this is still a type of moving average, it can be used for the same signals as the simple moving average. The difference between the two is generally the exponential moving average is smoother than the simple moving average and it eliminates more spikes and fluctuations. It is important to note that these moving averages are good for observing the direction of a trend as either upward or downward. However, they are not always the most indicative of the strength of a trend.

Interestingly, the exponential moving average is a type of low-pass filter in discrete time signal processing and analysis. It was previously mentioned that the moving averages smooth out whipsaws and fluctuations from the price data as a low-pass filter would for an electric signal. By implementation, they are in fact the same when a low-pass filter is considered as a discrete first-order infinite impulse response (IIR) filter. Unlike the finite impulse response filter, like the simple moving average, the IIR filter has feedback. That is, each value of the EMA depends upon previous values of the EMA as well as the system’s inputs. Such a system is often called be defined recursively.

A derivation of the EMA can be done with circuit analysis of a first-order RC filter like that in Figure 3.

![Figure 3: A simple RC low-pass filter](image)

The transfer function of this filter can be determined by using Kirchhoff’s current law.

\[ \frac{v_{out} - v_{in}}{R} + i_c = 0 \]

The current through the capacitor must be written in terms of one of the known voltages: the input or output. Using the \( q = CV \) relation, the current is determined to be

\[ q = CV \]

\[ q = Cv_{out} \]

\[ \frac{dq}{dt} = i_c = C \frac{dv_{out}}{dt} \]

The resulting equation is

\[ \frac{v_{out} - v_{in}}{R} + C \frac{dv_{out}}{dt} = 0 \]

Multiplying by \( R \) the equation becomes

\[ v_{out} - v_{in} + RC \frac{dv_{out}}{dt} = 0 \]

Assigning \( v_{out} = y \) and \( v_{in} = x \) gives the more familiar form of the IIR filter \( y - x + RC \frac{dv_{out}}{dt} = 0 \). Since exponential moving averages are discrete systems rather than continuous systems (as the RC filter is), this equation must be discretized. The derivative can be approximated by the difference between the current point and the previous divided by the sampling period\(^{25} \).

\[ y[n] - x[n] + RC \frac{y[n] - y[n-1]}{T} = 0 \]

Putting this difference equation into standard form, it becomes


\[ y[n] = \left( \frac{T}{T + RC} \right) x[n] + \left( \frac{RC}{T + RC} \right) y[n - 1]. \]

Assigning the constant \( \alpha = \frac{T}{T + RC} \), then \( \frac{RC}{T + RC} = 1 - \alpha \). The final equation becomes

\[ y[n] = \alpha x[n] + (1 - \alpha) y[n - 1] \]

or equivalently,

\[ y[n] = \alpha (x[n] - y[n - 1]) + y[n - 1]. \]

With \( y[n] \) being the output and \( x[n] \) being the input, one can see that the derived equation is equivalent to Equation 2. As the EMA can be directly implemented as a low-pass filter, it is clear that it serves as filter itself for price data.

2.3.3: Bollinger Bands Indicator

Bollinger bands are a type of support and resistance indicators, built on the Moving Averages. There are three lines in Bollinger Bands. Upper Bollinger Band which represents the resistance, middle Bollinger Band which symbolizes the Moving Average and the lower Bollinger Band which characterizes the support\(^{26}\). One important aspect of Bollinger bands is its size. The bands are narrow when the volatility of the market is low, but they are wide when the volatility of the market is high.

Default settings in MT4 trading platform are 20 days period with 2 times standard deviation.

Comments:

Bollinger Bands are only good when the market is sliding, i.e. not changing very much. If it is like on 22\textsuperscript{nd} September 2011 in Figure 4 below when the market is overly bullish, (or overly bearish in other times), Bollinger Bands are misleading. But on 23\textsuperscript{rd} September 2011, when the market is sliding, Bollinger Bands are extremely useful for short-term, low-pip traders because each time the price hits the lower Bollinger Band, it is a definite indicator that the price will rebound upwards. On the other hand, when it touches the upper Bollinger Band, it is another certain indicator that the price will rebound downwards. It should be reiterated that the Bollinger

Bands are only good when the market is sliding, not when the market is extremely bullish or bearish. Volatility explained above comes into play when judging whether the market is sliding or not, and thus, it is a very useful indicator for entry and exits.

As can be seen in the Figure 4 above, when the price hits the bottom Bollinger Band around 20:00 on September 22\textsuperscript{nd} 2011, it rebounds upwards and when it hits the top Bollinger Band around 08:00 on September 23\textsuperscript{rd} 2011, it rebounds downwards eventually. Bollinger bands can also be used with other indicators such as Average Directional Movement Index (ADX), Relative Strength Index (RSI), or Moving Average Convergence-Divergence (MACD) which are explained in the following sections.

**Mathematics:**

As mentioned above, since the middle line is a MA, the math for it is already defined. However, the upperband and lowerbands are calculated by taking in consideration of deviations. Code below is excerpt from the code base of MT4, showing the math behind the upper and lower Bollinger bands\textsuperscript{27}.

\[
\text{deviation} = \text{BandsDeviations} \times \text{MathSqrt} \left( \frac{\text{sum}}{\text{BandsPeriod}} \right);
\]

\[
\text{UpperBuffer}[i] = \text{oldval} + \text{deviation};
\]

LowerBuffer\[i\]=oldval-deviation;

Upper Bollinger band is the addition of old value and the deviation while lower Bollinger band is the subtraction of deviation from old value.

2.3.4: Average Directional Movement Index (ADX)

Average Directional Movement Index (ADX) is the strength of the trend of the Moving Average. It is a single line indicator in a separate window with a range of 0 to 100. Although it may looks like an oscillator graph where the movements both direction have meaning, ADX is a uni-direction indicator, meaning that only one direction, an upward direction, has a meaning. Whenever trend of the market is strong, ADX value will be above 25. The higher the number, the stronger the trend is. The direction of the ADX trend is also crucial because only the upward direction of ADX is reliable. It can also be said that the value and the direction of ADX are complementary.

Unless the value is above 25, it can be that the price movement is ranging and not trending\(^{28}\).

![Figure 5: Average Directional Moving Index](image)

Comments:

Combined with both simple and exponential Moving Averages, ADX is very useful in finding the entry point of a trade. As can be seen in Figure 5 above, around 18:00 on September 16th, it is a time to get into the trade and wait for the price to continue the uptrend. Therefore, as soon as the ADX value touches 25 while it is having an uptrend and if the Moving Average is uptrend, it is a good time to go for long whereas if the Moving Average is downtrend, it is wise to have a short position. Divergence is another sub-indicator of ADX because it notifies the trader when to exit. If the ADX is showing lower peaks while the price is still moving upward, it is a good time to exit the trade because the price will hike down in the near future. However, one can only encounter divergence infrequently and divergence technique is useful mainly for long term traders.

**Mathematics:**

Figure 6 is the calculation of ADX obtained from the following link: http://forex-indicators.net/adx.

![ADX Formula](http://forex-indicators.net/adx)

### ADX Formula

\[
\text{ADX}_t = \frac{\left( \text{ADX}_{t-1} \times (n - 1) \right) + \text{DX}_t}{n}
\]

where

\[n = \text{smoothing period}\]

\[
\text{DX}_t = \frac{100 \times (\text{PDI}_t - \text{MDI}_t)}{\text{PDI}_t + \text{MDI}_t}
\]

\[
\text{PDI}_t = \text{Positive Directional Movement} = \text{MAX}(\text{H}_t - \text{H}_{t-1}, 0)
\]

\[
\text{MDI}_t = \text{Negative Directional Movement} = \text{MAX}(\text{L}_t - \text{L}_{t-1}, 0)
\]

**Figure 6: Formula for ADX**

### 2.3.5: Relative Strength Index (RSI)

Relative Strength Index, as defined by the professionals, is a momentum indicator that can be used as both entry indicator and trend indicator. It shows if the market or a currency pair

---

is overbought or oversold. Overbought means that the currency pair has reached its maximum point and the price is expected to go down, whereas oversold means that the currency was sold too much that it has reached minimum point and ready to go up. RSI is a bi-directional indicator and has a scale from 0 to 100. 30 and 70 are the most important points in RSI, representing “oversold” and “overbought” points respectively.30

RSI can also be used as a trend indicator. When the Moving Average is uptrend, wait for a retracing point. When RSI dips below 50, one can jump into the trade and go for long. The same holds true for reverse position. RSI is also used with trends to see whether the trend is going to hold its slope. If the trend is downward, make sure the trend is below 50 point, and vice versa. Therefore, RSI is a good tool to use when fake retracements, also known as fake alarms, occur.

Comments:

Figure 7 below shows the relative strength index graph under the price movement graph. As can be seen in the figure, when the RSI touches the 70 point line around 20:00 on September 21st 2011, and 01:00 on Sep 22nd 2011, they were indicators that the currency pair is overbought and short position is favored. Around 06:00 on September 22nd 2011, the RSI line touching the 30 point line is an indicator that the price will move upward. A point to note is that reaching oversold and overbought points does not mean that the price will move further down or up anymore. Around 17:00 on September 23rd 2011, the price still moved upwards regardless of the RSI touching 70 point. RSI is touching 70 again at the end of the figure just before the market is closed. Therefore, we are expecting the USDJPY to go short when the market reopens.

Mathematics:

Figure 8 is the calculation of RSI obtained from the following link: http://forex-indicators.net/rsi.

\[
\text{RSI} = 100 - \frac{100}{(\text{RS} + 1)}
\]

where:

\[
\text{RS} = \frac{\text{Average Upward Price Change}}{\text{Average Downward Price Change}}
\]

\[
\text{Average Upward Price Change} = \frac{[(\text{previous Average Upward Price Change}) \times 13 + \text{current Upward Change}]}{14}
\]

First Average Upward Change = Total of Upward Changes during past 14 periods / 14

\[
\text{Average Downward Price Change} = \frac{[(\text{previous Average Downward Price Change}) \times 13 + \text{current Downward Change}]}{14}
\]

First Average Downward Change = Total of Upward Changes during past 14 periods / 14

For calculation Downward Price Changes are taken as positive values.

2.3.6: Moving Average Convergence-Divergence (MACD)

MACD is an oscillator type indicator, meaning that both directions have meaning. It is also one of the easiest indicators to use, apart from Moving Average. As the histogram bars passes through the triggering line, following the trend of the MACD will provide most of the right forecasts. However, MACD is best for divergence forecasting. There are two kinds of divergences: positive and negative. Positive divergence occurs when the lows of a currency are
getting lower and lower while the MACD lows are getting higher and higher, we have a positive divergence. We get negative divergence when the highs of a currency pair are getting higher and higher while the highs of MACD are getting lower and lower. Divergence provides a notification or a warning that the price is going to rebound upward if the price is bearish or downward if the price is bullish.

Figure 9: Moving Average Convergence-Divergence showing the negative divergence

Comments:

Whenever MACD passes through or have a cross over at 0 point (triggering line), it clearly shows in Figure 9 that it would be beneficial to use the trend MACD to trade; if MACD is upward trend when it crosses trigger line, go for long position and if MACD is downward trend, go for short. As can be seen above, Figure 9 is also evidently presenting a negative divergence where MACD highs are getting lower and lower and price highs are getting higher and higher. Therefore, it would have been profitable to jump into the market to go for short on USDCAD around 06:00 September 12th. Most of the time, MACD is used with Moving Average (MA), Average Directional Movement Index (ADX), Bollinger Bands, and Relative Strength Index (RSI) as all of them are complementary to each other.

Mathematics:

Figure 10 is the calculation of MACD obtained from the following link: http://forex-indicators.net/macd.

\[
\text{MACD} = \text{EMA(}\text{Close})_{\text{period1}} - \text{EMA(}\text{Close})_{\text{period2}} \\
\text{Signal Line} = \text{EMA(}\text{MACD})_{\text{period3}}
\]

where

\text{period1} = \text{standard settings are 12 bars} \\
\text{period2} = \text{standard 26 bars} \\
\text{period3} = \text{standard 9 bars}

The following are the steps to calculate MACD

1. Calculate the 12-days EMA of closing price
2. Calculate the 26-days EMA of closing price
3. \text{MACD} = 12-days \text{EMA} - 26-days \text{EMA}
4. \text{Signal Line} = 9-days \text{EMA of MACD}

Formula for EMA

\[
\text{EMA} = (\text{SC} \times (\text{CP} - \text{PE})) + \text{PE}
\]

\text{SC} = \text{Smoothing Constant (Number of days)} \\
\text{CP} = \text{Current Price} \\
\text{PE} = \text{Previous EMA}

Figure 10: Formula for MACD

2.3.7: Stochastic

Stochastic index is a momentum and oscillator type indicator that can be used for both entry and exit points. Like Relative Strength Index (RSI), Stochastic indicator also signifies if the market is overbought or oversold. However, unlike RSI, oversold points and overbought points are 20 and 80 respectively. There are three types of Stochastic indicator: slow, fast, and full. Slow Stochastic indicator provides less reaction to the price movements; fast stochastic indicator provides more vigorous reaction to the price movements. Full stochastic indicator is rarely used by professionals, so it will not be discussed here.

There are two lines in the Stochastic indicator: %K and %D. Only if the Stochastic lines are above 80 or below 20, it is the time to look whether Stochastic lines %K and %D passes
though each other. Other crossovers should be ignored. Stochastic divergence can also be used as other divergences if successive higher lows or lower highs are above 80 or below 20 lines\textsuperscript{32}.

![Stochastic Indicator showing when to go short, when to miss, and false alarm](image)

**Comments:**

As can be seen in Figure 11 above, the currency did not follow a downward trend although $%K$ line passes though $%D$ from above, thus producing a false alarm. The second time the $%K$ and $%D$ lines had a crossover, there is an opportunity for a profitable short position. The third arrow in the figure says “Miss this” because the crossover was near the 20 point line, but both $%K$ and $%D$ lines had not passed through the 20 point line yet. Fourth arrow says “Short” because stochastic lines had a crossover again. This is a little bit risky because the crossover point is extremely close to 80 point line. There is another false alarm indicated by fifth arrow although it can be interpreted as a long position and the price did not move upward much. Like all indicators, Stochastic is not perfect, displaying false alarms sometimes. However, it is a good indicator if used with other indicators.

Mathematics:

Figure 12-15 is the calculation of stochastic indicator obtained from the following link: http://forex-indicators.net/stochastic.

\[
\text{STC FULL FORMULA}
\]
\[
\begin{align*}
\%KF_{\text{Full}}(t) &= \%DF_{\text{Fast}}(t) \\
\%DF_{\text{Full}}(t) &= \text{SMA}(\%KF_{\text{Full}}(t))_{(n)} \\
\text{where} \\
\%KF_{\text{Full}}(t) &= \text{Full Stochastic} \\
\%DF_{\text{Full}}(t) &= \text{Simple Moving Average (SMA) of Full Stochastic} \\
n &= \text{number of periods of SMA}
\end{align*}
\]

*Figure 12: Formula for FULL Stochastic Indicator*

\[
\text{STC FAST FORMULA}
\]
\[
\begin{align*}
\%KF_{\text{Fast}}(t) &= \frac{100 \times (C_{(t)} - LL_{(n)})}{HH_{(n)} - LL_{(n)}} \\
\%DF_{\text{Fast}}(t) &= \text{SMA}(\%KF_{\text{Fast}}(t))_{(n2)} \\
\text{where} \\
\%KF_{\text{Fast}}(t) &= \text{Fast Stochastic} \\
\%DF_{\text{Fast}}(t) &= \text{Simple Moving Average (SMA) of Fast Stochastic} \\
n &= \text{number of periods} \\
n2 &= \text{number of periods of SMA} \\
C_{(t)} &= \text{Close} \\
HH_{(n)} &= \text{Highest high for the period } n \\
LL_{(n)} &= \text{Highest low for the period } n
\end{align*}
\]

*Figure 13: Formula for FAST Stochastic Indicator*
2.3.8: Head and Shoulders Pattern

One way to show reversals in established trends, so can the head and shoulders pattern. This pattern is illustrated in Figure 15. In the head and shoulders pattern, there are three peaks. The first peak is reached and followed with a drop. From this drop, the price reached a second peak higher than the second peak. After this peak drops it rises to a third peak. In the head and shoulders pattern, this third peak is again below the second peak. The first and third peaks are at about the same level.\(^{33}\)

\[ \begin{align*}
\%K_{\text{slow}(t)} &= \%D_{\text{fast}(t)} \\
\%D_{\text{slow}(t)} &= \text{SMA(}\%K_{\text{slow}(t)}\text{)}(n) \\
\text{where} \\
\%K_{\text{slow}(t)} &= \text{Slow Stochastic} \\
\%D_{\text{slow}(t)} &= \text{Simple Moving Average (SMA) of Slow Stochastic} \\
n &= \text{number of periods of SMA}
\end{align*} \]

Figure 14: Formula for SLOW Stochastic Indicator

This pattern features key fluctuations between the peaks in price. Overall, the pattern shows that despite a strong increase up to the peak, it will not likely continue rising, but instead will reverse its trend and trend downwards.

Certainly, the opposite case of the head and shoulders pattern can occur as well. The chart in Figure 16 is indicative of such a pattern. Whereas the regular head and shoulders patterns involve two peaks for shoulders and a greater peak for a head, its inverse pattern has two equal dips and a greater central dip for a head.

![Figure 16: An inverse head and shoulders pattern.](image)

This inverse pattern can be used to signal the end of a downtrend just as the normal pattern is used to signal the end of an uptrend.

2.3.9: Parabolic Stop and Reversal (Parabolic SAR)

Parabolic SAR is a strong indicator for entry and exit positions because it shows the start of trend and end of the trend. Traders only need to look at the dots and decide which position they should go for. If the trend is bullish, the indicators will be under the candlesticks, but if the trend is bearish, the indicators will be below. Generally, if the dots are below the candlesticks, it is suggesting to go long, and if the dots are above, Parabolic SAR is recommending to go short. It is very easy to use for both professionals and beginners because it shows the change of a trend clearly and the traders do not have to calculate anything at all (i.e. looking whether the trend
reach above or below certain points). Default parameters of Parabolic SAR include 0.02 step size and 0.2 maximum\(^\text{34}\).

**Comments:**

The trick in using Parabolic SAR is to look for the first dot that breaks its dot-trend on the graph. As can be seen in the Figure 17 above, at the tip of the first arrow, the first trend breaker dot occurs. When it happens, a trader should determine whether a dot is above or below the candlestick; depending on the position of the dot, a trader can trade short or long. Since the dot at the tip first arrow is above its corresponding candlestick, it would be profitable to go short. Moreover, the dot at the tip of second arrow being below the candlestick suggests the long position.

![Figure 17: Parabolic SAR indicating profitable short and long positions](image-url)

However, like any other indicators, Parabolic SAR is not perfect and a trader will need help of other indicators to decide for a profitable position. Furthermore, a trader will need to look at the screen incessantly for the trend changing indicator dot so that she will know when to enter or exit a position. This indicator is very profitable for short-term (day) traders since it dynamically shows the direction of a trend. For long-term traders, this indicator may not be very useful because they need to react quickly to a trend, which defeats their purpose of long term trading.

Mathematics:

Figure 18 is the calculation of parabolic-sar indicator obtained from the following link: http://forex-indicators.net/parabolic-sar.

**SAR Formula**

1) Determine if the initial position \( P_{\text{initial}} \) is Long or Short. ProSticks assumes an initial Long position.

2) Determine initial Stop-and-Reversal \( (\text{SAR}_{\text{initial}}) \).

   IF \( P_{\text{initial}} \) = Long THEN
   \[
   \text{SAR}_{\text{initial}} = L(t-1)
   \]

   IF \( P_{\text{initial}} \) = Short THEN
   \[
   \text{SAR}_{\text{initial}} = H(t-1)
   \]

3) Determine initial Extreme Price \( (\text{EP}_{\text{initial}}) \).

   IF \( P_{\text{initial}} \) = Long THEN
   \[
   \text{EP}_{\text{initial}} = \text{MAX}( \text{High}_{t}, \text{High}_{t-1} )
   \]

   IF \( P_{\text{initial}} \) = Short THEN
   \[
   \text{EP}_{\text{initial}} = \text{MIN}( \text{Low}_{t}, \text{Low}_{t-1} )
   \]

4) Determine Acceleration Factor \( (\text{AF}_{t}) \). Set initial Acceleration Factor to \( \text{AF}_{\text{initial}} \), increasing the value by \( \text{AF}_{\text{initial}} \) on each period, up to a limit, that a new Extreme Price is made until a position closes.

   IF \( P_t \) = new position THEN
   \[
   \text{AF}_{t} = \text{AF}_{\text{initial}}
   \]

   IF \( \text{EP}_{t} = \text{EP}_{t-1} \) THEN
   \[
   \text{AF}_{t} = \text{AF}_{t-1}
   \]

5) Calculate \( \text{AFD}_{t} \) by multiplying \( \text{AF}_{t} \) by the absolute value of the difference between \( \text{EP}_{t} \) and \( \text{SAR}_{t} \).

   \[
   \text{AFD}_{t} = \text{AF}_{t} \times \text{ABS}( \text{EP}_{t} - \text{SAR}_{t} )
   \]
6) Determine $P_t$, $EP_t$, and $SAR_t$.

IF $P_{t-1} = \text{Long AND } (SAR_{t-1} + AFD_{t-1}) > Low_t$ THEN

$$P_t = \text{Short}$$

$$EP_t = L_t$$

$$SAR_t = EP_{t-1}$$

IF $P_{t-1} = \text{Long AND } (SAR_{t-1} + AFD_{t-1}) \leq Low_t$ THEN

$$P_t = \text{Long}$$

$$EP_t = \text{MAX}(\text{High}_t, \text{High}_{t-1}, \ldots, \text{High}_{t-n})$$

$$SAR_t = \text{MIN}(SAR_{t-1} + AFD_{t-1}, Low_{t-1}, Low_{t-2})$$

IF $P_{t-1} = \text{Short AND } (SAR_{t-1} - AFD_{t-1}) < High_t$ THEN

$$P_t = \text{Long}$$

$$EP_t = \text{High}_t$$

$$SAR_t = EP_{t-1}$$

IF $P_{t-1} = \text{Short AND } (SAR_{t-1} - AFD_{t-1}) \geq High_t$ THEN

$$P_t = \text{Short}$$

$$EP_t = \text{MIN}(Low_t, Low_{t-1}, \ldots, Low_{t-n})$$

$$SAR_t = \text{MAX}(SAR_{t-1} - AFD_{t-1}, High_{t-1}, High_{t-2})$$

where

$$n = \text{length of current position}$$

Figure 18: Formula for Parabolic SAR

2.3.10: Commodity Channel Index (CCI)

Commodity Channel Index is also an oscillator type indicator showing buy and sell signals. Like RSI, and MACD, overbought and oversold signals are defined at -200 and 200 points of CCI. Moreover, like other divergence signaling tools, CCI can also be used as a divergence signaling tool when it moves up 100 point or below -100. It has basically four main
points: -200, -100, 100 and -200. Nothing can be decided when the CCI line is between -100 and 100. CCI is useful when the line moves above 100 point or below -100 point, and as mentioned above, buy/sell signals, overbought/oversold signals and divergence signals are all decided at those regions. It is a bit difficult to interpret compared with other indicators because it has more regions. However, this is the most useful tool since three signals are shown in just one graph. One important fact to note is that the slope of the CCI does not always represent the moving average. The default CCI period is 14 candlesticks.35

Comments:

CCI is usually used as a trend strength indicator. When the trend is strong, CCI reaches above 100 or below -100 regions. By looking at the slope of the CCI in those regions, we can decide the trend is in favor of long or short positions. When the CCI has a negative slope as can be seen in Figure 19 below, the first arrow is pointing at a negative slope CCI, meaning that a short position is favored. However, like other indicators, the indicator is not perfect. The exit point of the trade is indicated when the CCI leaves the -100 region, shown by the second arrow. The third arrow signifies a profitable short position. The fourth arrow shows that CCI has touched -200 point, representing an oversold position and a profitable long position at this point. There is fifth arrow, a short one, showing a profitable long position.

A trader must decide herself whether to get into a trade with the aid of other indicators. As mentioned before, all the indicators and signaling tools are not perfect and impose faulty signals some of the time. It is a trader’s choice to use the best indicator tool and signals that works best for her. Each time a trader has an unsuccessful trade, she should look for her errors and learn from those mistakes. The reason that many people fail in this business is mainly that they never learn lessons. To conclude, one has to have a systematic mindset to be successful, or else she will be tricked by the big dogs in this environment.

**Mathematics:**

Figure 20 is the calculation of CCI\(^{36}\) obtained from the following link: http://www.linnsoft.com/tour/techind/ccl.htm

\[
TP = \frac{(HI + LO + CL)}{3}
\]

*TP stands for Typical Price*

\[
MATP = MA(TP, n)
\]

*\(n = CCI\) Period*

*MATP stands for Moving Average (Simple) of Typical Price*

\[
MDTP_x = \frac{\sum_{i=x-n}^{x} \text{abs}(TP_i - MATP_x)}{n}
\]

*where \(n = CCI\) Period*

*MDTP stands for Mean Deviation of Typical Price*

\[
CCI = \frac{(TP - MATP)}{(MDTP \times 0.015)}
\]

*Figure 20: Formula for CCI*

**2.3.11: Demarker Indicator**

Demarker indicator is an oscillator type indicator which is developed by Tom Demarker and is assumed to catch all the overbought and oversold points that other oscillator type indicators miss.

indicators are not able to perceive. Most of the time, Demarker indicator has a range of 0 to 1 as maximum and minimum points, while there are other versions of Demarker indicator with a range of 0 to 100. Like most of the oscillator type indicators, Demarker indicator is a bi-directional oscillator type, meaning that both upward and downward directions have implications. When the market has a bull trend, meaning the price is moving upward, the indicator value is also rising, whereas while the market has a bear trend, meaning downward price movement, the indicator value is falling. However, the indicator cannot be used when the Demarker value is between 30% and 70% of the range. This region is termed as a neutral region by Tom Demarker, the developer of this indicator. For instance, if the range is 0 to 1, the Demarker points are 0.3 and 0.7, while the points are 30 and 70 for 0 to 100 range Demarker graph. Although 0 to 100 range is preferred because it can give more accuracy, we will explain with 0 to 1 range Demarker provided by Meta Trader 4 (MT4).

Like Relative Strength Index (RSI) and Moving Average Convergence-Divergence (MACD), Demarker Indicator shows the oversold and overbought points represented by 0.3 and 0.7 lines respectively. If the indicator value hits the oversold point, long position is assumed to be profitable, whereas a short position is implied if the indicator value passes thought the overbought point.

Demarker is used as a trend indicator. If the Demarker line is outside the neutral region (a region between 0.3 and 0.7) and if the price action and oscillator slope are converging, we have a strong trending currency pair. In this position, it can be interpreted that the trend will continue to develop.

Demarker can also be used as a divergence indicator. If the Demarker is in uptrend while the price movement is in downtrend, it is called positive divergence and long position is suggested. On the other hand, if the Demarker produces downward trend while the price displays upward movement, negative divergence occurs and thus a short position would be profitable. It is good to keep in mind that divergence can be used as a trend breaker. Trend breakers notify the point at which a trend reversal, and therefore can be as an entry point as well as an exit point\textsuperscript{37}.

**Comments:**

Demarker indicator is almost the same as RSI, except that the latter uses exponential moving average whereas the former uses simple moving average. Although the developer of this indicator claims that it is better than RSI, it is a trader’s choice to use the indicator that is better suited for her. Default setting for Demarker is 14 candle sticks and it can be changed according to the preference and the settings of other indicators that are used together with this indicator. Like other oscillator type indicators, it is implied that Demarker cannot be used alone by itself. One needs other indicators such as Moving Averages or Support & Resistance to forecast the price movement.

Figure 21: Demarker Indicator showing long position and a positive trend

Figure 21 above indicates a clear long position when it touches the 0.3 oversold point. A positive trend is displayed by two sold straight lines in the figure which indicates that an uptrend is strong at that point. Having both trending indication and oversold indication suggests the profitable long position. However, most of the time, one cannot get both trending and overbought/oversold conditions at the same time. Therefore, we have to use other lagging indicators such as SMA/EMA or Bollinger Bands or Parabolic SAR. If one uses Demarker, one does not need RSI because they are basically the same indicator with different kind of Moving Average. The developer of the Demarker suggests that the demarker is optimized for the ranging market, but it can also be used for trending market with other trend indicators suggested above. Personally, I have not found the correct way to use this profitably with other indicators although there may already be strategies developed by professional traders.
Mathematics:

Figure 22 is the calculation of Demarker obtained from the following link:
http://www.forextraders.com/forex-indicators/demarker-indicator-explained.html

1. Choose a predetermined period “X” (Standard value is “14”, although a value of “8” or “9” tends to be more sensitive);
2. Calculate DeMax = High – Previous High if >0, otherwise DeMax = 0;
3. Calculate DeMin = Previous Low – Low if >0, otherwise DeMin = 0;
4. DeM = MA of DeMax/(MA of DeMax + MA of DeMin).

Figure 22: Formula for Demarker Indicator

2.3.12: Alligator Indicator

Alligator Indicator is a trend indicator created by trading expert Bill Williams. It is made of three Moving Average lines which are termed with three parts of an Alligator’s mouth: jaws, teeth, and lips. Alligator’s jaw is made of Simple Moving Average (SMA) with 13-period candle sticks and the color is blue. The teeth line is created with 8-period SMA and colored red while the lips is a 5-period SMA and represented with a green line. These jaws, teeth and lips are shifted by 8, 5 and 3 bars/candle sticks respectively. Although some trading software platforms do not provide the Alligator indicator, it is easy to reproduce by following the above procedure on the values of SMA.38

The Alligator indicator displays the strength/presence and the direction of the trend at the same time. If all three lines (jaws, teeth, and lips) are in a correct order, meaning Jaws at the bottom, teeth in the middle, and lips on top (i.e. green, red, blue from top to bottom), an upward price movement is to be expected. A downward price movement is valid when the three lines are in opposite order with Jaws on top, teeth in the middle, and lips at the bottom (i.e. blue, red, green from top to bottom). It can also be viewed as an Alligator lying flat on its belly or its back. An Alligator on its belly is means that it is looking upwards, while being on its back means it is

looking downwards, representing long and short positions respectively. If the lines are twisted, or intertwined, meaning that they are in wrong order compared with the stated two above, the Alligator is considered to be sleeping with its mouth closed, according to Bill Williams. As Alligator indicator rests, we should also rest. One should not open any new trades when the Alligator is sleeping because the market is ranging at this point.

The longer the Alligator sleeps, the hungrier it gets. Therefore, after a long sleep, Alligator is ready to hunt for food; the longer the rest of the Alligator indicator is, the more the market will move vigorously and form a new trend. The food for the indicator is the market price. As it starts eating, the Alligator opens its mouth widely and the three trends start to form a correct order and move away from one another, indicating a good time to jump into a new trade. If the Alligator is full, it will close its mouth with all three lines close to each other go back to sleep with three lines tangled and intertwined again. An insightful suggestion is not to feed the Alligator when it is sleeping. Everything will go to a waste if the Alligator is in its rest. The strategy is to move with the Alligator or one will be eaten.  

Comments:

As Alligator indicator is a trend indicator, the main trick is to look for a formation or reversal of a trend. The most profitable strategy is to look at the trend reversal and follow the Alligator position. Uptrend is formed with green value greater than red which in turn greater than blue. Downtrend is formed with green less than red less than blue values. As can be seen in Figure 23, both downtrend and uptrend are formed by Alligator indicator with a rest time in between.

Some strategists suggest that when there is a Moving Average crossover and a candle with clear opposite price movement, it is a time to jump into the trend. It is shown in Figure 23 as a sell signal. If such a signal does not occur at the closing time, one has to wait for the next closing price. The green line, the lips of the Alligator, can also be used as support and resistance lines as can be seen in Figure 23. Therefore, this indicator is an easy and useful indicator with many features available in one place and is suitable for both beginners and professionals.

However, since moving average indicators are lagging indicators, Alligator can lead to potential loss if one jumps into the trade too late. Like other lagging indicators, it may inevitably produce false signals every now and then. Therefore, it is a good idea to use this indicator with other leading indicators such as MACD, RSI, CCI, all of which are oscillator types. Moreover, it is suggested not to go against the Alligator trend unless one is very sure of the market conditions or fundamental factors. Although changing the periods of the lips, teeth, and jaws are not recommended, a trader can test with any number she preferred to better suit her trading style.

**Mathematics:**

Formula for Alligator Indicator is due to the fact that because Alligator’s jaws (blue line), teeth (red line), and lips (green line) are Simple Moving Averages of period 5, 8 and 13 respectively.
2.3.13: Fractals

Fractals are also part of indicators developed by Bill Williams. The indicator looks like an arrow head without a body of an arrow. The indicator is one of the best indicators developed thus far in the trading history. Fractals can be used as a standalone indicator or in conjunction with other indicators. Fractals are formed when there is a series of 5 consecutive bars where the middle bar is the highest or lowest, thus showing the trend reversals. “Buy Fractals” are formed at the top of the price movement when highest high is sandwiched between two lower highs on both sides, whereas “Sell Fractals” are formed at the bottom of the price movements with lowest low is between two lower lows on each side.\(^\text{40}\)

Comments:

First of all, Fractals can be used as support and resistance indicators because Fractals signify the price points when the market fails to hold and reverse. When the market breaks this resistance or support point indicated by the Fractals, it means that new price movement is in favor.

As can be seen in Figure 24 there are several support and resistance lines created by Fractals that can be used to gain several pips. The figure is in M15, meaning each candle sticks is 15 minutes period. If Resistance (1) is broken nearby, new uptrend strength is formed and thus


Figure 24: Fractals indicator showing support and resistance lines
the time go trade long position, hence the name “Buy Fractals”. Support (1) is never broken; however, since the price reverted back after touching the support line, Support (1) line can be considered as a trend reverting line. After Resistance (2) line is broken, it also signifies a profitable long position.

Fractals can also be used as trends lines with slopes. This is easy and useful for beginning traders because they only to connect the highest buy Fractals or lowest sell Fractals and form a trend line. Since other people may be looking at the graph and trading the same way, there may be some benefits from using Fractals as a trend indicator. Moreover, since Fractals can change according to the time period of candle sticks, it is up to the interpretation and preference of a trader to use the best time period.

Trend (1) in Figure 25 represents the ranging trend because the line drawn by connecting the high Fractals does not display the steep slope, whereas Trend (2) represents the bear trend because the line connecting the high Fractals displays a negative slope which suggests a short position. Fractals are lagging indicators, and thus, are prone to false signals and should be used with other indicators, such as Bill Williams’ Alligator Indicator discussed above.

Here, I will explain a technique used by Bill Williams which is provided on the website of forex-indicators.net. Bill Williams suggest the technique containing the following four rules:
1) If a Buy Fractal is above the Alligator’s teeth (a red line with SMA of period-8), place a pending buy limit (from MT4) a few pips, may be 2 or 3 pips, above the high of the Buy Fractal.

2) If a Sell Fractal is below the Alligator’s teeth, place a pending sell limit with 2 or 3 pips below the low of the Sell Fractal.

3) Buy Fractals below the Alligator’s teeth are false signals.

4) Sell Fractals above the Alligator’s teeth are also false signals.

An example of the usage of this technique is provided and explained with the help of the Figure 26 provided below.

**Figure 26: Fractals with Alligator Indicators**

Signal at point (1) displays a Fractal above Alligator teeth line (a red line in Figure 26), and therefore, a long position is suggested and one should set a pending buy line 2 or 3 pips above the peak of the bar under with the Fractal. When using Fractal with Alligator indicator, we do not execute trades with real time, but rather with future pending executions. This technique can also be perceived as support and resistance.

Signal at point (2) is considered a false signal because it violates the fourth rule stated above. The Sell Fractal being above the Alligator teeth does not represent an actual sell (short) position. Therefore, we ignore this signal. Signal at point (3) suggest a pending sell signal by being under the Alligator teeth. Setting a pending sell line 2 or 3 pips below the minimum of the candle stick would provide a successful trade. At point (5) we can also create a pending sell signal.
At point (4), we can create a pending buy line a few pips above the maximum of the candle sticks, but another buy signal occurs at point (6) although it is not a distinct signal. Therefore, we will skip setting a new buy line a few pips above (6) and set only above (7) when another distinct buy signal appears. As can be implied, a new buy line replaces an old buy line if it is below the old one (signal 4 and signal 6 is an example). The opposite is also true for the case of a new higher pending sell line which replaces an older pending sell line. It should again be repeated that this technique should only be used with pending buy or sell lines.

Personally, I get 100% profitable executions from this technique; however, one must not be greedy by setting the take profit line much higher above the pending order line. 5 or 6 pips is enough for this technique, which is very suitable for a short-term traders like me. Catching four of 5 or 6 pips gains at least 20 pips per day, thus provides a trader favorable return percentage.

Mathematics:

There is no legitimate formula for Fractals because they are formed when there is a series of 5 consecutive bars where the middle bar is the highest or lowest.

2.3.14: Aroon Indicator

Another indicator in technical analysis of the forex market is the Aroon indicator. The Aroon is used detect the beginning and end of trends and their directions. It uses two lines: the Aroon Up and Down. By definition, the Aroon indicator is an oscillator. These two lines oscillate between 0 and 100—as they represent percentages. Each line related the total amount of time that has passed to amount of time has passed since its respective extreme value. In particular, the Aroon Up value is based on the time since the last maximum price and the Aroon Down is based on the time since the minimum. Equation 3 describes these indicator lines mathematically, where $N$ is the period of the indicator.

$$Aroon \text{ Up} = 100 \cdot \frac{N - n_{\text{max},N}}{N} \quad Aroon \text{ Down} = 100 \cdot \frac{N - n_{\text{max},N}}{N}$$

Equation 3: The formulas for the Aroon indicator lines.

---

With the Aroon indicator, traders can watch the crossover of the two indicator lines. When the Up line crosses above the Down, this is indicative of an uptrend. Conversely, when the Down line crosses below the Up, this suggests a downtrend. These are only the basic rules of Aroon indicator. One must also take into account the values of the indicators line as well, for these are what truly provide the important signals.

Beyond crossovers, the values Up and Down lines serve to indicate the strength and likelihood of an uptrend or downtrend. Strong trends in either direction push the Up and Down lines apart, with one tending towards 100 and the other tending towards 0. Strong trends are indicated when one line stays above the 70 line and the other below the 30 line. In the case of an uptrend trend, the Aroon Up line is above the 70 line while the Down is below the 30 line. Conversely, downtrends have the Down line above 70 and the Up below 30. In strong trends, the Aroon lines will run roughly “parallel” while staying in their respective regions for the duration of the trend, as seen in Figure 27.

The end of a trend can be spotted when the indicator lines come back together. As the lines move together towards the 50 line, this suggests a consolidation of the price. While in this consolidation period, there is no significant trending in the price. Another thing that can occur when the lines come together is another line crossing. If the lines cross opposite of the previous
trending, this is likely a good time to close the trade if it has not already been closed. In fact, this may even be an appropriate time to open the opposite position, should the trend reversal seem solid enough. The end of a trend can be considered when the indicator lines leave region above 70 and below 30.

2.3.15: Gator Oscillator

Gator oscillator is also created by Bill Williams, a trading guru, and it creates a visualization tool for Alligator indicator displayed above. The Gator oscillator focuses mainly on the periods when the Alligator indicator is sleeping or hungry, meaning when the Alligator bands are narrow/twisted or wide.\(^{42}\)

![Figure 28: Gator Oscillator with Alligator and Fractals Indicators](image)

**Comments:**

The Gator oscillator, represented by the histogram, is a bidirectional oscillator with value above zero of the histogram signifying the difference between blue and red lines (Alligator’s jaws and teeth respectively) whereas values below histogram lines indicating the difference between red and green lines (Alligator’s teeth and lips respectively).

A green histogram appears when a value on the histogram is greater than its previous value while a red histogram appears when a value on the histogram is smaller than its previous value.

---

value. It may seem to be very confusing to just try to understand what the green and red histogram means.

In the Figure 29 below, point (1) with all green histogram bars above and below represents the time when Alligator is eating, meaning the trend is strong. Point (2) indicates the region when the Alligator is full and wants to sleep. At this point, top half of the histogram is green while the bottom half is red, indicating the trend is going to reverse or break. This indicator is very useful when used with other indicators created by Bill Williams such as Fractals and Alligator indicators as it can be used to confirm the price action and reversals.

![Figure 29: Gator Oscillator explained](image)

Point (3) in the figure signifies a point when the Alligator is sleeping with red bars above and below, meaning the trend is in side way or ranging. As stated above, it is not a good time to trade when the Alligator is sleeping because when it wakes up, it will be hungry and the market will move vigorously, sometimes in favor of and sometimes against the traders. Point (4) represents the time when the Alligator awakes, indicated with red lines above and green lines below. When the Alligator wakes up after a long rest, it is a good time to jump into a trade because it will eat vigorously because it is hungry. It is good to keep in mind that the Moving Averages of the Gator oscillator are shifted into the future, and thus it may not sometimes represent the real-time data.
Mathematics:

The formula of gator oscillator indicator is obtained from the following link: http://www.forexindicators.net/gator-oscillator.html.

Median Price = (High + Low)/2

Jaw (lower moving average) = Smoothed moving average of the median price over 13-period

Teeth (upper moving average) = Smoothed moving average of median over 8-period

Lips (middle moving average) = Smoothed moving Average of the median over 5-period

Top bar = Jaw - Teeth

Bottom bar = - (Absolute value of (Teeth - Lips))

2.4: Money and Risk Management

The most important thing about trading should be surviving to fight another day. Swing traders are people who have a hard time keeping money in their accounts due to having to risk too much on a single trade. One should never have to empty an account just to be able to become rich. By approaching trading with a scientific mind, one can create rules to help from emptying accounts of money. Many people start out trading expecting to make a lot of money very quickly, however they soon realize that they begin to lose their money very quickly. They begin to freak out and try to make back all their money they lost by risking more money on bad trades. This is the reason why many people lose all the money in their accounts when they first start out. They do not know the proper amount to risk per a trade and soon they find themselves draining their account of all of its funds. Especially in countries the offer higher leverage meaning that accounts can be drained even faster. It is very important to develop rules appropriate for each individual trade, but more importantly it is necessary to follow those rules.

2.4.1: Money Management

Money management deals with how to determine the amount of money you should trade with. This can deal with determining how much to risk on a trade or how to make money comfortably. On average, you should never trade more than 5% per trade at any given time. This can be easily understood when looking at an example account of $100,000. 2% of $100,000 ends up being $2,000 when one works out the math. Therefore, on average you should never have trade that risks you losing more than that amount. It is not a real set rule, more a helpful incentive for young traders when they first get into forex trading. It helps keep their money in their bank account and not in other people’s pockets. As one progresses and learns more about trading and what they are capable of, these rules can be relaxed and you can trade more than that if you feel comfortable.

The best technique of money management is “not to get greedy” while trading. Greed is the major flaw of most traders, no matter if one is beginner or professional. Greed is a fundamental asset of human that can never leave a person. If one can harness greed, one can conquer the world, at least a trading world. As my professor always says, a person needs a systematic mind to be successful. One does not need to win too many pips to get enough profit. 20 pips a day with 1 standard lot would give a trader 100% profit of the original asset of $50,000. Therefore, one only needs to win 7 pips each from 3 trades, or 5 pips each from 4
trades; 20 pips from a single trade is practically impossible for every trade. Usually, waiting for a currency pair to differ 20 pips from original price takes a long time and, thus, is not appropriate for short-term traders. Sometimes, the price reverts and even some profit is transformed into losses. Thus, dividing the desired pips profits into several trades is an excellent strategy for short-term traders.

Another suggestion on money management is to not trade on so many currency pairs. Choose only five or six pairs that are most traded on the market. For instance, EURUSD, USDCHF, GBPUSD, USDJPY, GBPUSD, and EURJPY are the most traded pairs on the market. Having too many currency pairs in the list is difficult to handle and one might lose track easily. However, there may be opportune times when fundamental analysis suggests trading on minor currency pairs. One should not let these opportunities go, although the spread may be too high. Furthermore, trading on major currency pairs would provide lower spreads than on minor ones. Minimum spread on minor currency pairs goes as much as 5 pips which is too much to recover in a short term. For example, a short term trader would have to wait for 12 pips difference to get 7 pips profit. One should also look for low spread brokers due to this reason alone. However, we have to ask ourselves “what’s the catch?” when we trade with low spread brokers. We have to know if the trades are transparent, meaning that whether the trades go directly to the monetary entities such as banks, or if these brokers playing against us. Hence, though research on brokers and their background is also a necessity.

2.4.2: Risk Management

Never go against a trend. Trends are good for “day” traders who trade only for a short period of time. Trends indicate price movements and are usually presented as moving average. If a trend is bearish, it is unwise to have a long position as long as no fundamental factors, such as a country’s political and economic situations, change. It is also true for opposite case; it is risky to go short for a bullish trend unless one has complete information about what will happen next. However, one does not always need to go with the trend. Professionals sometimes go against a trend and gain profit from doing so; however, the trick is to find the right settings for the indicators and follow the signals, which is uneasy for beginning traders.

Trading along with the fundamental changes is very unsafe because when one gets news or information, it might already be too late for her to react since the price might have already
moved to its extreme. When a trader jumps into a trade, it may be the time when the price is going to move exactly opposite to the news. Thus, it is never a good idea to profit from the news unless one gets the news first hand.

Taking risk includes setting limits to the trades. A trader must know her minimum gain and maximum loss margin for a day. If a trade goes against the expectations very harshly, a trader may lose an amount she cannot afford and be kicked out of the business. By setting maximum loss, a trader never loses too much and may recover the loss the next day. Although setting minimum gain may lead to less profit, the trader can still adjust the “take profit” bar if the price is moving in her favor. But, remember not to get “too greedy”, but to have a systematic mind.

One thing to watch out for is setting your stop losses and take profits lines appropriately. Setting your profit lines and loss lines can be tricky and may be altered from trade to trade however; here are some general rules for setting them. On average the stop loss should never be more than 30 pips above your entry point for any given trade. Regardless of how certain you are that your assessment of the market is correct, it is foolish to set you stop loss and further away due to random fluctuations. The final thing to remember is that you must always set stop losses no matter what. It is extremely dumb to enter a trade without a stop loss to guard against random changes and you can easily empty and account that way. Setting take profit lines is another thing that must be taken on a case-by-case basis. As stated above, one should evaluate the market before setting but on average the take profit should be no more than 20-30 pips away from the entry point. Setting a take profit is not necessary if one is willing to watch the market the whole time, but if you do not want to continue to watch the market then you should set a take profit. In time as one become more accustomed to trading, you could possibly increase the total standard lots traded instead of setting profit lines further away to increase profit.

Risk assessment also includes knowing when to trade. Timing is a crucial part of trading because diving into the trade when liquidity is low may leads to potential losses. Liquidity means that an asset can be traded or exchanged without affecting the price movement. If a market has high liquidity, the price shifts up or down only a little bit even if a billionaire invests all of her fortune in the market. It is a good time to trade because it is the time when a lot of people are trading and the price does not change very much. When the liquidity is low, even an input from a
millionaire can move the price abruptly, let alone a billionaire. If this happens, even setting 20 pips difference may be too little as there will certainly be a lot of price spikes during low liquidity time. One might get caught in the price movements by “big dogs”.

From reading online articles, we have learned one important aspect of trading. Trying to win back the loss is much harder than it seems to be. Let’s assume there is a $100,000 account. If I lose 25% of the base account, I am left with $75,000 as new balance. Therefore, in order to return to the base capital of $100,000, one is required approximately 33% (i.e. $25,000) of the new capital. If I lose 50% of the base account, I am left with $50,000 and I need 100% (i.e. $50,000) of the new balance. And if I have lost 75% (i.e. $75,000) of base capital, I am required to gain 300% (i.e. $75,000) of new balance of $25,000. Although it seems like a paradox, this is how money system works. If one encounters a loss, one needs to gain more with the current money to get to the original price.\(^{44}\)

One needs to know the risk/reward ratio they are using in trading. It is crucial to have a risk/reward ratio of at least 1:1, meaning that chances to lose are the same as the chances to win. If there are 10 total trades with 5 loss trades and 5 profitable trades, then one does not make any profit with this risk/reward ratio, but at least he will survive and his account will not be wiped out quickly. With risk/reward ratio of 1:3, 5 loss trades of 10 pips (risk) would cause a loss of 50 pips while 5 winning trades of 30 pips (reward) would bring a profit of 150 pips, leaving a total profit of 100 pips.

High liquidity times are around 8:00am to noon EST because this is when a lot of trades occur with New York forex market. From 4:30pm to 7:30pm EST, Japanese forex market is most active and a time interval from 3:00am to 7:00am is when London market has the most liquidity. Therefore, the bottom line is “do not trade when liquidity is low”. Benefits of trading during high liquidity times include low spread, less loss, stable price movements, and beneficial technical analysis.

2.4.3: Rules of Entry and Exit

Indicators provides entry and exit points. From previous trades, it has become obvious that CCI indicator is a good leading oscillator type indicator, which is also included in this paper.


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Indicators such as Alligator indicator, Fractals, and Gator indicators, created by trading specialist Bill Williams, are also very useful in forecasting the price movements and are explained in details above. As indicated above, rules of entry and exit are mostly determined by the indicators and are sometimes faulty. One needs a complete knowledge of most of the indicators to perceive entry and exit points. Most of the time, leading indicators, mostly oscillator types, such as RSI, MACD, CCI, and Stochastic are useful for both entry and exit points whereas the trending indicators such as SMA, EMA, Parabolic SAR are useful for entry points. Furthermore, Bill Williams’ indicators are considered to be a complete set of indicators that can be used for entry and exit points.

If the trend is sliding, it is not a good time to enter or exit a trade as the movement is unpredictable. If the price movement is in a porcupine-like manner, “day” traders or short term traders who set the stop loss too low may lose in an instant although the price average does not change.

**2.4.4: Risk and Psychology**

Psychology is a significant factor in risk management. Unfortunately, human cognition introduces some negative biases that can affect one’s trading. The first of these biases is the confirmation bias. Confirmation bias suggests that the trader is more inclined to believe evidence that supports his or her opinion of the how the market will go and is more inclined to ignore evidence of the contrary. For example, the trader may think that an uptrend is forming based readings from the RSI and increasing prices on the chart. However, a long-term moving average says the average price is decreasing. The confirmation bias would give the trader the false impression that although it would seem logical that if the MA were decreasing, then the uptrend would not likely last.

A second cognitive bias is the omission bias. This bias suggests that a person is more inclined to make no action, even if taking no action increases risk. This is can be applicable to trading when a trader is in a bad trade. With all signs pointing to failure of the trade, the trader may feel inclined to stay in, hoping that the market will turn around again. It is because of this that keeping a consistent trading plan is important. When the accepted loss is hit, the trade must

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be closed. Hanging on to a trade for any longer only presents more risk. This is a challenge that must be met early in trading.

Another costly cognitive bias is commonly called the gambler’s fallacy. The gambler’s fallacy suggests that after losing so many times, one must eventually win. Because the forex market is much more complex than this simple hypothesis, this is hardly a reliable method by which to trade. It is for reasoning like this that a successful trading plan must enforce a maximum number of failed trades or even total trades per day or per week. Sometimes it is just best to admit that it just is not our day and close the trading program for the day. By continuously opening trades to find this supposedly winner amongst losers, the trader is only presenting more risk and likely increasing his or her losses. This can also be quite stressful and discouraging to the trader.

Emotions affect one’s trading as well. When one is happy or experiencing positive emotions, one’s perception of risk is greatly reduced. This bias can skew a trader’s assessment of risk and result in entering a bad trade. With the proper risk management technique employed, the trader can avoid losing substantial amounts of money, but without them the trader’s entire account could be emptied by this move. It is also discouraged to trade when one is angry or frustrated. A trader should take some “cool-off” time after having an argument, losing something important, or any other stressful event before trading. The trader’s emotions can cloud his or her judgment and make the trader open poor trades. A trader is more successful when thinking clearly.
2.5: Introduction to Platforms
When one is in forex trading business, one has to deal with forex brokers to trade currency whether in small or in large amount of sums. Dealers exist both physically and virtually, meaning that the personnel working as brokers are “physical” brokers of the brokerage firm that operates “virtually” on the World Wide Web. However, most of the time, we train ourselves by using demo accounts provided by those brokers so that we do not have to rely on physical brokers, but only on the trading platforms that, most of the time, fulfill our needs. There are two trading platforms that we utilized in our IQP: MetaTrader4 and TradeStation.

2.5.1: MetaTrader4
The MetaTrader 4 platform provides for a comprehensive and effective how to construct programs to assist trading in their trading. An MT4 program can perform a variety of tasks from opening and closing trades, setting or changing stoplosses, drawing an indicator, or even be a fully-functional trading robot.

To accomplish these applications, MT4 uses its own programming language called MetaQuotes Language (MQL). In particular, for MT4 this language is MQL4. Its language is very reminiscent of the traditional C programming language. It offers many built-in functions pertinent to trading, granting access to the data collected and maintained by the trading platform. For instance, several trading functions exist to access the data points of many popular forex indicators, such as moving averages and the MACD. On the other hand, MQL4 lacks many of the more advanced features of C that offer additional complexity and flexibility to a programmer’s code, like structures in C and classes in C++.46

All programs for MT4 can be developed within the MT4 platform. Programs can be edited (with a full syntax highlighter for convenience and debugging), compiled, and run within MT4. This is greatly advantageous, as the programmer need not import or export any data to or from MT4 into a separate application. Since all programs are run inside of MT4, they have access to the platform’s trading data (prices, computed indicators, etc.) This integration allows programmers to focus their efforts on the application, not the collection and management of data. Instead, this data management is performed “under the hood” with the MT4 platform, graciously provided by the developers.

MT4 offers three general types of programs: scripts, custom indicators, and expert advisors. Each type of program serves a different purpose. Scripts are the simplest of the three types of MT4 programs. They are intended to run a particular task once. Such a task may be opening a trade at the current price and setting a 20 pip stop-loss and 20 pip take-profit. One can think of a script as a tool in a toolbox. Custom indicators allow traders to program their own graphical indicator to put on a plot. Expert advisors are trading programs commonly called robots. They are allowed to run indefinitely without the traders’ invention. This type of program is allowed to open and close trades.

2.5.2: TradeStation

TradeStation is a top broker in the United States. It boasts on its excellence in nine aspects of trading field: award winning software, competitive pricing, extensive lightning fast market data, account security, strategy network, its community of traders, its rich online education, world class customer support, and trade execution quality.

TradeStation’s own software TradeStation offers unlimited potential to signals, indicators, and strategy components. It also allows traders to write their own expert advisors programs which monitor the price movements and perform automatic trading. It also offers more charting tools, indicators, and enhanced user friendly interface (such as one-click execution, modifying, and setting different buy and sell amounts on a single trade) compared with other common trading platforms. TradeStation offers 6 general types of programs: Indicator, ShowMe, PaintBar, ActivityBar, ProbabilityMap, and Strategy (which are written in EasyLanguage software). In TradeStation, one can open up to 99 indicator plots which can be overlapped on the price charts or can be displayed as a separate sub-graph. ShowMe is another type of indicator which “draws a dot in a chart window”\(^{47}\) to alert the trader that conditions defined in the program are met. PaintBar is also a form of indicator fill the bars with a pre-defined color to indicate the conditions defined in the program are met. One can use activity bar to display the all the price actions occurred within each bar on the chart. In other words, one can use activity bar to see the price movement in finer detail. ProbabilityMap provides the information of historically-driven

price data. Strategy in TradeStation is similar to expert advisors in MT4 in a way that they can be used to open and close trades automatically.

TradeStation states that its swift and reliable market price updates allows its customers to see the price actions before other people do. Its technological feature also prevents the customers from missing trading opportunities due to temporary internet connection loss. Due to its reliable historical data, programmers can do back-testing of their software not only to past year, but to several years back.

![Figure 30: Currency Spreads from TradeStation](image)

According to its disclosure on account security, TradeStation is a member of SIPC which offers up to $500,000, including a cash balance of $250,000, a protection given to all customers.

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in case the financial institution went bankrupt. The other aspect of the account security that TradeStation stresses about is the online identity theft. It offers how to online identity theft can happen and how to protect the account. Most common ways of stealing identities occur through malicious software programs that are installed when one opens an untrusted site, and is sometimes called “phishing” when these programs comes through emails and fake websites. These programs tend to steal not only people’s account information and email passwords, but also their social security numbers and other sensitive information. Some ways of protection provided on the website are to increase the level of security software and firewall, to use only one’s computer, to monitor any download, to make difficult password, and log out completely when one is done.49

As can be seen in Figure 30, TradeStation offers low spreads even on the minor currency pairs. Traders need low spreads to achieve high profits and thus this broker is one of their favorite amongst hundreds of brokers all over the world. Furthermore, it has several customer support teams working 24 hours a day and six days a week. Each team has its specific field that they has specialized to help customers of forex, futures, stocks, or options with their full potential. They even have separate customer support team for TradeStation client support to help customers as well as programmers with the platform. It has its own “university”,50 a collection of resources such as video tutorials, articles, and books, to help customers, new or professional, with their trading strategies. Thus, TradeStation is one of the best brokers in US helping traders with their trading to be successful.

2.5.3: Comparison between MT4 and TradeStation

In General, MT4 is very popular among the trading community that all traders, novice or experienced, have heard about it. It cannot be denied that MT4 is the most common trading platform since almost all the brokers uses MT4. However, the only difference will be the pip spreads between individual brokers; some may have high spreads while others may provide low spreads to attract customers. Therefore, if one knows how to use MT4 trading platform properly, one can choose among many options of brokers to trade. MT4 also has a simple and user-

friendly interface which requires users to have minimal knowledge about the platform, but provides less control over it. Since its programming language, MQL4, is similar to C programming language, it is easier for experienced programmers because they do not lose time in familiarizing with the syntax.

On the other hand, TradeStation is only popular among the experienced traders due to its sophisticated features. As mentioned above, TradeStation has a lot more indicator types that are very valuable to professionals. It also provides reasonable spread for all currency pairs and is comparable with other brokers. TradeStation’s EasyLanguage is not difficult to learn for most of the traders, but it drains a lot of hours for programmers who have been programming in C, C++, or JAVA, since they are not accustomed to the syntax. Another drawback of EasyLanguage is that the documentation is difficult to follow. There are too many functions in the platform that should be combined into a general function that would provide the same functionality for those functions. On the other hand, functions with a few arguments are more intuitive for novice programmers.

Both platforms has advantages and disadvantages over each other. Depending on the level of experience in trading, MT4 is suitable for beginners, while TradeStation is perfect for professionals. Furthermore, knowledge with many programming languages comes into play on deciding the platform. EasyLanguage may be easier for both novices and experts, but MT4 is definitely aimed for those with decent programming background.
Section 3: Methodologies

Using the information from the previous section, different strategies were formed to create successful trading plans. While many schemes were created throughout the year, only the prudent ones were mentioned in the section below. The main method used by the group in both the programming project and the manual trades was the triple crossover, which is explained in greater detail below.

3.1: Forex Strategies

The following section includes the chosen strategies for each member of the group. It includes how the $100,000 dollar accounts were managed and what methods were applied throughout the project. As stated in detail below, the major trading strategy employed by all at some time or another was the triple crossover. However, different methods were used throughout the term, and they were included in this section as well. Starting off, this paper will discuss how the $100,000 accounts were managed.

3.1.1: Trading Plan with $100,000 Accounts

Let us assume that we are given a $100,000 account. First we need to know the leverage we will be trading with because brokers offer different amount of leverage for different accounts. Although there may be platinum, gold, or silver accounts with different privileges, most brokers allow customers to choose their choice of leverage to maximize their profits or minimize their losses. Leverage is proportional to the amount of risk a person is taking, meaning that playing with high leverage imposes higher risk and may lead to either maximum profit or maximum loss. Even though leverage is used to earn significant profits, it sometimes works against investors. For instance, if the price moves opposite of what one has invested, leverage amplifies the amount lost from the trade. Thus it is vital to choose the amount of leverage that matches with the risk one can handle.

A ratio of 50:1 is a standard in United States. Since this ratio is issued as a standard by the authorities to reduce the losses of most investors, it is wise for novice investors to follow the already existing standard. Hence, for a standard lot which worth $100,000, we only need to invest $2,000 with the leverage of 50:1 ratio which is significantly less than an actual amount needed to invest to acquire substantial profits. Since we have $100,000 capital, we have 50 standard lots in total to do the investment. If we invest 1 standard lot per trade, we are only using
2% of our capital investment for each trade, which is at such a small risk compared to the accounts with higher leverages.

First we have to decide the amount of percentage of the total investment that we want to profit over a year. In other words, we must have a goal of annual earnings in percentage so that we can calculate the average amount that we have to make each day, excluding the weekends. As mentioned above, forex market opens 24 hours a day, but only 6 days a week, not including Saturdays. Even on Sundays, the market only opens for a few hours, starting at 5pm EST with very low volatility until the early Monday morning when the liquidity of the market is high. Thus, in consideration of the days in a week to calculate the annual profit percentage, we ignore Saturdays and Sundays and assume there are only 5 trading days a week. Therefore, there are total of $5 \times 52 = 260$ days per year and we trim the number to approximately 250 days per year for convenience in calculations.

Some forex investment firms and companies provide from 5% up to 15% return of the total investment over a year and ask for 10% to 20% of the total profits gained over a month as fees to the firm. It may seem as if 15% return is substantial, but systematic calculations prove that 15% return is easily achieved with the minimum risk, let alone 7% or 8% return provided by most investment firms. Calculations go like the following. 15% of total investment $100,000 is $15\% \times 100,000 = 15,000$ per year, which may seem a large sum of money to the government bond holders who only get around 5% per year. To get $15,000 per year, one need $15,000 \div 250 = 60$ per day. This amount is equivalent to 6 pips difference if 1 standard lot is invested. During high volatility times, the price moves as much as 10 pips in even five minutes. Thus, the difference of 6 pips means almost nothing to most professional investors. As mentioned before, 1 standard lot is equivalent to 2% of the initial investment of $100,000 and this minimizes the potential risk.

If one can take more risk, increasing the lot size decreases the amount of pips needed to obtain desired profit percentage. Investing 2 standard lots, equivalent to $4,000 actual capital or $200,000 leveraged capital, would require only 3 pips per day to attain 15% return profit. If 6 pips profit per day is easy enough, 3 pips per day is no sweat for professionals although the current trade to initial investment ratio percent rose from 2% to 4%. On the other hand, 0.5 standard lots would need 12 pips to make $60 per day. This is typically the minimum amount of
lot that professionals play with initial capital of $100,000. Since the risk is low, it is intuitive that one needs more pip difference to obtain the requisite amount of profit.

Furthermore, one does not need to stick with a particular currency pair, but one can trade separate currencies with strong relative movements at the same time, or even in different times. The following five major currencies are good ones to watch since they are always moving: EUR, USD, JPY, CHF, and GBP. The reason that I choose EURUSD is its high volatility which is very helpful for day traders like me since I do not need to wait for a very long time to get the pip difference that I want if I trade in peak hours mentioned above in Risk Assessment section. During peak hours, many people are active in trading, leading to high liquidity and high volatility market. Since most people use the same indicators or expert advisors (explained later in MQL4 Programming section), the price action goes the way they think most of the time. At such times, even billionaires cannot move the price the way they want because of high liquidity market. Turning back to investing in different currencies at the same time, margin value or free margin is plays an important role to make sure an investor is not risking most of his fortune at once. It is automatically calculated by any trading platform software and displayed on the main screen most of the time. Personally, my maximum trading risk per day is 10% of my original capital, which is 5 standard lots or an equivalent sum of $10,000. Therefore, I can safely invest 2 standard lots in two currency pairs at the same time, which I usually do to get 10 pips from each currency pair. As stated above in Money Management section, I strongly believe that getting 20 pips from a single currency pair in an hour is impossible and very risky, let alone the spread from brokers.

Most traders cannot get away from superstition, which is not as bad as it sounds. Having superstition is helpful sometimes. If I think I am in bad luck, I quit trading for the rest of the day. How do I decide if I am in bad luck? If I have two losses for the day, I assume I am having bad luck. If I continue trading, I am certain I will lose more not because I am “actually” in bad luck, but because my mind is in rage and confusion, and I would want to invest more without looking at indicators and signals properly. In other words, superstitions in trading can be related with human psychology. Human can perform very well if their minds are clear and without any external disturbances. External disturbances may include playing games, noises, doing homework, or housework while trading. One needs to have a serene place with clean desk, a
computer, a comfortable chair, and may be a nice cup of coffee to spend the morning and trade calmly.

I usually put 10-15 pips for take-profit and 15-20 pips for stop-loss to control my risk for each trade. If the price moves into take-profit region, I sometimes change my stop-loss to a quarter of the current profit, so that even if the price rebounds, I still have profit. This strategy, provided by my group member Joe DiChiara, has helped me several times while I was trading with the demo account. Setting stop-loss saved me several times in the past few weeks during the Swiss banks crisis, and Greek crisis. Without it, my account would have been wiped out within a few hours while I was away from my computer. Stop-loss and take-profit are really useful for those who cannot watch the computer screen all the time, and those who have other careers or duties outside the trading environment.

3.1.2: Trading Strategy

The trading strategy we obtained from our professor is to look for a crossover point for Moving Average with period of 5 (MA5) versus Moving Average with period of 13 (MA13), and if MA5 is below MA13, it is a signal for short, or if MA5 is above MA13, it is a signal for long.

![Figure 31: a) Before crossover b) After crossover](image_url)

It seems very easy to implement this strategy just from reading it, but it is, in fact, complex due to the nature of Moving Average indicator. Since Moving Average is calculated on the certain amount of the latest bars or candle-sticks, the Moving Average line is dynamic, i.e. it moves corresponding to the price of the last candle stick. Therefore, we should wait for another candle-stick after a crossover occurs. From Figure 31a, it is apparent that the MA lines are going to have a crossover, and there was even a crossover when the price moves to approximately
1.38905 although the crossover disappeared in Figure 31a when it reaches 1.38962. Figure 31b shows that when there is a clear crossover point, short position is profitable. But how can we decide a clear cross over point? It turns out there are two ways to decide the strong crossover: 1) to wait for one more bar after the cross over, 2) to wait for the four-to-nine pips difference between two moving averages. Since second way is hard to decide, I usually implement the first strategy for my trades. However, most of the time, the price moves so fast that it was too late to jump into the trading because it has reached its maximum point. Therefore, we will need a program that will make sure both conditions are met and send the order immediately at that instant. The program should also set the desired take-profit and stop-loss points automatically without the need for manual input from the user. I prefer take-profit point to be 10-15 pips and 20 pips for the stop-loss line due to occasional price spikes.

![Figure 32: a) and b) Example of a false signal crossover](image)

Figure 32a above shows that a crossover of MA5 and MA13 occurs, and it may seem as if it is time to take long position. However, from Figure 32b, it turns out that it is a false signal because there is no crossover at the same point after a few bars or candle-sticks. Therefore, two rules for crossover must be applied to all trades if this strategy is used. Before finding out this limitation or flaw in this strategy, we spent a lot of money in demo account provided by brokers such as OANDA and FXCM. I believe that the demo or practice accounts are not only for practice, but they are also for testing programs and finding flaws in them.

There is a second strategy, which is usually used during manual trading. We noticed that if the price goes up/down approximately 50 pips in one candle-stick, it sure will rebound back. However, a trick to this strategy is to set a stop-loss of nearly 20-30 pips from the point of
entrance. An example is provided in Figure 33 showing that too much price movement in just one candle-stick is a chance of a profitable trade.

Another trading strategy we obtained from the website is provided in Fractals subsection of Technical Indicators section and step-by-step procedures are explained on how to use those Bill William’s technical indicators. There are other trading strategies that I got from online resources, which I have been testing and analyzing, and there are some promising ones, but most are not robust enough to use for all currency pairs or not decent enough to have a good return percentage. However, if the strategy given by my professor can be programmed perfectly, it can even return 100% within a month, which I have tested this with one of my practice accounts. The need for programming arises due to the amount of currency pairs and the limitation of humans on multitasking, which is explained with human psychology in next section.

The main trading strategy that was implemented in most manual trades was a modification of the double cross over. The double crossover, which was explained above, uses two exponential moving averages. The ‘fast’ one uses a short period of previous data to calculate its position, while the ‘slow’ one uses a longer period of previous data to calculate its current value. The terminology of EMA-5 or EMA-11 refers to how many bars of previous data it uses to
calculate. However, in this new method one throws in a simple moving average along with the two exponential moving averages. For further explanation on the differences between these two moving averages, see the section technical analysis. The three indicators together form a type of “triple crossover” that can predict shifts in the market trends. This method can be used in the two following ways: as a type of reverse trend trading or with trend trading. Since reverse trend trading is very risky, we will only employ the other method. In this formation we wait for large market moves and get in for small period of time to make money.

3.2 Robot Trading

The following sections talks about the robots that were built during the course of this IQP. Each person was required to create at least 1 small function, but the group robot was to be more in depth. The following documents the creation of each robot, but the results of each will be displayed in the results section.

3.2.1: Kaung’s Programming Project

One of the strategies provided in Trading Strategy section is utilized as a base to create the following program. The requirements are that if there is a trade already opened on a particular currency pair, the program should not open another trade, that if a trade should opened with take-profit and stop-loss points already set, that a trade should only be opened when Moving Average (MA) with a period of 5 passes MA with a period of 13, and that MA5 and MA13 are different in certain pips. The following program is developed based on the Moving Average Expert Advisor originally written by MetaQuotes Software Corp.

```c++
//+------------------------------------------------------------------
//|                                                             EA_EMA5_13_2.mq4 |
//|                                                   Kaung Myat Win |
//+------------------------------------------------------------------
#define MAGICMA  201110
#define MAGICNUMLOW 4   // pip diff between MA5 and MA13
#define MAGICNUMHIGH 9
extern double TAKEPROFIT         = 15;
extern double STOPLOSS           = 30;
extern double Lots               = 0.1;
extern double MovingPeriod5      = 5;
extern double MovingPeriod13     = 13;
extern double MovingShift        = 0;
//+------------------------------------------------------------------
//| Calculate open positions                                         |
//+------------------------------------------------------------------
int CalculateCurrentOrders(string symbol)
{
  int buys=0,sells=0;
  //---
  for(int i=0;i<OrdersTotal();i++)
  {
```

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if(OrderSelect(i,SELECT_BY_POS,MODE_TRADES)==false) break;
if(OrderSymbol()==Symbol() && OrderMagicNumber()==MAGICMA)
{
  if(OrderType()==OP_BUY) buys++;
  if(OrderType()==OP_SELL) sells++;
}

//---- return orders volume
if(buys>0) return(buys);
else return(-sells);

void CheckForOpen()
{
  double ma5,ma13;
  int res;
  //---- go trading only for first tics of new bar. NOTE: COMMENTED OUT
  //if(Volume[0]>1) return;
  //---- get Moving Average
  ma5=iMA(NULL,0,MovingPeriod5,MovingShift,MODE_EMA,PRICE_CLOSE,0);
  ma13=iMA(NULL,0,MovingPeriod13,MovingShift,MODE_EMA,PRICE_CLOSE,0);
  //---- sell conditions
  if(ma5<ma13-(MAGICNUMLOW*10*Point) && ma5>=ma13-(MAGICNUMHIGH*10*Point))
  {
    res=OrderSend(Symbol(),OP_SELL,Lots,Bid,3,0,0,\"\",MAGICMA,0,CLR_NONE);
    OrderModify(res,OrderOpenPrice(),(Bid+STOPLOSS*10*Point),(Bid-
    TAKEPROFIT*10*Point),0,CLR_NONE);
    return;
  }
  //---- buy conditions
  if(ma5>ma13+(MAGICNUMLOW*10*Point) && ma5<=ma13+(MAGICNUMHIGH*10*Point))
  {
    res=OrderSend(Symbol(),OP_BUY,Lots,Ask,3,0,0,\"\",MAGICMA,0,CLR_NONE);
    OrderModify(res,OrderOpenPrice(),(Ask-
    STOPLOSS*10*Point),(Ask+TAKEPROFIT*10*Point),0,CLR_NONE);
    return;
  }
}

// Start function
//---- check for history and trading
if(Bars<100 || IsTradeAllowed()==false) return;
//---- calculate open orders by current symbol
if(CalculateCurrentOrders(Symbol())==0) CheckForOpen();

The code provided above is a completely working program that opens trade, sets the take-profit and stop-loss values, and close the trade automatically. It also runs as long as the program is not closed or removed from the chart. First of all, some constants are defined and assigned to variable names. Afterwards, using extern, other constants are assigned to variables with predefined values which can be changed later by the input from user. Then, two user-defined functions, CalculateCurrentOrders() and CheckForOpen() are created.
**CalculateCurrentOrders()** function assures that there will be no duplicate orders on a particular currency pair while **CheckForOpen()** function calculates moving average values of period 5 and 13 and send an order by using **OrderSend()** function without setting take-profit and stop-loss values. Although we can set the values of take-profit and stop-loss, most servers that I have seen do not allow setting these values at the time of sending the order. Therefore, **OrderModify()** function is used to modify the take-profit and stop-loss values. As can be seen from the code provided, **MAGICNUMLOW** of value 4 and **MAGICNUMHIGH** of value 9 are used as conditions to open a trade, i.e. if the MA5 is greater/less than MA9 and if the pip difference is between 4 and 9, buy/sell the first currency of the currency pair. The main function is **start()** function that drives the Expert Advisor to operate on every new tics/candle-sticks. The first if statement of the **start()** function makes sure that the information is up-to-date and the trading is allowed, thus ignoring to do trading during the time the market closes. If trading is allowed, the next if statement is executed and two user-defined functions are executed. However, the program shown here is not perfect because every time there is a 4-to-9 pips difference between MA5 and MA13, the Expert Advisor executes even if the crossing of two EMA lines are far behind. Moreover, the Expert Advisor performs well only on EURUSD pair because of its high volatility.

### 3.2.2: Richard’s Programming Project

At the beginning of the project, my goal had been to develop a trading program for my original trading strategy, which used the two MA crossover and the MACD. This was soon replaced by the new strategy that I had learned using the triple crossover, as described previously. To develop a robot for this trading system, I had to use this trading plan and interpret it in the form of code, such that the program could follow my same steps. This stage is very important; it is the equivalent of a trader paying close attention to strictly following his or her trading plan. A program must be constrained to the same levels of discipline in obeying the trading plan.

According to this strategy, the trader enters trades according to the crossover of three moving averages. They are labeled **Fast**, **Medium**, and **Slow**. **Fast and Medium** are EMAs of periods 14 and 28, respectively. The final MA **Slow** is a simple moving average of period 40. To determine the crossing of the three lines the **Fast** must cross with **Medium** and separately cross with **Slow**.
Of course, the likelihood of all three MAs crossing at the same time is preposterous. This is especially unlikely since these lines are in fact discrete rather than continuous, are therefore not guaranteed to be exactly equal at any given point when crossing. The algorithm accounts for this by checking the change in relative position of the Fast line to the other. On each new tick (data point), the program computes two points of each MA. By subtracting the fast MA with the slower MA, the program can determine the relative position of the lines. When the difference is positive, the fast line is above the slower one. When it is negative, the fast line is below the slower one. These positions are important for determining the direction of the trend. The flow chart in Figure 34 describes this process algorithmically.

The three lines are very unlikely to cross in the same bar. To account for this fact, a crossing window was defined. In order to consider the triple crossover as valid, each crossing must happen within a certain number of bars. Two variables are used to store the number of bars since the last crossing of this pair of MAs. When a cross is detected, the corresponding variable is set to zero. Otherwise, the variable is incremented by one to signify that one more bar has

![Flow chart for the EMA crossover code.](image)

Figure 34: Flow chart for the EMA crossover code.
passed since the last crossover of this pair. When both of these counter variables are less than the windows value (by default 3 in the program), a valid triple crossover is detected. This process is illustrated by the flow chart in Figure 35.

![Flow chart for the triple cross detection.](image)

It is very important for the program to keep track of its progression through the stages of opening a trade. Each stage is responsible for performing tasks unique to that stage in order to follow the procedure dictated by the trading plan. This is very much like the next-stage logic and output logic of a finite-state machine (FSM). This program keeps two main state variables: position and trade. The variable trade is used to track the stage of trade-opening. It is initially equal to TRADE_NONE to indicate that no crossover has been detected and no trade is open. The variable position is used to store the direction (buy or sell) for the current or pending trade. It is initialized to POS_NONE to indicate the value that there is no open or pending trade.

When trade=TRADE_NONE, the program both if it is the right time of day to trade and if a crossover has occurred. If both conditions are met, the program enters the TRADE_PEND stage and the trade action is set as TRADE_BUY or TRADE_SELL in position. When trade=TRADE_PEND, the program again checks the time of day to filter out potential false trade signals. Another important step in this stage is checking the pattern. It was noticed over the
course of the project that in strong trends the MA lines follow a certain pattern. For uptrends, the
lines stack up from slow, medium, to fast. Downtrends follow the reverse pattern of fast,
medium, to slow. This extra check was added in an effort to reduce the amount of false signals.
If the lines are in the correct order, then a trade is opened and stop-losses and take-profits are set.
The variable trade is set to TRADE_OPEN and the ticket of the new trade is saved for later use.
If the lines are out of order, the program goes back to the TRADE_NONE stage and awaits another
crossover to analyze.

The final stage of the program is the TRADE_OPEN stage. It is in this stage that the
program checks that opened trade is still open. The trade could be closed by a stop-loss or take-
profit, and therefore would never end. This allows the program to open new trades when this
occurs. This stage is also where the exit signal is checked. If the exit signal is generated, the
program is will exit. The entire program can be described by the state transition diagram in
Figure 36. A flowchart is also provided in Appendix B.

Figure 36: A state-transition diagram for the robot program.

*Initial Testing Results*

Back-testing with the EURUSD M5 data for the year of 2011 was performed. The results
are displayed in Figure 37 and Table 1. This tested the program with fixed 5-pip take-profits and
stop-losses. This was done in the absence of adequate exit logic, which was explored throughout
C Term. The take-profit and stop-loss levels were kept low to help guarantee profits on winning
trades and limit losses on losing trades. Also, the program is only allowed to trade from 7:00AM
EST to 9:00AM EST and from 12:00AM EST to 3:00AM EST. These include the first two
hours of the New York session and the three hours preceding the London session.
The results of this back-testing show this program is not yet profitable. This could be for a number of reasons. If the method is fundamentally wrong, the program has no chance of success. However, the code very closely follows the method used in manual trading, which has been very successful. Another reason for its losses could be that the method is too sensitive false signals. This could be corrected by altering (optimizing) the parameters, such as the window in which to open a trade. Back-testing is not the most accurate measure of a robot’s performance, however. It could be possible that this program performed poorly for last year’s data only. In fact, it would be better to refrain from judgment until another year is tested, simulated data is entered, or through forward-testing (testing with current real-time data). To tweak the program to be profitable for a particular year could actually make it perform worse overall if that were one of the few years it performed poorly. Certainly if more time were available, more testing could be performed.

**Further Development**

Future development of this robot would importantly include thorough research and testing of exit logic. This would effectively replace the take-profit strategy that is employed
now. This will allow the program to go after bigger profits and exit when the trade is losing. With this added complexity, a trailing stop-loss could be implemented to secure the maximum amount of profit when a trade is ending or reversing. This would also prevent winning trades from becoming losing trades as the result of missed exit logic.

This program could be more complex, adding many addition stages to check for many different signals. This could also potentially eliminate false signals to which the current program is susceptible. This may include the incorporation of addition indicators and trade signals to act as a check for the triple crossing method.

**Individual Project: Programming an Indicator**

As an individual effort, I developed a custom indicator for the triple crossover strategy. The indicator draws green up-arrows for bullish trade signals and red down-arrows for bearish trade signals. Much of the same code and logic used in the trading robot based on the same strategy was used in this indicator. The screenshot in Figure 38 was taken from MT4 of this indicator.

![Figure 38: The triple crossover indicator.](image)

The first step to creating a custom indicator in MQL4 is to allow _buffers_ for the indicator. Buffers are contiguous pieces of memory with (usually) a large number of slots to store data. A custom indicator is allowed up to eight different buffers. These are assigned values from 0 to 7 using the `SetIndexBuffer()` function in MQL4.
Like Expert Advisors, the special function `start()` is called on each tick. When this function is called, the program can check how many bars need to be updated using the `IndicatorCounted()` function. This says how many bars of the indicator have already been processed and calculated. By subtracting this number from the number of bars (the MQL4 variable `Bars`) minus one, one gets the number of bars that must be computed. These will be the most recent bars, so the programmer can count down from this resulting number to zero to compute the missing bars.

For this indicator, the `start()` function loops through the uncounted bars as described above. For each of these bars, it will loop through the number of previous bars specified by the window parameter. This parameter determines within how bars the crossover can occur. For each bar in the window, the Fast-Medium and Fast-Slow crossovers are checked. The Boolean variables `FMcross` and `FScross` are updated to true if the cross has occurred on that bar. The direction of the Fast-Medium cross is saved in the variable `FMcrossType` if a cross occurs. This informs the program whether or not the triple cross is a bull or bear signal. After the loop, the program checks if both crossovers have occurred. If so, it will put an arrow in the buffer for bull signals or in the buffer for bear signals depending on the value of `FMcrossType`. If no triple cross occurred, then both buffers receive an empty value of 0.0 for that bar.

### 3.2.3: Joe's Programming Project

In this section I will talk about the multiple programs that I wrote throughout the year. The first was my attempt at programming in MQL4, while the second is an attempt in easy language. Both perform a simple cross and buy method that I use while manual trading.

#### 3.2.3.1: Project1

Seen on the next page, is the program that I received off of website called mql4.com. This website does not create fully working functions already made, but examples of how to make the code work in the standard MetaTrader 4 program. This program helped start me off, but the actually code to sell, buy was written by myself. I understood and rewrote this code so that it is in my own words, but I did use this website as a basis and how to create a functioning code that can be profitable. I attempted to write a code that took two moving averages and bought or sold accordingly. Basically, it starts off by discerning whether or not the two moving averages have crossed, and if they have, it places a buy or sell order according. If you are curious as to why I’m using two moving averages or what this means, please see the section titled my trades where I
discuss in greater detail what the crossing of two exponential moving averages tells me. I believe this is the simplest program to write for a beginner than can easily make money without losing massive amount of profit. Many trades that I perform manually depend on two exponential moving averages. For this reason, I decided to stick with them when I did my robot trading to make things simple.

extern int RunIntervalSeconds = 10; // Run EA in intervals of... seconds
extern string MA1 = "1st Moving average parameters";
extern int MA1_Period = 28; // ma setting
extern int MA1_Shift = 0; // ma setting
extern int MA1_method = 1; // ma setting
extern int MA1_AppliedPrice = 4;
extern string MA2 = "2nd Moving average parameters";
extern int MA2_Period = 14; // ma setting
extern int MA2_Shift = 0; // ma setting
extern int MA2_method = 1; // ma setting
extern int MA2_AppliedPrice = 4;

//+------------------------------------------------------------------+
//| expert start function                                            |
//+------------------------------------------------------------------+

int start()
{
    // alert criteria

double MA1_bc = iMA(NULL, 0, MA1_Period, MA1_Shift, MA1_method, MA1_AppliedPrice, 0);
double MA2_bc = iMA(NULL, 0, MA2_Period, MA2_Shift, MA2_method, MA2_AppliedPrice, 0);
double MA1_bp = iMA(NULL, 0, MA1_Period, MA1_Shift, MA1_method, MA1_AppliedPrice, 1);
double MA2_bp = iMA(NULL, 0, MA2_Period, MA2_Shift, MA2_method, MA2_AppliedPrice, 1);
double MA1_bl = iMA(NULL, 0, MA1_Period, MA1_Shift, MA1_method, MA1_AppliedPrice, 2);
double MA2_bl = iMA(NULL, 0, MA2_Period, MA2_Shift, MA2_method, MA2_AppliedPrice, 2);
double MA1_bl2 = iMA(NULL, 0, MA1_Period, MA1_Shift, MA1_method, MA1_AppliedPrice, 3);
double MA2_bl2 = iMA(NULL, 0, MA2_Period, MA2_Shift, MA2_method, MA2_AppliedPrice, 3);

if ((MA1_bc > MA2_bc) && (MA1_bp > MA2_bp) && (MA1_bl < MA2_bl))
{
    res = OrderSend(Symbol(), OP_SELL, Lots, Bid, 3, 0, "", 22, 0, CLR_NONE);
    PlaySound("alert.wav");
    Alert("Alarm triggered by ", Symbol());
    // Alarm
}
if ((MA1_bc < MA2_bc) && (MA1_bp < MA2_bp) && (MA1_bl > MA2_bl))
{
    res = OrderSend(Symbol(), OP_BUY, Lots, Ask, 3, 0, "", 22, 0, CLR_NONE);
    PlaySound("alert.wav");
    Alert("Alarm triggered by ", Symbol());
    // Alarm
}
Sleep(RunIntervalSeconds*1000);
return(0);

Here I will start to discuss what each portion of the code does and how it all fits together to be an autonomous trading bot. First, I define my global variables, which are not specifically defined in my function, but are defined in a hierarchy under which my function is built. I define things like the period, which tell me how many past data points I want to use, the shift, which tell the point how many data points I want to move over, and the method, which determines whether I use simple or exponential moving averages. As I stated before, all of these variables are not defined within my function, but are defined with a hierarchy of which my function is a part. Due to this, I can call upon these functions at any time as long as I specify before I start my function, which ones I’m going to be using within the system.

Moving on, I will now talk about my next group of variables that all start with double. These are variables, which are exclusively defined within my function, and will use the global variables as a stepping-stone to create smaller functions that will make my code easier to read. Notice how everything that I defined before is now defined within another variable or function that will be used directly within my code. I do this to simply make things more legible and understandable for anyone who wishes to read my code and understand what is going on. From here I proceeded on to writing my actual code that performed the trading.

For this next section I define to separate If statements that stand alone within the function waiting to be called upon when the right situation in the market presents itself. If you look at it closely, you will be able to eventually discern that the code waits until one of the exponential moving averages crosses over the other one before it performs it else function. An if loop waits until the clause is proven true before executing the else statement defined within. Basically one of the if loops waits for one average to cross over the other before buying, while the other waits for the other average to cross over the previous one before selling. This is a simple tactic that I use in my manual trading all the time the helps be discern which way the market is moving over minutes at a time. While nothing is full proof, this is a relatively decent indication and is right more times than its wrong. When one of those statements is proved true, it buys or sells according and gets out after a specified period of time.

3.2.3.2: Project 2

At this moment, I’m working on coding a program that will use my method 1 of trading on an independent basis. Right now it is a work in progress to try and get two exponential
moving averages to cross and then buy or sell accordingly. Seen below is the code that I have written so far that incorporates part of my method, but the whole code is not written yet.

```plaintext
Inputs: Price(close),
       length1(14),
       length2(28),
       cts(1);

Vars:   ExpAve1(0),
         ExpAve2(0);

ExpAve1= XAverage(Price,length1);
ExpAve2= XAverage(Price,length2);


if Condition1 then
   Begin
      Buy ( "buy" ) cts Contracts next bar at market ;
   end;
if Condition2 then
   Begin
      Sellshort ( "ShortSale") cts Contracts next bar at market;
   end;
```

I’m currently working on using multiple moving averages to trade successfully in the forex market. Some of the main things that I want to focus on are how to enter and exit the trades. Obviously waiting for two or three moving averages to cross before enter a trade is good, but I wish to add more to that to make my strategy even better. Here are some of the ideas I’m currently working on to improve my basic robot.

3.2.4: Group’s Programming Project

Group’s Programming Project takes the backbone of Kaung’s Programming Project and added a few parameters to refine the program. The robot still relies on the crossover points of the moving average and it executes only one trade at any time, i.e. there will not be multiple trades opened at once. The program is assigned to work on first ticks of a new bar, but it is modifiable to work on every tick of each bar. Multiple factors are added for decision making process to improve the backbone program.

1. **Crossovers**: Determined by the crossover of two Exponential Moving Average lines with different periods. If the faster EMA crosses the slower EMA from below, it is a signal for long position. On the other hand, if the faster EMA crosses from above and moves below
slower EMA, it is a signal for short position. All of the factors below are considered after the crossover occurs.

2. **SMA**: The EMA crossovers are not perfect by themselves. Therefore, another slow moving average (SMA) line with period slower than both of those EMA lines is included. Long position crossover is reliable only when it occurs above the SMA line and short position crossover has high probability when it occurs below the SMA line.

3. **Slope/Degree**: The slope/degree of the slower EMA line is also an important factor. The angle between +15° and +35° is favorable for long position and -15° and -35° is promising for short position. For long position, if the angle is less than 15°, it is not safe to jump into trade, and if it is greater than 35°, the strength of the price movement may already been diminished.

4. **More controlled pips-difference between EMAs**: The pips-difference is also required to see the strength of the price movements. A set of pips-differences is necessary to set up the safe region for trading. If the difference is too small, the price action has not much strength. If the pip difference is too large, the price has lost momentum and the trend may reverse.

5. **Time**: One does not need to trade on the days when the liquidity is low, or the price action has no strength. One also should avoid times that are outside regular hours because these are the times where market players aim to trick traders.

The code provided in Appendix B is a working program although it is not making much profit from back-testing. First, the code flow will be explained. There are a few constant declarations made with `#define` statements. They can also be declared as `extern` variables to obtain values from user. Then other global variables seen below are defined to be used throughout the program.

```c
#define MAGICMA 20110304
#define MAGICNUMLOW 15  // pip diff between 5 and 13
#define MAGICNUMHIGH 25
#define MAGICDEGHIGH 35
#define MAGICDEGLOW 21

double TAKEPROFIT    = 50;
double STOPLOSS      = 50;
double Lots          = 0.1;
double MovingPeriod5 = 5;
double MovingPeriod13 = 13;
double MovingPeriod50 = 50;
double MovingShift   = 0;
```
The code portion below calculates the amount of open positions and returns the amount of long or short positions and is called in the `start()` function.

```csharp
int CalculateCurrentOrders(string symbol)
{
    int buys=0,sells=0;
    //----
    for(int i=0;i<OrdersTotal();i++)
    {
        if(OrderSelect(i,SELECT_BY_POS,MODE_TRADES)==false) break;
        if(OrderSymbol()==Symbol() && OrderMagicNumber()==MAGICMA)
        {
            if(OrderType()==OP_BUY)  buys++;
            if(OrderType()==OP_SELL) sells++;
        }
    }
    //----
    return orders volume
    if(buys>0) return(buys);
    else       return(-sells);
}
```

`CheckForOpen()` calculates two exponential and one simple moving averages for 4 bars including the current bar. A short position crossover point is triggered when the newer first EMA is lower than the older first EMA while the newer second EMA is higher than the newer first EMA, but only between a few pips. This can be seen in the code snippet below. The code also mentions the position of the first EMA with respect to the SMA line.

```csharp
(ma5_prev1<ma5_prev2) && (sma50_prev1>ma5_prev1) && (ma5<ma13-(MAGICNUMLOW*10*Point)) &&
(ma5>=ma13-(MAGICNUMHIGH*10*Point))
```

Afterward, it calculates the degree that will be used as a decision factor to open a trade by using `CheckDegree()` function. `CheckDegree()` function utilizes the angle searching formula, known as a SSS rule, which states that if one knows all three sides of a triangle, one can find any angle of the triangle. SSS refers to “Side, Side, Side” of a triangle.

![Figure 39: A triangle: angles in upper case and sides in lower-case](http://www.mathsisfun.com/algebra/trig-solving-sss-triangles.html)

---

When moving averages cross, the price action can be visualized as a triangle. The difference between the current EMA5 and current EMA13 is side “a” in Figure 39. Side “b” and “c” are the corresponding distances between two points of current EMA and previous EMA. The following formula is used to obtain the angle A, which is considered as the difference between two EMAs.

\[
\cos A = \frac{b^2 + c^2 - a^2}{2bc}
\]

Equation 4: SSS formula

Below is the ChecDegree() function that employs the SSS formula provided above in Equation 4 above. The upper and lower bound of degrees that are used to trigger a trade are 21 and 35 as mentioned in specifications above.

```c
double CheckDegree(double ma5, double ma5_prev2, double ma13, double ma13_prev2)
{
    double rad, a, b, c, b_sqr, c_sqr, period, deg;
    period = Period() * 0.0001;
    a = MathAbs(ma5 - ma13);
    b = MathSqrt((ma5 - ma5_prev2) * (ma5 - ma5_prev2) + (period * period * 4));
    b_sqr = (ma5 - ma5_prev2) * (ma5 - ma5_prev2) + (period * period * 4);
    c = MathSqrt((ma13 - ma5_prev2) * (ma13 - ma5_prev2) + (period * period * 4));
    c_sqr = (ma13 - ma5_prev2) * (ma13 - ma5_prev2) + (period * period * 4);
    rad = MathAbs(MathArccos((b_sqr + c_sqr - a * a) / (2 * b * c)));
    deg = rad / 3.1418 * 180;
    return(deg);
}
```

Two more functions are employed to control dates and times of trading. CheckForGoodTime() checks the high liquidity times and returns true if the condition is met and otherwise the function returns false. CheckForGoodDay() makes sure that the program only trade during Tuesday, Wednesday, and Thursday during which the price action is not considerably affected by the fundamental factors around the world.

The code of start() function in the refined program is the same as that of the backbone program. It ensures that there are enough data points to perform calculations before opening any trades and it calls CalculateCurrentOrders() to confirm there is only one opened trade.
Section 4: Methodology Applications

The following sections talk about how the knowledge from this IQP can be used for different applications. Specifically, we looked into trying to create a business from the knowledge we gained from trading. It was our understanding that good traders, with strong background in programming, could create a good methodology to build a company off of.

4.1: Creating a Business Company

As stated before, the long-term goal of this project is to one day become strong enough traders or develop a sophisticated enough robot to start a forex based company. How we are going to structure our company, what kinds of licenses do we need, and how will we market our company are some of the things we need to research. Since we spent the last couple of months trading and developing strong programs, our company will be a type of brokerage that accepts money from clients and trades for them. As explained later on, we plan to offer many types of plans for the client to choose from which spans from responsible trading methods that has low risk up to risky programs that risk up to 10% of the capital on any given trade. All of these things will be discussed in greater detail in the following paragraphs, but one key thing to remember is that this is a long term goal. This research and plan has been worked out over the past three months, but is planned for the future. A lot of these details and plans are subject to change in the company years as the market changes and we change.

4.1.1: Company Structure and Layout

After finishing the general research on establishing a company, we have decided that we will be creating our corporate entity in the U.S. Basically, there are four types of entities as which we can start our company – sole proprietorship, partnership, corporation, limited liability company (LLC). In this report, we will focus more on the differences between these corporation categories, their pros and cons, cost and whether the type of business is suitable for our company.

Sole proprietorship is the easiest and the most flexible to organize a company among all business entities types. The business is run by the owner and all the decisions are solely made by the same person. The business entity and the owner are considered as one for legal purposes. Therefore, if there are malpractice lawsuits against the sole proprietor, he or she will be held responsible for all the actions of the company as well as it liabilities and debts. Personal assets
will be absorbed into liabilities since there is no protection against any litigious activities. Since sole proprietorship implies that a company must be owned by only one person, the issuance of stocks is prohibited. Thus, investment from external sources is absolutely impossible, and there is no method to expand the business. One interesting fact about sole proprietorship that arises during our research is that if the owner is no longer capable of running the business (e.g. being in comatose stage) or upon death of the owner, the company will be dissolved. However, setting up a sole proprietorship business is very cheap since there are no legal documents or organizational documents required for setting up this type of business. The only certificate that one will need is a DBA (“Do Business As”) certificate which costs only around $50 to $75 depending on the corresponding state agencies. According to Neil Patel, one of the top entrepreneurs rated by Wall Street Journal, sole proprietorship is ideal for individuals who provide services such as legal advices or accountants. This type of business entity is irrelevant for our company because the company will be established by the three of us and the sole proprietorship prohibits multiple owners.

Therefore it leads us to partnership type business entities. There are two types of partnership – general and limited partnerships. Partnerships can be operated by more than one owner and is relevant for our company. Both general and limited partnerships assume co-ownerships between individuals. But, the major difference is that general partner manages the company while limited partners involve only in investing capitals. Let’s put our focus on general partnership first. General partnership can be between more than one owner and all individuals are considered owners of the business entity and have to take full responsibilities on any outcome of the business. Liability is an issue in general partnership because all the owners will have to cover all the debts and liabilities of the company if one of the co-owners commits misconduct activities. Due to this reason, a general partnership firm will not receive any outside investment since the outside investors will not take the risk of founders making mistakes intentionally or accidentally. However, unlike sole proprietor entities where the death of the owner terminates the existence of a company, interest and capital of a general partner company can be transferred legally. The cost of forming a general partnership is inexpensive because the

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partnership can be verbally established between individuals and no legal agreements are required, although it would be wise to have agreement forms between co-owners. Like sole proprietorship, the only requirements to form a general partnership are to fill up DBA forms and a partnership agreement which would cost around $1,000 to $2,000. This type of partnership is relevant but not suitable for our company because it will take much loyalty and faith between co-owners and none of us will be happy if one makes a wrong decision.\(^5^5\)

The pitfalls of the general partnership makes our heads turn to the limited partnership. The formation is similar to general partners, but the limited partners cannot influence any decisions of a company. A limited partner only has to assume the liability proportional to amount of his or her investment. However, if the limited partner takes part in decisions of the company, he or she will be considered as the general partner and the status of the limited liability is revoked. For a limited partnership to occur, there must be a general partner or a LLC in which capital can be invested. Limited partnership attracts some portion of external resources because the assets of limited partners are partially protected against personal liability. Individuals are taxed only once unlike C corporations. The cost of forming the partnership may be relatively expensive compared to sole proprietorship and general partnership because the partnership must be filed with the Secretary of State and the costly agreement forms are required. Despite the benefits of protection of the personal assets from liabilities, this type of partnership is also irrelevant for our company. Since we are starting a new company, one of us must take the full responsibility by being a general partner, instead of investing money in another company.

The shortcomings of the partnership companies lead us to corporation type entities. Generally, there two types of corporations – C corporation and S corporation – that are well-known for establishing a business entity. Corporations are very complex entities because one needs to follow numerous state laws to establish one. They are legally separated from the owner and shareholders are shielded from personal liabilities with only an obligation to part of the debts of the corporation. Due to the protection against liabilities, C corporation attracts venture capitals and outside investments. Unlike S corporations, the capital of the C corporation can be divided to various classes and the stocks can easily be issued to employees. Moreover, the amount of shareholders for C corporations is not limited to 100 which would potentially raise the capital of

\(^5^5\) IBID
the company. However, as mentioned above, C corporations are very expensive (cost around $6,000) due to formalities of regulations, bookkeeping, and agreement forms between entities. If a shareholder fails to follow the formalities, he or she may be subjected to be held personally liable for the mistakes of a corporation. C corporations are also double taxed, i.e. the corporation itself and the shareholders taxed separately due to its legal separation of existence from the owners. As of now, our company is aimed to be operated by the 3 of us. As long as we do not intend to issue shares and stocks, we do not need an expensive C corporation, but we can change to C corporation later if the business expands. Since the losses of a company do not pass through to shareholders, it is also unfavorable for us, which leads us to another type of corporation called S corporation\textsuperscript{56}.

S corporation is different from C corporation that it is a pass through entity, signifying that any profits or losses of the corporation affects all shareholders, and that it is not subjected to double taxation. However, venture capitalists are only interested in C corporations where the pass through tax treatment is not executed. It is, however, very easy to switch from S to C corporation and the cost is almost negligible. The main drawbacks of S corporations are that the type and number of shareholders are limited. Shareholders must be U.S. citizens or residents and the number of shareholders must not exceed 100, meaning that capital growth and foreign investments are very much prohibited. S-corporations are limited to one type of stocks which is not issuable to the employees. Although this type of corporation is both relevant and suitable for our company, it is still not cost effective for a novel company\textsuperscript{57}.

The last type of business entity is the Limited Liability Company which is the hybrid between the corporation type and partnership type. It absorbs the advantages of both business types – protection against personal liabilities, no double-taxation, and flexibility in management. As shareholders of a corporation are effectively shielded against the personal liabilities, the members of an LLC are relatively protected against liabilities. From our research, we learned that single member LLC are not protected against liabilities. Although it is not relevant to us at the moment, this information is a precious in case we form one member LLCs on our own in the future. Since LLCs can be elected to taxed as individual (sole proprietorship), corporations (C

\textsuperscript{56} IBID
\textsuperscript{57} IBID
type or S type), or partnerships, the tax treatment is very flexible. As long as LLC does not elect itself to be treated as C corporation for tax purposes, double-taxation can be avoided. Since the profits and losses can also be passed through to members, one does not need to take all the responsibilities for the losses incurred by the company. However, LLC needs to go through a complicated process when it comes to tax purposes because the regulations for LLCs are very complex and have to fill up many pages of tax forms. Unless an attorney is hired to fill up those forms, it is a very difficult to comprehend the subtleties of the tax forms. As mentioned above, venture capitalists and external investors are only interested in C corporations that would protect them from personal liabilities without pass-through tax treatments. However, a forex trading company like ours will not be relying on external capital, and thus, this downside of LLC can be ignored. Issuing stock options to employees is difficult with LLC type firms and it is also difficult and expensive to convert to C corporation if we want to have shareholders. Since the company will be operated only by the three of us, these difficulties can also be disregarded.\[58\]

Since the needs of most trading and consulting firms are compatible with the advantages of limited liability companies, such a legal structure is famous in the forex environment and we have decided that the company we establish will be a limited liability company.

Forex advisors may legally accept management fees depending on the assets under management (AUM), which usually range between 0%-2% and performance fees ranging from 10%-30%. Such fees may provide significant income if there are a lot of customers. For example, if a fund is controlling $1 million AUM, the management income will be $10,000 with 1% management fees alone. There are two advisor types: commodity trading advisor (CTA) who manages individual accounts and commodity pool operator (CPO) who manages a pool of accounts called funds. Generally, CPOs cannot advertise to persuade investors but CTAs can advertise their services. Investors usually look for funds that invest their own capital in the fund so that the firm will not be using capitals of investors for its own personal expenses. Although it may sound illogical, experienced investors prefer to invest in firms that charges performance fees depending on the profits gained annually. If a forex firm is also interested in trading currency future options, the fund must be registered with Commodity Futures Trading Commission.

\[58\] IBID
(CFTC). Furthermore, any forex firm must be approved by National Futures Association (NFA) to be a CPO\textsuperscript{59}.

Since tax-related regulations of LLC are complicated, it is prudent to hire a lawyer to get legal advice for taxation, paperwork, organizational documents, and formalities of maintaining a company. From here, we will now discuss the types of agencies that will regulate our company and the type of licenses we will need to legally operate in the United States.

**4.2: Agencies Regulating Forex Trading in the U.S.**

There are three main bodies in the United States regulating the foreign exchange market and they are the following: the Securities and Exchange Commission (SEC), the Commodities and Futures Trading Commission (CFTC), and the National Futures Association (NFA). Each body sets their own regulations to help protect traders in the United States from being scammed by brokerage firms. In the following paragraphs, each regulation body will be discussed in greater detail. By examining these entities history, regulations, and rules one can gain a better understanding of what is necessary to be a foreign exchange company and broker\textsuperscript{60}.

**4.2.1: Securities and Exchange Commission**

The Security and Exchange Commission (SEC) was created by section 4 Securities Exchange act of 1934. The agency is primarily responsible for the enforcement of United States federal securities laws. This organization oversees the entire financial district which includes but is not limited to, forex trading, stock trading, and futures and bonds. This company has many laws and regulations that apply to the entire financial district, but I will try to focus on the laws regulating fore brokers and companies.

Most brokers and dealers must register with the SEC and a self-regulatory organization (SRO). Their guidelines strictly outline who a broker is leaving little room for interpretation. For our purposes, we are clearly outlined as a broker under the definitions set forth by the SEC. While there are more specific descriptions that outline almost every scenario, the general descriptions clearly outline the business proposal for our company as seen in the following quote. In our business model, we are going to be excepting money from people to trading in the forex market making us fir quite nicely into these guidelines.


Section 3(a)(4)(A) of the Act generally defines a "broker" broadly as any person engaged in the business of effecting transactions in securities for the account of others.\textsuperscript{61}

While I continue on reading what is required of forex brokers, they sheer amount of rules and regulations set forth by the SEC seem quite mind numbing. These administrating bodies seem to have a strong noose around the necks of these individuals who trade. However, these people are dealing with the money of other individuals and they could be tempted to cheat and scam, so it is good that they monitor them so heavily.

4.2.2: Commodities and Futures Trading Commission

The Commodities and Futures Trading Commission is another entity that regulates foreign exchange brokers. Established in 1974 Congress amended the Commodity Exchange Act (CEA) by replacing the Commodity Exchange Authority with the CFTC. From what I have read about this company they mainly deal with Hedge funds and major companies, unlike the SEC that seems to try and policy everyone. This is the most recent company that helps police the economic district. This is a company that no one has to join to be a broker, but helps stops fraud and tries to educate people. The next body that I’m going to deal with is another young institution that has more dealing specifically within the forex market.

4.2.3: National Futures Association

This self-regulatory organization is another independent body helps police and regulates the finance district. To be a broker or work in the futures market, one must be a member of this organization. This organization works with no cost to the taxpayers, but collects dues from their members to run. This independent body was created in 1982 under the same legislation that created the commodities and futures trading commission. Like most of the other policing forces, their goal is to monitor and restrain people cheating or getting some form of unfair edge in the futures market. They put forth restrictions and regulations on brokers and companies, while watching real time market analysis to help the average trader from being scammed out of their money.

4.3: Licenses

Getting a license to be a broker in the United States is a difficult and tedious task to say the least. However, if one wishes to trade in the forex market, then one must get a license before even joining a company. Some jobs in the United States allow you to work while applying for a license, but to be a broker; one must already be in the system and have all the necessary requirements. To apply for a broker license of a company license, one must apply through the CFTC and the SEC. When applying for a license the typical documents are required: company memorandum and articles of association, documents of the internal and external operations of the company, the results of a fit and proper test and a company business plan. There are numerous stipulations and rules that the SEC and CFTC put on people applying for brokers in the United States. Whether or not our company is going to be in the United States is still up to debate, but we will still be doing trading in the United States regardless\(^2\).

4.3.1: Series 3 License

The series 3 license is the national commodity and futures test that allows one to work as a forex broker. When applying for a job with a company, it could be advantageous to already have the license in hand to show that one is capable of doing the job well. If we plan to open a company and trade as brokers, each one of us would be required by the SEC and CFTC to pass this exam. The exam is 120 questions and a 70% or better is required for passing. This is a vital an important part to starting our own reputable company. Some of the things covered on the exam include the following\(^3\):

- Definitions and introductions to cash contracts, forward contracts and futures contracts
- Understanding strategies and calculating gain and loss
- Options, Futures and Hedging
- Calculating initial margin deposits and additional margin
- Trading floor procedures and understanding functions of traders and brokers
- NFA (National Futures Association) rules and regulations
- Reporting rules and customer accounts


4.3.2: Series 30 License

Since we wish to open our own company and not just join some other, we will be required to pass a series 30-exam license as well. This license is for branch managers and people who wish to run a brokerage company. While this license is not required for every member of our company, it is important for those of us who wish to monitor and regulate other people that we hire in our company. Just like the series 3-exam it is a 50-question exam that needs a 70% or better to pass. As I said before this license is mandatory by the NFA to run a brokerage company, or a company that trades in futures and commodities. Some of topics that the exam includes the following:

- CPO/CTA General
- CPO/CTA Disclosure Documents
- NFA Know Your Customer Rule
- Disclosure by CPOs and CTAs Required for Costs Associated with Futures Transactions
- Disclosure by FCMs and IBs Required for Costs Associated with Futures Transactions
- IB General
- General Account Handling and Exchange Regulations
- Discretionary Account Regulation
- Promotional Material (Compliance Rule 2-29)
- Anti-Money Laundering Requirements

4.4: Marketing the Company

A great deal of a company’s success can be attributed to the way it is marketed. Effective and strategic marketing can bring one’s company and its products and services to a great number of people, each of which could be a potential client. In the case of a small investment startup like ours, attracting these clients is critical to the growth and development of the company.

4.4.1: Performance Measures

Considering the risk associated with the forex market, the informed the customer will want to ensure that our business will be safe and responsible with his or her money. This concept of risk is likely the hardest hurdle our company would have to overcome. Careful investors and skeptics alike will need to be assured that safe practices are observed and their investments will not be lost.

To attract potential investors, our marketing plan must include our trading performance. To prove that our company is worth their investment we plan to make available our current and past profits. This will show customers our capabilities as traders and our ability to provide the promised annual return. While profit alone would be a good measure of our company’s performance, we must also show that we can make a profit consistently. We must make available our company’s percentage of winning trades. This quantity should be considerably high—about 65 to 70 percent. This will show our customers that we make smarter traders rather than making riskier trader to gain higher profit at the expense of many losing trades. The latter example demonstrates a riskier business that could ultimately cause the customer to lose money.

In a similar respect, it is also important to report our maximum drawdown. This value is a measure of losing streaks. Drawdown is defined by the difference from a recent high point before the losing streak to the bottom of the loss. A high drawdown represents either a long string of losing trades or large losing trades. Ideally, we should keep this quantity as low as possible. High drawdowns will not inspire much faith our company’s ability make a profit and provide a secure investment. Following the example of hedge fund managers, we will also report estimates for the year’s profits. This will give our customers an understanding of our progress towards our annual goal. Some sources also suggest including third party audits to ensure the authenticity of our results and numbers. Such a policy promotes and ensures honesty between our company and our clients.

4.4.2: Reaching the Customer Base

Establishing what to advertise is only half the battle in attracting customers and reaching potential clients. The vehicle by which is information is disseminated comes from the how of the question. Various media of advertising are conveniently and affordably available that reach our clientele.

The internet would be our widest reaching asset. We could purchase ad space on forex and finance related webpages. People interested in this subject may be considering investing their money or investing in forex. This would be a good audience to reach, as they likely looking

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for such a service. Advertising on investment and finance forums could have a similar effect of bringing our service to an already willing audience.

4.4.3: Features That Will Make Us Stand Out

Since we are a new company in a market already being dominated, we decided that our company needs a feature or an angle that will make us stand out. The following is the ideas that the company could employ to draw in a bigger client basis when first starting out. This is a very important part of the marketing aspect of the company and hopefully the reason why we get our clients.

The first idea offered up was the idea to offer lower fees to the first 20 or so clients that sign up with the company. Offer them smaller profit fees on each trade and possibly not ask them for a yearly commission fee at all. By boasting that we will offer the same profit rates the competitors promise with smaller fees could really attract some clients to invest. This would not be offered to every client but only to first few to get the company name out into the world. As the company grows then we could increase the fees back to our original plan. Once the company is profitable and keeping up with the competitors we will no longer need any gimmicks

Another marketing approach would be business cards. These are easy to carry around and easy to distribute. There are many services online such as VistaPrint and Pandora that offer free business cards. As a small startup, this would be free advertising. Also, events could be held to draw in people interested in an investment service. At this event, we could pitch our business plan and present our incentives and advantages. Another marketing strategy would be to waive management fees for life for the initial customers, such as the first fifteen customers. At the least, this would introduce quick capital to the business and potentially loyal clients, each of which could refer our service to others.

It is important to note that a forex-based company or fund must first be registered with a securities exchange before it can advertise to customers and clients. Before such qualification is met, however, the manager of the fund is in fact allowed advertise for the trading and investment services that the fund would offer. In other words, it will be initially difficult to attract customers. At the early stages of funds development much of the clientele will likely come from
our personal friends, family, and co-workers. With luck, these customers will spark interest with their friends and family and continue to grow our customer base.

4.4.4: Different Types of Trading Options

The way people trade is different, and the amount of money people like to risk is also different. Therefore, why would we have only one type of option for people to choose from? On this line of thought, we think offering different types of parameters to people investing with us is the best way to go about attracting clients. To start off, we thought to create 3 different types of programs for people to pick when giving us money. The advantages and disadvantages of each program are discussed in greater detail below in the following paragraphs.

The first option that we are going to offer is the low-risk option. This low-risk option works exactly as it sounds. In this option, the broker who’s dealing with this account will never risk more than 1-5% of the capital on any given trade. On a yearly scale, this option shoots for a 10% gain per year. The fee for this option asks for 5% of the profit gained along with a 2% commission fee on a yearly basis. This option is for the people that do not want much risk of emptying their account but want to have some gain. This is choice for older people that want to have a better return what a bank gives but can’t afford to lose the entire account. It is important to note that there is risk with every account no matter how ‘low-risk’ it is. The Forex market is a volatile system that can easily empty any account and trick the smartest of brokers. However, this option will offer the lowest amount of risk for people who still want to enter the forex market.

The second option offered by this company is a type of medium ground between the other two choices. This option is standard option that most companies offer in some form or another. The medium-risk offer will put 5-10% of the capital at risk on any given trade. The goal of this program shoots for 20% return per year on average. The fee for this option requires the investor to surrender 10% of the winning profit to the company along with a 2% management yearly fee. This type of program is geared towards people of higher income that have some money to splurge and wish for a nice annual return on investment. 20% return per year is a standard package that most brokers offer, which is why we included it in our system. This is a typical plan that most people will be familiar with. However there is risk involved with every trade and the investor should know that it is possible no matter what broker is chosen that an
account can lose money and even be emptied. From here we will move on to the third option that our company will offer.

This third and final option that our company will offer to different investors is the high risk option. This setup is geared towards very high income individuals that have plenty of money to spend frivolously. This method puts a lot of the capital at risk all the time, but rewards the investor by giving them a lot of profit. On average the broker will risk between 10-20% of the capital on any given trade. The goal of this program is to make a minimum 30% annual return on investment for the individual. For a fee the brokerage will ask the investor to surrender 15% of their profit made that year along with annual 2% commission fee. This offer is truly a double-edge sword since it offers such high rewards, which can quickly shift into such high losses. This option is not for the faint of heart or the people that depend on the money in their accounts, but for people with money to be tossed around. This option requires an account minimum of $100,000 for any investor due to the high win/loss swing.

4.5: Past Performances and Client Disclosure

No matter which option is chose it is vital that the investor understand the risks involved with forex trading. The forex market is a very volatile system that can easily trick and fool even the smartest of investors. This is not a fulfill system and this company does not promise profits. We as a company only offer an opportunity that could make profit or could lose the part initial investment or the whole. This market is not 100% predictable in anyway, and all we do is offer experience in trading in this volatile system. In no way are we promising anything to our investors, we only wish to try and make them money. Even in money is lost over 1 whole year the 2% management fee is still due to the company. We wish for our clients to trust us and feel comfortable with us, so in that respect each broker will produce yearly statistics.

Each broker producing yearly statistics allows people to not be lured into a false sense of security. All though this market can be unforgiving, we would not offer our services if we did not think we could make money. By shows clients yearly statements from past years, the investor can get some realistic sense of what to expect. These yearly outputs would not include individual trades but monthly reports of how the investor did across all accounts. It would show pips made and total dollars accrued. By showing this to the clients they can see the not every month will be positive and a loss of money is inevitable. It seems that there is a problem of understanding with
people investing. They believe that since you give them money they will always get more money back. It is very important to realize that this company is not a bank and we not give out an annual rate. This is a trading company that tries to help customers by offering them the experience of people who have traded for many years.

This is the complete idea of the company that could be launched in a few years after a lot more practice and idea refinement. Through the summary of manual trades and back testing of robots, we have shown that there is some promise to the ideas we are currently working on. In the coming months and years, these ideas will hopefully be refined into solid concrete designs with much more promise. In a couple of years, some ideas will surely be thrown out and new ones will be created, but the solid concepts of creating a company will surly stay the constant. It is our hope to one day see these ideas realized and become a reality.
Section 5: Results

In this section, we will individually discuss the results of the programming projects and manual trading. Each person will explain in detail how their own individual projects turned out and how profitable they were. As a group we had many individual projects outside the group program and group manual trading account. This section will show you how these things ended up and how much money they made.

5.1: Kaung’s Program Results

Kaung’s program is designed to trade on any tic of a bar on a price chart. It is a simple buy and sell program, which made decisions on only one condition, the difference between 5-bars period EMA and 13-bars period EMA. The following Figure 40 and Figure 41 show the performance of Kaung’s program in table form and in graph form respectively.

As can be seen in Figure 40, there are total of 2596 trades executed within a period of one year from January 1, 2011 to January 1, 2012. This number averages to approximately 10 trades per trading day, which is a relatively large number of trades compared to those executed by manual traders. It also establishes a requirement for our final group programming project to have much less trade execution over a year. Our belief is that a trading program should not need to perform so many trades, but rather get into positions that are profitable.

<table>
<thead>
<tr>
<th>Initial deposit</th>
<th>10000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total net profit</td>
<td>-1652.00</td>
</tr>
<tr>
<td>Gross profit</td>
<td>24570.00</td>
</tr>
<tr>
<td>Gross loss</td>
<td>-28732.00</td>
</tr>
<tr>
<td>Profit factor</td>
<td>0.86</td>
</tr>
<tr>
<td>Expected payoff</td>
<td>-1.80</td>
</tr>
<tr>
<td>Absolute drawdown</td>
<td>4171.40</td>
</tr>
<tr>
<td>Minimal drawdown</td>
<td>4406.30</td>
</tr>
<tr>
<td>Relative drawdown</td>
<td>43.05%</td>
</tr>
<tr>
<td>Total trades</td>
<td>2596</td>
</tr>
<tr>
<td>Short positions (won %)</td>
<td>1257 (52.57%)</td>
</tr>
<tr>
<td>Long positions (won %)</td>
<td>1339 (55.78%)</td>
</tr>
<tr>
<td>Profit trades (% of total)</td>
<td>1638 (63.10%)</td>
</tr>
<tr>
<td>Loss trades (% of total)</td>
<td>958 (36.90%)</td>
</tr>
<tr>
<td>Largest</td>
<td>profit trade: 15.00</td>
</tr>
<tr>
<td>Average</td>
<td>profit trade: 15.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>consecutive wins (profit in mon...</td>
</tr>
<tr>
<td>Maximal</td>
<td>consecutive profit (count of wins)</td>
</tr>
<tr>
<td>Average</td>
<td>consecutive wins</td>
</tr>
</tbody>
</table>

Figure 40: Performance Statistics of Kaung’s program
In order for a robot to execute fewer trades, it requires many restrictions for the trade entry position. Such restrictions include better algorithms for finding crossovers, slope between two EMAs, and the days and hours of trading, all of which are stated in the specifications of the group programming project. These restrictions play a major role in restricting the amount of execution to sheer 61 over one year period.

As can also be seen in the statistics, the total loss incurred by Kaung’s robot is $4162 over one year period. We believe that this loss is due to the imperfect algorithm in deciding when to trade and that the negative results could be inverted to positive ones with the restrictions. Thus, Kaung’s robot in conjunction with the restrictions stated above are decided to be used as a backbone for the group programming project and the results are provided in the later sub-section.

### 5.2: Richard’s Program Results

By the end of the project, Richard’s program was able to successfully open and close trades. The program’s setup as in the manner of a finite-state machine ensured that the appropriate actions were taken in response to the triggering event and the confirmation of the trigger. This new, more robust design eliminated a fatal bug that had occurred in the middle of development. This bug did not recognize that trades that hit the stop-loss or take-profit were closed. An additional check in the open-trade state used the MQL4 function to check the status of an open trade ticket.
Despite this more reliable design approach, the program is not yet profitable. A possible solution to this problem would be finding a more optimal set of parameters. The window in which a triple-crossover is detected may need to be reduced, as it may always more false signals to trigger trades. Also, this triple crossover method has been seen to be quite reliable at certain times of the day, in particular in the hours surrounding the London trading session. It is possible that this method works for this year’s market. All back-testing has been performed using the price data from 2011. Additional testing should be performed to test this hypothesis if additional development of this program is performed.

Overall, the program has a very solid foundation on which future development can be done. The finite-state machine approach makes integration of addition checks and triggers much simpler than the previous implementations. It also provides a template for other robots. The same (or similar) logic can be used with different conditions and triggers substitute for the one implemented in this program. The most important aspect of future development of this program, however, would be the implementation of appropriate exit logic. This could be achieved through extensive observation and trading in the relevant markets to this program. In particular, observations of trend reversals of the EURUSD in the London and New York sessions would be most appropriate and beneficial.

5.3: Joe’s Program and Manual Trade Results

While Joe programmed small functions in MQL4 and EasyLanguage, his main focus was in manual trading. Seen in appendix C is the group manual trading account that he managed throughout B and C term. A triple crossover method was used between two EMA’s and one SMA that gave a strong insight into what the market was doing. For the two terms that Joe traded, he averaged a 60% winning rate in his trades resulting in a net profit of $6000. Seen below in Figure 42, which is also shown again in appendix C, is TradingStation report that was generated from my account. Most professional traders boast a 60% winning record to their clients. We believe that Joe’s strategies performed very well and could be further developed in a strong method.
Figure 42: Trading Station Performance Report

Moving on to his programs, both of them work in their respective platforms, however they do no incorporate a triple crossover method. Both of them simply buy and sell on a double crossover method, and they are not very profitable. However, the group programming project was an extension of everyone’s program to see if we could make a profitable program. The results of the group project can be seen below.

### 5.4: Group Programming Results

Although the code is working very well without any flaws, the parameters need to be modified to obtain better results. As of now, with the back-testing feature of MT4, the program is making negative profit of $350 with the base equity of $10,000 with 0.1 standard lot for each trade as can be seen in Figure 43 and Figure 44. The back-testing was performed on EURUSD pair with 30 minute interval bar chart.

<table>
<thead>
<tr>
<th>Total Net Profit</th>
<th>$6,525.54</th>
<th>$0.00</th>
<th>$6,525.54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Profit</td>
<td>$23,457.44</td>
<td>$0.00</td>
<td>$23,457.44</td>
</tr>
<tr>
<td>Gross Loss</td>
<td>($16,931.90)</td>
<td>$0.00</td>
<td>($16,931.90)</td>
</tr>
<tr>
<td>Profit Factor</td>
<td>1.39</td>
<td>n/a</td>
<td>1.39</td>
</tr>
<tr>
<td>Roll Over Credit</td>
<td>$(194.33)</td>
<td>$0.00</td>
<td>$(194.33)</td>
</tr>
<tr>
<td>Open Position P/L</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Select Total Net Profit</td>
<td>$6,525.54</td>
<td>$0.00</td>
<td>$6,525.54</td>
</tr>
<tr>
<td>Select Gross Profit</td>
<td>$23,457.44</td>
<td>$0.00</td>
<td>$23,457.44</td>
</tr>
<tr>
<td>Select Gross Loss</td>
<td>$(16,931.90)</td>
<td>$0.00</td>
<td>$(16,931.90)</td>
</tr>
<tr>
<td>Select Profit Factor</td>
<td>1.39</td>
<td>n/a</td>
<td>1.39</td>
</tr>
<tr>
<td>Adjusted Total Net Profit</td>
<td>$(6,679.69)</td>
<td>$0.00</td>
<td>$(6,679.69)</td>
</tr>
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<td>Adjusted Gross Profit</td>
<td>$16,039.55</td>
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<td>$16,039.55</td>
</tr>
<tr>
<td>Adjusted Gross Loss</td>
<td>$(22,518.23)</td>
<td>$0.00</td>
<td>$(22,518.23)</td>
</tr>
<tr>
<td>Adjusted Profit Factor</td>
<td>0.70</td>
<td>n/a</td>
<td>0.70</td>
</tr>
<tr>
<td>Total Number of Trades</td>
<td>16</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Percent Profitable</td>
<td>55.55%</td>
<td>0.00%</td>
<td>55.55%</td>
</tr>
<tr>
<td>Winning Trades</td>
<td>16</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Losing Trades</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Even Trades</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Avg. Trade Net Profit</td>
<td>$362.59</td>
<td>$0.00</td>
<td>$362.59</td>
</tr>
<tr>
<td>Avg. Winning Trade</td>
<td>$2,345.74</td>
<td>$0.00</td>
<td>$2,345.74</td>
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<tr>
<td>Avg. Losing Trade</td>
<td>$(2,116.49)</td>
<td>$0.00</td>
<td>$(2,116.49)</td>
</tr>
<tr>
<td>Ratio Avg. Win/Avg. Loss</td>
<td>1.11</td>
<td>n/a</td>
<td>1.11</td>
</tr>
<tr>
<td>Largest Winning Trade</td>
<td>$31,559.20</td>
<td>$0.00</td>
<td>$31,559.20</td>
</tr>
<tr>
<td>Largest Losing Trade</td>
<td>$(6,432.40)</td>
<td>$0.00</td>
<td>$(6,432.40)</td>
</tr>
<tr>
<td>Largest Winner as % of Gross Profit</td>
<td>40.28%</td>
<td>n/a</td>
<td>40.28%</td>
</tr>
<tr>
<td>Largest Loser as % of Gross Loss</td>
<td>37.99%</td>
<td>n/a</td>
<td>37.99%</td>
</tr>
<tr>
<td>Net Profit as % of Largest Loss</td>
<td>101.45%</td>
<td>n/a</td>
<td>101.45%</td>
</tr>
<tr>
<td>Select Net Profit as % of Largest Loss</td>
<td>101.45%</td>
<td>n/a</td>
<td>101.45%</td>
</tr>
<tr>
<td>Adjusted Net Profit as % of Largest Loss</td>
<td>(106.94%)</td>
<td>n/a</td>
<td>(106.94%)</td>
</tr>
</tbody>
</table>
The following data from Table 2 suggests that degree calculations as of now does not affect the outcome very much. However, there are two conclusions that can be made from this data set. One can say that with current settings for other parameters such as pips-difference, time, and bar-chart periods, this bound has no effect on the performance because the outcomes – win or lose – are almost uniformly distributed over the range of 21 to 23.5. Another conclusion is that there is a need for finer resolution degree calculation since the data is bounded from above by 23.5 with this setting of parameters.
With the limitation of super computers on campus, our group could not figure out the optimized set of parameters for this robot to make decent profit. The requirement for a super computer is mentioned here because our robot has a finite but huge set of permutations and combinations of parameters as a result of more than 10 parameters that can undertake many values. Our future recommendations on this programming project will be to add more indicators to have more control over the entry and exit points, to find a set of parameters that would potentially make profit, and to hone the degree conversion function to obtain finer sets of points.

**Table 2: Performance of the Group’s program with 21-35 as bounds for degree between two EMAs**

<table>
<thead>
<tr>
<th>Deg</th>
<th>W/L</th>
<th>Deg</th>
<th>W/L</th>
<th>Deg</th>
<th>W/L</th>
<th>Deg</th>
<th>W/L</th>
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</thead>
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<tr>
<td>23.2420</td>
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<td>23.0314</td>
<td>0</td>
<td>22.0403</td>
<td>0</td>
<td>21.1712</td>
<td>0</td>
</tr>
<tr>
<td>22.9457</td>
<td>1</td>
<td>21.9644</td>
<td>0</td>
<td>21.2839</td>
<td>0</td>
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<tr>
<td>22.0977</td>
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<td>23.1501</td>
<td>0</td>
<td>22.1543</td>
<td>1</td>
<td>21.4742</td>
<td>1</td>
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<tr>
<td>22.3026</td>
<td>1</td>
<td>21.0062</td>
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<td>23.1398</td>
<td>0</td>
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<tr>
<td>22.0752</td>
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<td>22.1601</td>
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<td>0</td>
<td>22.3394</td>
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<tr>
<td>23.3810</td>
<td>1</td>
<td>22.0549</td>
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<td>1</td>
</tr>
<tr>
<td>21.1215</td>
<td>0</td>
<td>22.0291</td>
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<td>21.2375</td>
<td>1</td>
</tr>
<tr>
<td>21.0919</td>
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<td>21.2325</td>
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<td>21.776</td>
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<td>21.0109</td>
<td>0</td>
</tr>
<tr>
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<td>22.1640</td>
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<td>21.3376</td>
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</tr>
<tr>
<td>21.1691</td>
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<td>21.7903</td>
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<td>21.0351</td>
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<td>22.2602</td>
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<td>22.6007</td>
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<td>0</td>
<td>21.1359</td>
<td>1</td>
<td>22.9570</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 45: Testing the Group’s program with 21<degree<41**

With the limitation of super computers on campus, our group could not figure out the optimized set of parameters for this robot to make decent profit. The requirement for a super computer is mentioned here because our robot has a finite but huge set of permutations and combinations of parameters as a result of more than 10 parameters that can undertake many values. Our future recommendations on this programming project will be to add more indicators to have more control over the entry and exit points, to find a set of parameters that would potentially make profit, and to hone the degree conversion function to obtain finer sets of points.
Section 6: Conclusions and Recommendations

Through this project, the group has explored many aspects of the forex currency markets. Much of the first term of the project was spent as an introduction to forex trading. Much research was conducted into operation of the forex market, important terminology, and learning and comparing trading tools. At this point, the group was becoming familiar with forex indicators used for trading and developing rudimentary trading strategies. Active participation in the forex market was critical to the success of this stage of the project. Good habits were developed early in observing strict money and risk management rules to prevent excessive and crippling losses.

The group’s good understanding of currency markets and basic trading plans enabled exploration of the increasingly popular of field and upcoming market in automated trading and robot development. Both MetaTrader’s MQL language and TradeStation’s EasyLanguage were explored and tested. The group produced several robot programs, each capable of trading without intervene of the user. Also, custom indicators were made to facilitate the group’s manual trading. In order to develop successful and profitable robots, more refinements were needed to develop solid and rigid trading plans.

The final goal of the project was to investigate the process of starting a forex trading firm. Much research was conducted to determine what kinds of forex firms exist and what types of company structures are appropriate for such a firm. It was crucial to read into the regulations and certifications associated with such an endeavor. The group was tasked with developing a viable business model for a forex firm that would be attractive to potential clients and investors in this hypothetical startup.

6.1: Recommendations for Future Projects

While this year’s IQPs were quite successful and enriching, improvements could be made to improve the overall quality of project. This year’s project gave participants a wide view of the realm of forex trading. The fast-paced project did not leave enough time to fully explore any one of the many avenues of forex trading. A recommendation for next year’s project would be give an overview of the forex market in the first term, introducing company structures and programming. At this point, students could be allowed to select the area of the forex that meets their interests and better suits their backgrounds. This would allow students do more in-depth research into their selected project path. For instance, a group more interested in developing
robots would be able to fully dedicate its time to refining its algorithm, optimize the robot’s parameters, and perform extensive forward- and back-testing and analysis. Consequently the final deliverable projects would likely be of a greater caliber.

In this year’s offering of the project each student was exposed to many aspects of the forex market. Each student was required to do manual trading, programming, and research forex firms. While this approach produces more well-rounded traders with experience many aspects of forex trading, it does not necessarily make the most efficient use of students’ time. In particular, many students had little or no experience in programming. For these students, the extensive programming requirements in the project would be very difficult to complete. It would be more optimal to allow students to specialize in a particular area. For instance, some group members could specialize in programming—most likely ones with previous experience in programming—and other members could specialize in manual trading.

Another possible improvement could be making more effective use of the group aspect of the project. Much of the work in A and B term was done as individuals. Group work began in Term B when each group was considered part of a large trading firm. Each group was given an account to share and manage together. However, the primary focus of the term was individual programming projects to produce robots or custom indicators. Group work has the benefit of allowing freer collaboration amongst group members and more checks and reviews from other group members. In most other IQPs, the final result typically reflects the whole group’s collaboration towards a set of goals. Most of the final products from this IQP are individual projects.

This year’s IQP employed a lecture or seminar type meeting for all participating students. This was a good opportunity to share ideas with other students as well as a good opportunity for the advisor to teach the theory behind the project. It was also used to track the progress of each group and students. While this model has its obvious advantages, it lacked the one-on-one communication with the advisor that most other IQPs have. With so many separate groups it was difficult to effectively have a group’s work thoroughly assessed and significant feedback returned. This project would benefit from employing lecture-based model with shorter meetings, but have weekly or bi-weekly meeting between each group and the advisor. This would both allow the advisor to better assess each group’s progress as well as provide more feedback for the
group to improve its quality of work, ultimately leading to a more refined and developed final deliverable product upon conclusion of the project.
Section 7: References


55. IBID
56. IBID
57. IBID
58. IBID
Appendix A: Economic Issues in the News

Many of the macroeconomic issues presented above can be seen in the news. Professional trader and investor Dennis Gartman issues a daily newsletter reporting on the major world political and economic news called the *The Gartman Letter*. Gartman presents a comprehensive review of the major happenings of the day in world politics, the forex market, commodities, and much more. Such a newsletter is of great value to any trader seeking a credible and convenient source of economic and political information from which to perform fundamental analysis.

European Debt: A Continuing Crisis

Most likely this year’s greatest concern in economic news is the European debt crisis. Several countries (namely Greece, Italy, and Spain) in the EMU have become drowned in large amounts of debt. This issue has hit the highest priority of European Union and much of the international community. The EMU has been working to avert the defaulting of these nations that would otherwise be inevitable without any kind of intervention. The world knows that the repercussions of these nations defaulting would likely lead to the demise of the European Union and cause for significant economic turmoil around the world.

In the forefront of the European debt crisis has been Greece. For its many years in the EMU, Greece has repeatedly been under watch for its problematic economy. The country has become the poster child of fiscal irresponsibility and political instability in the EU. Greece has consistently failed to meet its debt requirements as imposed by the EMU treaties. The nation’s citizenry has come to expect too much entitlement from the government and shirked its tax responsibilities. The Greek government has performed mass layoffs of government workers and cuts to the welfare program to respond to a discontented people demanding cuts in government spending. Discontent had been abundant on the streets of Greece, where union strikes, mobs, and riots protest the government. Much doubt has been expressed throughout the world of Greece’s chances to recover from this crisis. Among the critics is Dennis Gartman himself. Even the IMF has been reported to have little faith that Greece can survive the mountain of debt under which they have become stuck.

Since the beginning of this crisis, much of the recovery burden had been placed on the shoulders of Germany and France, two of the strongest economies of the EMU. A continued
alliance had been forged between German Chancellor Angela Merkel and French President Nicolas Sarkozy to resolve the debt crisis and preserve the integrity of the EMU. Merkel and Sarkozy have been working closely to develop a plan to revive these drowning nations. The most promising movement the two had developed had been to greatly expand the EFSF—a recovery fund created last year to combat the growing debt in the European Union. Gartman, a skeptic of Greece’s recovery, had stated that the success of the EFSF expansion is Greece’s only hope to survive.

Much opposition had been presented to expansion of the EFSF. In accordance to the EU treaties, before such an action can be taken, each member state—unanimity—of the EMU must vote to do so. First, it was speculated that the Germany would not comply with these measures in response to a strong outcry from the German people. The people of Germany had become tired of paying the way of states like Greece that have repeatedly exercised a lack of fiscal responsibility. At the peak of this discontent, a failed vote had taken to the German Constitutional Court to challenge the legality of Germany’s bailout payments to the struggling nations. As a large contributor to the GDP of the EMU (about 30%), the German people have seen this to be an unfair situation. Despite much of the Bundestag being displeased with the measure, they recognized that Germany’s success has largely been due to the formation of the EMU, as it has significantly contributed to giving Germany a market for its exports to the other member states. As a result, the Bundestag approved the measure, giving an affirmative vote from Germany. Slovakia has stood to oppose the measure.

The Merkozy alliance had been adamant of forming a solution to the debt crisis. No solid plan had been reported, leaving many to doubt the likelihood of a suitable solution. Talks had been made of “write-downs” of Greek debt. However, the amounts speculated to be needed to make a difference have been criticized as being too much. By this point, it has been reported that Greece debt has little worth.

The next big panic from Greece was its November referendum. Former Prime Minister George Papandreou passed on the decision to leave the EMU to the discontented people of Greece. This action was not perceived well by the leaders of Europe, in particular Chancellor Angela Merkel of Germany and President Nicolas Sarkozy of France, who have been the biggest supporters of providing aid to the ailing nation. A result, great pressure was put on Papandreou to resign as
Prime Minister. He acquiesced to these demands as his country stood to lose any additional aid money from its more prosperous European allies.

The resignation of Papandreou opened the doors for the formation of a new Greek government with its sights on economic recovery necessary for the survival of the nation. Lucas Papademos was appointed the interim Prime Minister before the new elections. Another notable resignation was that of Prime Minister Silvio Berlusconi of Italy. The notoriously corrupt leader was finally ousted from office from outrage over recent scandals exacerbated by Italy’s failing economy and austerity measures. Following his departure, Senator Mario Monti assumed his role as Prime Minister. Monti has recently been working closely with Chancellor Merkel and President Sarkozy in crafting a plan for Europe’s recovery.

Merkel and Sarkozy have remained in the news as the faces of the European recovery efforts. The two leaders alongside new Italian Prime Minister Monti unveil the idea of the “Stability Pact” as an answer to the long promised “plan for a plan.” The Pact proposed changes to the EU and EMU treaties. It was designed to introduce reprimands for Eurozone countries that do not meet the financial requirements (such as debt-to-GDP ratio) like Greece. The stipulation of the Pact was to allow the European Central Bank (ECB) to buy European sovereign debt since is technically not in the Bank’s charge to do so now.

In previous months, the two leaders were almost always in lockstep. However, disagreements have recently arisen between the two. In particular, the Chancellor Merkel has fought the ECB’s roll in buying sovereign debt. Merkel fears for inflation of the Euro and possible credit downgrades from such an action. Sarkozy has strongly supported this practice since the beginning. He has argued that allowing the ECB to buying sovereign debts would ease the requirements of his country and others like Germany from buying the debts of ailing nations. France’s AAA rating has been under attack recently for such practices. President Sarkozy’s concern for downgrade has greatly drawn him to favoring allowing the ECB to buy sovereign debt.

The United Kingdom has been opposed to the changes in the EU treaties to make these provisions possible. Since any change to the EU and EMU treaties must be unanimous, the UK’s opposition could halt the measure entirely. This is yet another example of the growing rift
between the UK and the European Union. The UK once again publically declined to enter the EMU in response to the recent turmoil in the Eurozone. Merkel and Sarkozy insisted that rest of the EU will proceed with the Stability Pact without the nations that oppose it. Of late, the UK has linked with the other English-speaking nations like the United States and Canada rather than with the rest of Europe.

More recently the EMU (Germany in particular) has been pushing austerity measures on Greece. The Greek people have not responded well to this mandate. While the Greek government has approved the measure, the people have taken to the streets to protest these austerity measures. The imposed measures would severely cut government spending, cut minimum wage, and nationalize the country’s banks. The people feel they have been betrayed by their leaders at the request of the EU leaders. Specifically, the Greeks have named Germany as the sole oppressor. Cooperation between both countries will likely suffer in the future. Also, the new Greek government is likely to suffer severe losses in popularity because its compliance with the EU’s austerity measures.

The European—Greek in particular—debt crisis has taken a high priority throughout the world. The results of these countries collapsing would surely decimate the value of the Euro, causing severe economic trouble for the EMU. The parties holding Greek, Italian, and Spanish debt (namely the European Central Bank and China) will lose the money they have invested in buying these countries’ debts. The consequences of the collapse of countries like Greece and of the entire EU would surely cause a great deal of turmoil in the global economy. The value of the Euro would surely collapse.

**Operation Twist Revisited**

In the United States, a major action by the Federal Reserve has been under works. The Fed has been planning to resurrect an old monetary policy out of the 1960s used in *Operation Twist*. The Fed’s plan is to manipulate, or *twist*, the positive slope at the end of the yield curve on securities. To do so, the Fed plans on buying $400 billion of long-term Treasury securities and sell an equal amount of short-term ones. Consequently, the Fed is greatly limiting the interest from long-term securities.
This action from the Fed has drawn much criticism from Gartman. He has argued that it would be senseless to twist the yield curve. He stated that most small banks (not ones held by large corporations) make most of their money from long term lending with this positive sloping yield curve. It does not seem as if this plan from the Fed and the FOMC will reflect well on the American economy. If Gartman is correct, it will be very difficult for small banks to continue lending money at affordable rates. This would give the bigger banks that have more options of investments (greater access to capital) to find alternative investments allowing them to be profitable and competitive. Surely this would only serve to drive the small banks out of business, contributing to more unemployment and less economic growth, as small business is what ultimately creates the most jobs.

It appears as if the Fed is trying to combat the unset of inflation by manipulating the interest rates on securities. Interest rates are the main weapon of the Fed and the FOMC for economic policy. As Gartman has stated, he believes that the Operation Twist revival is an act of “desperation” for the Fed to impact the troubled US economy. He has speculated that the Fed is trying to make the US dollar a more appealing reserve currency—a safe haven—to encourage more investment in the dollar. The resulting increase in demand for the dollar would certainly give the value of the dollar a boost. The Fed has not fully presented a reason for the manipulation of the yield curve but if the above is true, it likely intends to increase dollar demand to fight the unset of the inflation that continues to grow. Such inflation would drive down the dollar otherwise.

**A New Direction for the Swiss Franc**

A major development in the forex market was the “pegging” of the Swiss Franc to the Euro. The Swiss National Bank (SNB) fixed the Swiss Franc to 1.2 EUR/CHF. Ultimately this brought down the value of the Franc, as the Franc was previously more valuable than the Euro. The SNB has been carefully and faithfully monitoring the value of the currency to ensure the peg on the Euro.

The Euro peg was devised under the guidance of the Philipp Hildebrand, the President of the Swiss National Bank. Hildebrand has stated that he thought the Franc was too strong and would ultimately hurt the Swiss economy. He reasoned that with the peg at 1.2 EUR to a CHF,
the SNB could keep printing Francs for Euros. With this large quantity of Euros, he reasoned that he could purchase whatever foreign currencies were necessary in which to invest.

Gartman has criticized Hildebrand’s actions as foolish. He has stated that he thinks that this movement will in time destroy the value of the Swiss Franc and instead bolster the Euro. Gartman predicted that the Euro peg will end only in severe inflation of the Franc, greatly overshooting Hildebrand’s goal to devalue the Franc to a workable value.

The Swiss have managed to maintain the peg so far with no severe consequences. The greatest repercussion thus far has been invalidating a major safe haven currency of the world. The stability of the Swiss Franc is very reliant now on both maintaining the peg to the Euro (by means of monetary policy from the SNB) and the success of the Euro.

With a bleak future for the Euro ahead if (or as Gartman would say, “when”) Greece, Italy, and Spain default, the Swiss Franc can hardly be considered a safe reserve. This could consequently serve to yield this duty to the US dollar, which has also been considered a safe haven currency. Even with the US economic troubles, the stability of the US has been looking more certain of late than the EU. Full faith in the Euro will have to first be established through proof that the EU and the EMU can weather the storm that is the European debt crisis. Until this time, the US dollar could see a rise in value with a great demand for reserves.

**The Wheat Market**

Of late a considerable shake-up in the global wheat market has begun. The United States is and has been the world’s largest wheat producer and exporter. However, the wheat season in the United States has seen some troubling issues this year. Severe drought conditions in the regions of the United States such as Texas, Kansas, and Oklahoma that produce much of the United States’ wheat exports have greatly hindered this year’s yield. It was only recently that significant rainfall came to region, helping revitalize the hopes of a successful harvest this year. The resulting yield thus far has not suggested any signs of crisis. Gartman speculated that rain in the region would likely act to bring US wheat prices down, making it as competitive as it would need to be in the market.

A growing competition has presented itself, threatening the reign of the US in the wheat market. This year the United States has lost some of its business from one of its most loyal
importers of wheat: Egypt. Instead of purchasing US wheat, Egypt instead purchased wheat from Russia, due to the Russian ruble’s relative weaken to the US dollar. Also, the addition of Ukrainian wheat to the global has also added pressure to US exports at an already difficult time for the product.

Some deal of controversy has entered the Canadian wheat market of late. In September, a vote was taken with Canadian wheat farmers over the continuation of the Canadian Wheat Board, the central player in the Canadian wheat trade. Despite the fact that most Canadian wheat farmers opposed the continuation of the Board, it survived this initial vote. The Canadian government as of early October had still been deciding on the issue of keeping the Board. Gartman has asserted the entire time that the Board is hindering the free trade of Canadian wheat. He has suggested that the dissolution of the Canadian Wheat Board would ultimately strengthen Canadian wheat and make it more competitive in the global market. This could in turn add greater pressure to the already pressured wheat market in the United States. Most Canadian farmers still pledged support to the CWB. It is important to note that the farmers producing the most wheat in Canada are in opposition to the Canadian Wheat Board. In the end, in late October the Canadian government issued it final decision to disband the CWB, leading to a downtrend in wheat prices, challenging US exports.

Better news for the US wheat and grain market came when the Russian government announced that it was considering reinstating the tax on the grain exports. It the intention of the government to try to limit to amount of Russian grains sent overseas. Instead, the grain is intended to remain in Russia to satisfy its supply needs. Ukraine has been in fierce competition for grain and wheat exports of late. The Ukrainian government decided to gain an edge in the market by lifting its own tax on grain exports. While now Russian grain may not be as big of a contender for large markets in Europe and Asia, Ukraine looks to be positioning to take stakes in these key markets. Not only must the United States monitor closely the exports out of Canada but also those from Ukraine to gauge the success of its exports and pressures they will face in the open market.

**Canada: A Growing Rift across the Border**

Gartman has brought to the attention of his readers the important relationship between the United States and Canada. These two nations have been long-time allies and trading partners. In
In fact, Canada trades the most with the US than any other nation. The majority of US energy comes from Canadian oil and other resources. The majority of Canadian exports are to the United States—this has held true for decades. More recently, in particular following the September 11th terrorist attacks, US-Canadian trade relations have lagged behind the volumes at which they used to be. Increased security at the US-Canadian border has made it much more difficult for goods to move between the two nations. As a result, over the elapsed years Canadian exports have been directed to new markets.

The most controversial event leading to this rift is the stalling of the Keystone XL pipeline. President Obama chose to delay his decision this fall regarding the pipeline rather than approve or veto it. The President attributed his decision to having inadequate time to make a fair and informed decision. It is quite well known that environmentalists across the country are opposed to the construction of the pipelining, claiming that it would cause too much disruption and destruction to the ecosystems in the surrounding areas. It would appear that the President is trying to secure the vote of these eco-groups and activists to better his odds in November’s election.

This news was less than pleasing to Canadians, who have been eagerly awaiting the United States’ approval to build the pipeline through both countries. This pipeline would carry more oil to the United States from oil-rich Canada. Consequently, the US could become less dependent upon Middle Eastern oil. Canadians were disappointed that the US was holding up this pipeline. Consequently, the pipeline will runs from the oil-rich areas of Canada out to the west coast of the country. This oil is intended to go to China, which would otherwise be US-bound.

In response to these changing relations, the US and Canada have been working to patch up old relations. It is their intention to continue this convenient and beneficial trade between the two long-time allies. Gartman speculates that the with the recent drop in value of the Canadian dollar, Canadian goods will become more attractive to the United States, as they will effectively cost less than they previous would have. Consequently, the exports to the United States would serve to strengthen the Canadian dollar.
Turmoil in the East

The world watched the demise of the dictator Muammar al-Gaddafi. For months dissenters amongst the people of Libya have clashed with the forces of their oppressor. NATO forces led by the UK and France have assisted the rebels, shattering Gaddafi’s defenses through aggressive bombing runs. The rebels have managed to take control of much of Libya. The recent death of Gaddafi has presented a milestone in the rebel movement. US leaders have been meeting with the rebel government to help establish the new democratic regime.

The situation in Libya is still far from resolved. For so long, the country has been divided along tribal lines. A nationwide democracy may create tensions across tribal lines that were otherwise suppressed under Gaddafi’s rule, much like those that arose from Saddam Hussein’s removal from power by US coalition forces in Iraq only a few years ago. Also, forces loyal to Gaddafi’s regime still stand strong in regions of Libya they occupy. These forces have expressed no interest in letting up on any attacks. Fighting in the nation will likely persist until Gaddafi’s forces have become exhausted or broken.

The fighting in the Libya has presented a significant economic challenge in the world oil market. As an oil rich nation, Libya has been expected to produce and export oil to the world. The fierce clashes between rebels and loyalist forces have prevented access to some of this oil. While the rebels now hold much of the country’s oil, the incessant strikes from pro-Gaddafi forces have proved to limit the amount of oil that can be collected and exported. It is likely that until a strong enough government and military presence is established and the entrenched enemy forces are defeated that the oil supply will be considerably secure. Until then, oil prices will likely be more volatile, responding quickly to each incident in Libya. This will put pressure on oil prices in the United States, effectively contributing to rising prices in most sectors of the US economy.

Syria and the Assad regime have also made major news in recent months. Syria has been yet another oil nation thrown into violence and fighting. There has been a large and growing movement against the rule of President Bashar al-Assad that has erupted into revolution and protest. Assad has responded with brutal force against protesters and rebels, fighting many civilians. Despite the mass desertion and defection from the military ranks, many forces remain loyal to Assad and continuously assault the rebel strongholds. This conflict was largely
motivated by ethnic conflicts. The rebel fighters are primarily Sunni, while Assad is Alawite. This adds another degree of complication to the matter, as there is no fundamental issue to address would be done in politically or economically driven wars.

International efforts have been made to end the bloodshed. The United Nations officially declared the insurrection a civil war, due to large numbers of military defectors turned against Assad’s regime. The Arab League has attempted negotiations with Assad, only to be refused and ignored by the dictator. The League has called for the president to step down but Assad insists that he will stay in power and punish the protesters and rebel who challenge his reign. To make matters worse, Assad has won the support of Iran, Russia, and China, thus making international efforts to oust him much more politically compromising. Russia and China have barred the Arab League’s appeal to the United Nations for intervention. Another threat to diplomatic relations with Syria and the Assad regime was the withdrawal of the US Ambassador in Syria.

The violence in Syria may soon come to an end with the recent success of the Free Syrian Army—the rebel group that has taken arms against President Assad. The Army has seized many areas surrounding the city of Damascus. With continued defections, Assad will soon be left with no more loyal soldiers to fight his war. In addition, the Arab League has discussed recognizing the rebel government as the legitimate ruling body of Syria. More pressure will be put upon the nation with the destruction of a major natural gas pipeline. The government blames the explosion on the acts of terrorists, but this is thus far unconfirmed. While this attack will not have much effect on the rest of the world, it will certainly exert supply pressures on the nation and the failing regime.

The stability of oil prices have also been challenged by the recent issues in Nigeria. An extremist Muslim terrorist group called the Boko Haram has vowed to remove the Christians in the north of Nigeria. The group has conduct attacks on many Christian villages and bombed Christian churches in the north. The Christians were commanded to leave in order for the Boko Haram to bring Sharia law to the region. Thus far, the Nigerian government has done little to stop this spreading threat, claiming to have no way to identify such an enemy.

The people’s sentiments have turned away from President Goodluck Jonathan’s government recently. The government’s inability to fight the Boko Haram has suggested to the
people of Nigeria that its government is not strong enough to protect them. Also, much discontent has come from citizens unhappy with the president’s decision to end the gas subsidy. This subsidy has been gas much cheaper for the people of Nigeria and left gas much more expensive for the government. However, the IMF asked the president to discontinue this popular practice and he complied. There is a citizen movement to impeach President Jonathan as a result. Also, the nation must also deal with the issue of the Movement for the Emancipation of the Niger River Delta. This separatist group has taken credit for at least one act of terrorism: the bombing of a Nigerian pipeline.

These recent developments in Nigeria could pose a threat the world’s energy supply. Nigeria is an OPEC nation and one of the largest suppliers of oil to the United States. The violence of the Boko Haram or the instability of the government, there is a chance that the resulting unrest could prevent crude oil from leaving the country. This is very similar to the situations in Syria and Iran. Each would result in a supply issue that would drive up the price of oil and energy, effectively weakening the US dollar because of the United States’ heavy dependence on oil.

Iran has brought itself to the center stage around the New Year. Initially, the Iranian military had boldly asserted that it would retaliate swiftly and sharply against any movement made by Israeli forces against its country. Its military leaders extended their challenge to the United States should it attempt to intervene on behalf of its Israeli allies. Just before the New Year, the Iranian government proclaimed that it would seem to closing the Straits of Hormuz should anyone threaten its exports through the Straits. Considering that a sixth of the world’s daily crude oil moves through the Straits, such a threat could have catastrophic effects on the world’s energy supply. However, US military leaders have assured the world that the US’s strong military presence in the Persian Gulf would ensure that the Straits would not stay closed long. It is likely that the United States would take this opportunity to eliminate Iran’s much smaller navy and destroy its nuclear sites, which have been a controversy on their own. The religious leaders of Iran (the true leaders) worked hard to pacify the United States, as they recognized that the rashness of its military leaders and president offer no benefit to the nation.

These recent threats only serve to drive sentiments towards to nation even lower. The European Union has already been watching Iran for the development of its nuclear program. The EU had
considered an embargo on Iranian crude oil in protest of the expansion this nuclear program. In response to this and other sanctions imposed Iran has vowed to stop exporting oil to companies in the United Kingdom and France. Such a measure would likely leave the US and Europe untouched, as the US has been long away from the use of Iranian oil. Europe could likely replace this supply when the new Hbshan-Fujairah pipeline is built by the United Arab Emirates to bypass Iran and the Straits of Hormuz in the oil delivery process. The UAE has also expressed its concern regarding Iran’s hold on Tunb Island. The island would give Iran a strategic advantage in controlling the Strait. Relations with Europe suffered also when extremists attacked the British embassy in Iran. With strong emotions on both sides of the table, one would expect some form of action to be taken in the near future.

The Race to the White House

The contention for the White House has seen many drastic changes over the course of the year. In the fall at the beginning of this project, incumbent President Barack Obama saw a significant loss in popularity. His approval rating amongst voters reached as low as 33%. The President has seen a loss of many wealthy and influential supports, many of whom have supported the President since his 2008 campaign for the White House. One notable example is the loss of James Carville, who has been an ardent supporter of the Democratic Party through the Clinton years. The President has recently received criticism for not seeming to have a plan for American economic recovery. President and CEO of the National Federation of Independent Businesses Dan Danner criticized the President for failing to help small business with tax cuts they need. Most importantly the President lost a crucial demographic: the independent voters. In the past, the independent voters have been the key to the success of a candidate in the Presidential election.

At first, the Republicans were looking at a certain victory. The American people were challenging the President for so many broken and forgotten promises. However, a series of poor campaigns and unpopular candidates effectively nullified the GOP’s chance at taking the White House in November.

The first GOP candidate to stand out in the race was Gov. Rick Perry. The Governor gained much popular from his bold public condemnation the broken Social Security system as being a “Ponzi scheme.” The Governor ran his campaign as a “Washington insider” in response
the growing discontent with the government and Obama’s administration. Perry managed to build enough of a following to match forerunner Romney in the polls. Eventually, Gov. Perry fell out of the public’s favor. This opened the doors for Herman Cain, a businessman and entrepreneur, to take center stage. Republican voters embraced his economic policies and sent Cain ahead in the polls. His demise was brought about with a scandal involving multiple sexual harassment allegations. Cain denied the allegations and pressed one with his campaign. However, the campaign did not survive the allegations and he quickly exited the race amongst other outcast runners, like Rep. Michele Bachmann and Gov. Chris Christie.

The current forerunner for the GOP is Gov. Mitt Romney. The Governor ran for President back in 2008 as well. While he did not get the Republican bid then, he is likely to win it this time. Romney appears to be the only viable GOP candidate left in the contention. He has seen much success in the nation’s primaries and caucuses leading up the Party’s official nomination.

Gov. Romney’s campaign was severely damaged by a speech the Governor made this winter regarding his income. Romney foolishly mentioned that his tax rate was only about 15% despite his high income. He misspoke in declaring that this low tax rate was achieved through exploiting tax loopholes. This did not fare well with many American taxpayers who are struggling in the down-trending American economy. While this will not likely cost him the Republican nomination, it does not seem likely that Romney can contend with Obama in the national election in November.67

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Appendix B: Programming Codes and Flow Charts

Below is the code for the group programming project.

```c
//+------------------------------------------------------------------
//|                                                 EA_EMA5_13_7.mq4 |
//| Joe DiChiara                  Richard Dennen               Kaung Myat Win |
//+------------------------------------------------------------------
#define MAGICMA 20110304
#define MAGICNUMLOW 15   // pip diff between 5 and 13
#define MAGICNUMHIGH 25
#define MAGICDEGHIGH 35
#define MAGICDEGLOW 21

double TAKEPROFIT = 50;
double STOPLOSS = 50;
double Lots = 0.1;
double MovingPeriod5 = 5;
double MovingPeriod13 = 13;
double MovingPeriod50 = 50;
double MovingShift = 0;

//+------------------------------------------------------------------
//| Calculate open positions |
//+------------------------------------------------------------------
int CalculateCurrentOrders(string symbol)
{
    int buys=0,sells=0;
    //----
    for(int i=0;i<OrdersTotal();i++)
    {
        if(OrderSelect(i,SELECT_BY_POS,MODE_TRADES)==false) break;
        if(OrderSymbol()==Symbol() && OrderMagicNumber()==MAGICMA)
        {
            if(OrderType()==OP_BUY)  buys++;
            if(OrderType()==OP_SELL) sells++;
        }
    }
    //---- return orders volume
    if(buys>0) return(buys);
    else       return(-sells);
}

//+------------------------------------------------------------------
//| Check for open order conditions                                  |
//+------------------------------------------------------------------
void CheckForOpen()
{
    double ma5,ma13,ma50,ma5_prev1,ma13_prev1,ma50_prev1,ma5_prev2,ma13_prev2,ma50_prev2,
    ma5_prev3, ma13_prev3, ma50_prev3, deg;
    int res;
    //---- go trading only for first tics of new bar
    if(Volume[0]>1) return;
    //---- get Moving Average
    ma5=IMA(NULL,0,MovingPeriod5,MovingShift,MODE_EMA,PRICE_CLOSE,0);
    ma13=IMA(NULL,0,MovingPeriod13,MovingShift,MODE_EMA,PRICE_CLOSE,0);
    ma50=IMA(NULL,0,MovingPeriod50,MovingShift,MODE_SMA,PRICE_CLOSE,0);
    ma5_prev1=IMA(NULL,0,MovingPeriod5,MovingShift,MODE_EMA,PRICE_CLOSE,1);
    ma13_prev1=IMA(NULL,0,MovingPeriod13,MovingShift,MODE_EMA,PRICE_CLOSE,1);
    ma50_prev1=IMA(NULL,0,MovingPeriod50,MovingShift,MODE_SMA,PRICE_CLOSE,1);
    ma5_prev2=IMA(NULL,0,MovingPeriod5,MovingShift,MODE_EMA,PRICE_CLOSE,2);
    ma13_prev2=IMA(NULL,0,MovingPeriod13,MovingShift,MODE_EMA,PRICE_CLOSE,2);
    ma50_prev2=IMA(NULL,0,MovingPeriod50,MovingShift,MODE_SMA,PRICE_CLOSE,2);
    ma5_prev3=IMA(NULL,0,MovingPeriod5,MovingShift,MODE_EMA,PRICE_CLOSE,3);
    ma13_prev3=IMA(NULL,0,MovingPeriod13,MovingShift,MODE_EMA,PRICE_CLOSE,3);
    ma50_prev3=IMA(NULL,0,MovingPeriod50,MovingShift,MODE_SMA,PRICE_CLOSE,3);
    deg = CheckDegree(ma5, ma5_prev2, ma13, ma13_prev2);
    // calculate the angles
```
//----- sell conditions
if( (ma5_prev1<ma5_prev2) && (sma50_prev1>ma5_prev1) && (ma5<ma13-(MAGICNUMLOW*10*Point)) && (ma5>ma13-(MAGICNUMHIGH*10*Point)) && (CheckForGoodTime() == true) && (CheckForGoodDay() == true) && (deg < MAGICDEGHIGH) && (deg > MAGICDEGLOW))
{
    res=OrderSend(Symbol(),OP_SELL,Lots,Bid,3,0,0,"",MAGICMA,0,CLR_NONE);
    OrderModify(res,OrderOpenPrice(),(Bid+STOPLOSS*10*Point),(Bid-TAKEPROFIT*10*Point),0,CLR_NONE);
    Print("degree = ",deg);
    return;
}

//----- buy conditions
if( (ma5_prev1>ma5_prev2) && (sma50_prev1<ma5_prev1) && (ma5>ma13+(MAGICNUMLOW*10*Point)) && (ma5<ma13+(MAGICNUMHIGH*10*Point)) && (CheckForGoodTime() == true) && (CheckForGoodDay() == true) && (deg < MAGICDEGHIGH) && (deg > MAGICDEGLOW))
{
    res=OrderSend(Symbol(),OP_BUY,Lots,Ask,3,0,0,"",MAGICMA,0,CLR_NONE);
    OrderModify(res,OrderOpenPrice(),(Ask-STOPLOSS*10*Point),(Ask+TAKEPROFIT*10*Point),0,CLR_NONE);
    Print("degree = ",deg);
    return;
}

// only trade during high liquidity
bool CheckForGoodTime()
{
    bool temp;
    if((Hour()>=2 && Hour()<=10) || ((Hour()>=18 && Hour()<=21)))
        temp = true;
    else
        temp = false;
    return(temp);
}

// only trade on Tuesday, Wednesday, Thursday
bool CheckForGoodDay()
{
    bool temp;
    if(DayOfWeek()>1 && DayOfWeek()<5)
        temp = true;
    else
        temp = false;
    return(temp);
}

// This function calculates the angle of the EMA difference with SSS rule
// CheckForOpen() uses this function
double CheckDegree(double ma5, double ma5_prev2, double ma13, double ma13_prev2)
{
    double rad, a, b, c, b_sqr, c_sqr, period, deg;
    period = Period()*0.0001;
    a = MathAbs(ma5-ma13);
    b = MathSqrt((ma5-ma5_prev2)*(ma5-ma5_prev2) + (period*period*4));
    b_sqr = (ma5-ma5_prev2)*(ma5-ma5_prev2) + (period*period*4);
    c = MathSqrt((ma13-ma5_prev2)*(ma13-ma5_prev2) + (period*period*4));
    c_sqr = (ma13-ma5_prev2)*(ma13-ma5_prev2) + (period*period*4);
    rad = MathAbs(MathArccos((b_sqr+c_sqr-a*a)/(2*b*c)));
    deg = rad/3.1418*180;
    return(deg);
}
void start()
{
    //---- check for history and trading
    if(Bars<100 || IsTradeAllowed()==false) return;
    //---- calculate open orders by current symbol
    if(CalculateCurrentOrders(Symbol())==0) CheckForOpen();
    //else
    CheckForClose();
    //----
}
//+---------------------------------------------------------------+
Below is the code for Richard’s robot.

```c
//+------------------------------------------------------------------
//|                                                        Trader.mq4 |
//|                                                   Richard Dennen |
//|
//+------------------------------------------------------------------

#define RMDMAGIC     12345
#define TRADE_NONE   0
#define TRADE_PEND   1
#define TRADE_OPEN   2
#define POS_NONE     0
#define POS_BUY      1
#define POS_SELL    -1
#define CROSS_NONE   0
#define CROSS_BULL   1
#define CROSS_BEAR   -1
#define NO_CROSS    -1
#define NULL_TICKET -1

int trade = TRADE_NONE;
int position = POS_NONE;
int ticket = NULL_TICKET;
int lastFS = NO_CROSS;
int lastFM = NO_CROSS;
extern int p_fast = 14;
extern int p_med = 28;
extern int p_slow = 40;
extern double lots = 1.0;
extern int window = 2;
extern int wait = 1;

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

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

//+------------------------------------------------------------------
//| expert start function                                            |
//+------------------------------------------------------------------
void start()
{
    // int dir;
```
if (Bars<100 || IsTradeAllowed()==false) return;

if ( Volume[0]>1 ) return;  // Run on the start of the bar only

if ( trade==TRADE_NONE )  // No trade
{
  if ( GoodTime() )  // Should I be trading right now?
  {
    if ( CrossOver() )  // Has a crossover occurred this bar?
    {
      trade = TRADE_PEND;  // Set state to pending
      position = CheckFMCross();  // FM cross indicates the direction of trend
      // Returns CROSS_NONE, CROSS_BEAR, or CROSS_BULL
      // Note that POS_NONE==TRADE_NONE, POS_BUY==CROSS_BEAR, POS_SELL==CROSS_BULL
      // Assigning the output to position is valid
    }
    else
    {
      clearState();  // Invalid the current state; no trading now
    }
  }
  else if ( trade==TRADE_PEND )  // Pending trade
  {
    if ( GoodTime() )  // Should I be trading right now?
    {
      if ( CheckPattern() )  // Does the pattern match the trend?
      {
        if ( position==POS_BUY )  // Open a buy
        {
          ticket = OpenBuyTrade();
          if ( ticket!=NULL_TICKET )  // Check for success
          {
            trade = TRADE_OPEN;  // Update state
            Print("Buy open at ", Ask);
          }
          else
          {
            clearState();  // Uh oh! Something went wrong
            Print("Error buying! ", GetLastError());
          }
        }
        else if ( position==POS_SELL )  // Open a sell
        {
          ticket = OpenSellTrade();
          if ( ticket!=NULL_TICKET )  // Check for success
          {
            trade = TRADE_OPEN;  // Update state
            Print("Buy sell at ", Ask);
          }
          else
          {
            clearState();  // Uh oh! Something went wrong
            Print("Error selling! ", GetLastError());
          }
        }
        else
        {
          clearState();  // Invalidate the current state; false signal
        }
      }
      else
      {
        clearState();  // Invalidate the current state; no trading now
      }
    }
    else
    {
      clearState();  // Open trade
    }
  }
}
OrderSelect(ticket, SELECT_BY_TICKET);
if ( OrderCloseTime()==0 ) // If close time is 0, then the trade is still open {
    if ( FoundExit() ) // Should I close this trade?
    {
        if ( position==POS_BUY )
        {
            OrderClose(ticket,lots,Ask,3,CLR_NONE);
            clearState(); // Clear old trade data
            Print("Ticket closed at ", Ask);
        }
        else if ( position==POS_SELL )
        {
            OrderClose(ticket,lots,Bid,3,CLR_NONE);
            clearState(); // Clear old trade data
            Print("Ticket closed at ", Bid);
        }
        else
        {
            // Adjust stop-loss, if necessary
        }
    }
    else // Stop-loss or take-profit has closed this trade
    {
        clearState(); // Reset state to default
        Print("Ticket was closed");
    }
}

int CheckFMCross()
{
    double fast1, med1;
    double fast0, med0;
    double d_fm0, d_fm1;

    fast0 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,0); // Get current data
    med0 = iMA(Symbol(),0,p_med,0,MODE_EMA,PRICE_CLOSE,0);

    fast1 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,1); // Get old data
    med1 = iMA(Symbol(),0,p_med,0,MODE_EMA,PRICE_CLOSE,1);

    d_fm0 = fast0 - med0; // Differences
    d_fm1 = fast1 - med1;

    if ( MathSign(d_fm0) != MathSign(d_fm1) )
    {
        if ( fast0 - fast1 > 0 ) // MA up
            return(CROSS_BULL);
        else if ( fast0 - fast1 < 0 ) // MA down
            return(CROSS_BEAR);
    }
    else
    {
        return(CROSS_NONE); // No cross detected
    }
}

int CheckFSCross()
{
    double fast1, slow1;
double fast0, slow0;
double d_fs0, d_fs1;

fast0 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,0); // Get current data
slow0 = iMA(Symbol(),0,p_slow,0,MODE_SMA,PRICE_CLOSE,0);

fast1 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,1); // Get old data
slow1 = iMA(Symbol(),0,p_slow,0,MODE_SMA,PRICE_CLOSE,1);

d_fs0 = fast0 - slow0; // Differences
d_fs1 = fast1 - slow1;

if ( d_fs0<0 && d_fs1>=0 )                                  // F cross S from below
{
    return(CROSS_BULL);
}
else if ( d_fs0>0 && d_fs1<=0 )                             // F cross S from above
{
    return(CROSS_BEAR);
}
else
{
    return(CROSS_NONE);                                      // No cross detected
}

bool CrossOver()
{
    if ( CheckFMCross()!=CROSS_NONE ) // Did Fast and Medium cross?
    {
        lastFM = 0;                      // Last cross was now
    }
    else
    {
        if (lastFM!=NO_CROSS) lastFM++;  // Increment
    }

    if ( CheckFSCross()!=CROSS_NONE )
    {
        lastFS = 0;                      // Last cross is now
    }
    else
    {
        if (lastFS!=NO_CROSS) lastFS++;  // Increment
    }

    if ( (lastFM>NO_CROSS && lastFM<=window) && (lastFS>NO_CROSS && lastFS<=window) )
    {
        return(TRUE);                    // The crossovers have occurred
    }
    else
    {
        return(FALSE);
    }
}

int OpenBuyTrade()
{
    int tic;
    tic = OrderSend(Symbol(),OP_BUY,lots,Ask,3,0,0,"Crossover buy",RMDMAGIC,0,Green);
    if ( tic!=-1 ) // Did it succeed?
    {
        OrderModify(tic,Ask,Ask-0.0005,Ask+0.0005,0,Blue); // Set stop loss 10 pips below
    }
    return(tic);
}

int OpenSellTrade()
int tic;

tic = OrderSend(Symbol(),OP_SELL,lots,Bid,3,0,0,"Crossover sell",RMDMAGIC,0,Green);
if ( tic!=-1 )    // Did it succeed?
{
    OrderModify(tic,Bid,Bid+0.005,Bid-0.005,0,Blue);    // Set stop loss 10 pips above
}
return(tic);

bool GoodTime()
{
    int hr = TimeHour(TimeLocal());
    return( (hr>=7 && hr<=9) || (hr<=0 && hr<=3) );
}

double MathSign(double x)
{
    if ( x == 0 )
    {
        return(0);
    }
    else
    {
        return(x/MathAbs(x));
    }
}

bool FoundExit()              // Function skeleton
{
    return(false);
}

void clearState()
{
    trade = TRADE_NONE;        // No open/pending trade
    position = POS_NONE;       // No position
    ticket = NULL_TICKET;      // No open order ticket
}

bool CheckPattern()
{
    bool ret=false;

double fast,med,slow;

    fast = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,0);
    med  = iMA(Symbol(),0,p_med, 0,MODE_EMA,PRICE_CLOSE,0);
    slow = iMA(Symbol(),0,p_slow,0,MODE_SMA,PRICE_CLOSE,0);

    switch (position)
    {
    case POS_BUY:           // Check buy pattern
        ret = (fast>med) && (med>slow);
        break;
    case POS_SELL:          // Check sell pattern
        ret = (fast<med) && (med<slow);
        break;
    default:                // anything else is false
        break;
    }

    return(ret);
}

}
Below is the code for Richard’s Indicator

```c
//+------------------------------------------------------------------
//|                                                  TripleCross.mq4 |
//|                                                   Richard Dennen |
//|
//+------------------------------------------------------------------
#
#property copyright "Richard Dennen"
#property link ""
#property indicator_chart_window
#property indicator_buffers 2
#property indicator_color1 Green
#property indicator_color2 Red

#define CROSS_NONE   0
#define CROSS_BULL   1
#define CROSS_BEAR -1
extern int p_fast = 14;
extern int p_med = 28;
extern int p_slow = 40;
extern int window = 3;
extern double pip_off = 10.0;

double bull[];
double bear[];
double offset;
int lastCross=-1;

//+------------------------------------------------------------------
//| Custom indicator initialization function                         |
//+------------------------------------------------------------------

int init()
{
    //----
    indicators
    SetIndexBuffer(0,bull);          // Set up the buffer
    SetIndexStyle (0,DRAW_ARROW,STYLE_SOLID,2,Lime);      // Line style
    SetIndexArrow(0,233);
    SetIndexEmptyValue(0,0.0);         // Zero is empty
    SetIndexLabel(0,"Triple Cross Bull");
    SetIndexBuffer(1,bear);          // Set up the buffer
    SetIndexStyle (1,DRAW_ARROW,STYLE_SOLID,2,Red);      // Line style
    SetIndexArrow(1,234);
    SetIndexEmptyValue(1,0.0);         // Zero is empty
    SetIndexLabel(1,"Triple Cross Bear");
    offset = pip_off/10000.0;
    //----
    return(0);
}

//+------------------------------------------------------------------
//| Custom indicator deinitialization function                       |
//+------------------------------------------------------------------

int deinit()
{
    //----
    return(0);
}

//+------------------------------------------------------------------
//| Custom indicator iteration function                              |
//+------------------------------------------------------------------

int start()
{
    int    counted_bars=IndicatorCounted();
    int i = Bars-counted_bars-1;
    int j;
```
bool FMcross, FScross;
int FMcrossType, temp;

//--
for (; i>=3; i--)
{
    if ( lastCross<i+window-1 && lastCross!=-1) continue;      // Skip; don't double count
    FMcross=false;       // Found nothing by default
    FScross=false;
    FMcrossType=CROSS_NONE;
    for (j=0; j<window; j++)
    {
        temp = CheckFMCross(i+j);
        if ( temp!=CROSS_NONE )
        {
            FMcross = true;         // Update crossing info
            FMcrossType = temp;     // Which direction?
            lastCross = i+j;
        }
        if ( CheckFSCross(i+j)!=CROSS_NONE )
        {
            FScross = true;
            lastCross = i+j;
        }
    }
    if ( FMcross && FScross )  // Did both cross within the window?
    {
        lastCross = i;
        switch (FMcrossType)
        {
            case CROSS_BULL:
                bull[i] = High[i]+offset;  // Mark bull entry
                bear[i] = 0.0;
                break;
            case CROSS_BEAR:
                bear[i] = Low[i] - offset;   // Mark bear entry
                bull[i] = 0.0;
                break;
            default:
                bull[i] = 0.0;             // Do nothing
                bear[i] = 0.0;
        }
    }
    else
    {
        bull[i] = 0.0;                   // No signal
        bear[i] = 0.0;
    }
}

SetIndexDrawBegin(0,Bars-counted_bars+1);
SetIndexDrawBegin(1,Bars-counted_bars+1);
//--
return(0);
//--

int CheckFMCross(int i)
{
    double fast1, med1;
    double fast0, med0;
    double d_fm0, d_fm1;
    fast0 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,i);    // Get current data
    med0 = iMA(Symbol(),0,p_med,0,MODE_EMA,PRICE_CLOSE,i);
fast1 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,i+1);    // Get old data
med1 = iMA(Symbol(),0,p_med,0,MODE_EMA,PRICE_CLOSE,i+1);

d_fm0 = fast0 - med0;

if ( MathSign(d_fm0) != MathSign(d_fm1) )
{
    if ( fast0 - fast1 > 0 )      // MA up
    {
        return(CROSS_BULL);
    }
    else if ( fast0 - fast1 < 0 )    // MA down
    {
        return(CROSS_BEAR);
    }
}
else
{
    return(CROSS_NONE);                                      // No cross detected
}

int CheckFSCross(int i)
{
    double fast1, slow1;
    double fast0, slow0;

    double d_fs0, d_fs1;

    fast0 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,i);    // Get current data
    slow0 = iMA(Symbol(),0,p_slow,0,MODE_SMA,PRICE_CLOSE,i);

    fast1 = iMA(Symbol(),0,p_fast,0,MODE_EMA,PRICE_CLOSE,i+1);    // Get old data
    slow1 = iMA(Symbol(),0,p_slow,0,MODE_SMA,PRICE_CLOSE,i+1);

    d_fs0 = fast0 - slow0;                                      // Differences
    d_fs1 = fast1 - slow1;

    if ( d_fs0<0 && d_fs1>=0 )                                  // F cross S from below
    {
        return(CROSS_BULL);
    }
    else if ( d_fs0>0 && d_fs1<=0 )                             // F cross S from above
    {
        return(CROSS_BEAR);
    }
    else
    {
        return(CROSS_NONE);                                      // No cross detected
    }
}

double MathSign(double x)
{
    if ( x == 0 )
    {
        return(0);
    }
    else
    {
        return(x/MathAbs(x));
    }
}
Appendix C: Summary of Manual Trades

The following is a summary of the group account in Trading Station. It shows the total analysis and amount of trades for the whole of B and C term.

### TradeStation Performance Summary

<table>
<thead>
<tr>
<th></th>
<th>All Trades</th>
<th>Long Trades</th>
<th>Short Trades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Net Profit</td>
<td>$6,525.54</td>
<td>$0.00</td>
<td>$6,525.54</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>$23,457.44</td>
<td>$0.00</td>
<td>$23,457.44</td>
</tr>
<tr>
<td>Gross Loss</td>
<td>($16,921.90)</td>
<td>$0.00</td>
<td>($16,921.90)</td>
</tr>
<tr>
<td>Profit Factor</td>
<td>1.39</td>
<td>n/a</td>
<td>1.39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Roll Over Credit</th>
<th>Open Position P/L</th>
<th>Select Total Net Profit</th>
<th>Select Gross Profit</th>
<th>Select Gross Loss</th>
<th>Select Profit Factor</th>
<th>Adjusted Total Net Profit</th>
<th>Adjusted Gross Profit</th>
<th>Adjusted Gross Loss</th>
<th>Adjusted Profit Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>($164.30)</td>
<td>$0.00</td>
<td>$6,525.54</td>
<td>$23,457.44</td>
<td>($16,921.90)</td>
<td>1.39</td>
<td>($6,078.60)</td>
<td>$16,036.55</td>
<td>($16,931.90)</td>
<td>1.39</td>
</tr>
</tbody>
</table>

| Total Number of Trades | 13             | 0               | 13                      |
| Percent Profitable     | 55.56%         | 0.00%           | 55.56%                  |
| Winning Trades         | 10             | 0               | 10                      |
| Losing Trades          | 0              | 0               | 0                       |
| Even Trades            | 0              | 0               | 0                       |
| Avg. Trade Net Profit | $362.53        | $0.00           | $362.53                 |
| Avg. Winning Trade     | $2,345.74      | $0.00           | $2,345.74               |
| Avg. Losing Trade      | ($2,116.49)    | $0.00           | ($2,116.49)             |
| Ratio Avg. Win:Avg. Loss | 1.11         | n/a             | 1.11                    |
| Largest Winning Trade  | $11,559.20     | $0.00           | $11,559.20              |
| Largest Losing Trade   | ($6,432.40)    | $0.00           | ($6,432.40)             |
| Largest Winner as % of Gross Profit | 49.28% | n/a | 49.28% |
| Largest Loser as % of Gross Loss | 37.99% | n/a | 37.99% |
| Net Profit as % of Largest Loss | 10.14% | n/a | 10.14% |
| Select Profit as % of Largest Loss | 10.14% | n/a | 10.14% |
| Adjusted Net Profit as % of Largest Loss | (106.94%) | n/a | (106.94%) |

### Figure 46: TradeStation Performance Summary

<table>
<thead>
<tr>
<th>#</th>
<th>Date/Time</th>
<th>Account</th>
<th>Symbol</th>
<th>Price</th>
<th>Roll Over Pips</th>
<th>Shares/Contracts Won</th>
<th>Profit</th>
<th>Gross Profit</th>
<th>Net Profit</th>
<th>P/L</th>
<th>% of Gross Profit</th>
<th>% of Net Profit</th>
<th>Net Profit as % of Largest Net Profit</th>
<th>Efficiency</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>03/21/01 09:15</td>
<td>04900001</td>
<td>TISIOO</td>
<td>$4000</td>
<td>10000000</td>
<td>100000</td>
<td>$4000</td>
<td>$4000</td>
<td>$4000</td>
<td>100</td>
<td>100.00%</td>
<td>100.00%</td>
<td>$4000.00</td>
<td>0.00%</td>
<td>0.10%</td>
</tr>
<tr>
<td>2</td>
<td>03/21/01 09:15</td>
<td>04900001</td>
<td>TISIOO</td>
<td>$4000</td>
<td>10000000</td>
<td>100000</td>
<td>$4000</td>
<td>$4000</td>
<td>$4000</td>
<td>100</td>
<td>100.00%</td>
<td>100.00%</td>
<td>$4000.00</td>
<td>0.00%</td>
<td>0.10%</td>
</tr>
</tbody>
</table>

### Figure 47: List of Trades

139
### TradeStation Trade Analysis

<table>
<thead>
<tr>
<th></th>
<th>All Trades</th>
<th>Winners</th>
<th>Losers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Trades</td>
<td>18</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Avg. Trade Net Profit</td>
<td>$362.53</td>
<td>$2,345.74</td>
<td>($2,116.49)</td>
</tr>
<tr>
<td>1 Std. Deviation of Avg. Trade</td>
<td>$3,735.17</td>
<td>$3,689.05</td>
<td>$1,934.57</td>
</tr>
<tr>
<td>Avg. Trade + 1 Std. Deviation</td>
<td>$4,097.76</td>
<td>$3,934.80</td>
<td>($181.92)</td>
</tr>
<tr>
<td>Avg. Trade - 1 Std. Deviation</td>
<td>($3,372.84)</td>
<td>($1,343.31)</td>
<td>($4,031.05)</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>1030.31%</td>
<td>157.27%</td>
<td>91.40%</td>
</tr>
</tbody>
</table>

### Time Averages

<table>
<thead>
<tr>
<th></th>
<th>10 Dys, 2 Hrs, 40 Mins</th>
<th>16 Dys, 21 Hrs, 10 Mins</th>
<th>1 Dy, 15 Hrs, 32 Mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Time in Trades</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg. Time Between Trades</td>
<td>n/a</td>
<td>2 Hrs, 40 Mins</td>
<td>16 Hrs, 58 Mins</td>
</tr>
<tr>
<td>Avg. Time Between Trade Profit Peaks</td>
<td>3 Dys, 11 Hrs, 12 Mins</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Outliers

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Outliers</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Outlier Profit/Loss</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

### Run-up/Drawdown

<table>
<thead>
<tr>
<th></th>
<th>Run-up</th>
<th>Drawdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Value</td>
<td>$27,817.60</td>
<td>($9,072.49)</td>
</tr>
<tr>
<td>Max. Value Date</td>
<td>1/13/2012</td>
<td>1/31/2012</td>
</tr>
<tr>
<td>Avg. Value</td>
<td>$3,382.14</td>
<td>($2,475.74)</td>
</tr>
<tr>
<td>1 Std. Deviation</td>
<td>$7,003.73</td>
<td>$2,398.02</td>
</tr>
<tr>
<td>Avg. + 1 Std. Deviation</td>
<td>$10,385.87</td>
<td>($77.13)</td>
</tr>
<tr>
<td>Avg. - 1 Std. Deviation</td>
<td>($3,621.59)</td>
<td>($4,874.36)</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>207.00%</td>
<td>95.00%</td>
</tr>
</tbody>
</table>

### Efficiency Analysis

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Efficiency</td>
<td>4.61%</td>
<td>47.60%</td>
<td>57.01%</td>
</tr>
<tr>
<td>1 Std. Deviation</td>
<td>55.87%</td>
<td>34.55%</td>
<td>32.82%</td>
</tr>
<tr>
<td>Avg. + 1 Std. Deviation</td>
<td>60.16%</td>
<td>82.15%</td>
<td>69.63%</td>
</tr>
<tr>
<td>Avg. - 1 Std. Deviation</td>
<td>($50.96%)</td>
<td>13.05%</td>
<td>24.39%</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>1205.45%</td>
<td>72.58%</td>
<td>57.22%</td>
</tr>
</tbody>
</table>

---

**Figure 48: TradeStation Trade Analysis**

**Figure 49: Equity Curve of Trades**
Appendix D: Other Forex Brokers

When one is in forex trading business, one has to deal with forex brokers to trade currency whether in small or in large amount of sums. Thus, it is crucial to know the information of the brokers around the world and to find the best broker that will suit one’s needs. Dealers exist both physically and virtually, meaning that customer support personnel working as brokers are physical brokers of the broker company, which operates virtually on the World Wide Web. However, most of the time, we train ourselves by using demo accounts provided by those brokers so that we do not have to rely on physical brokers, but only on the trading platforms that, most of the time, fulfill our needs.

It is also fundamental to know a company’s history and its regulations, which are usually provided on its website, so that the company cannot swindle one’s belongings and rip one off. Since many people have lost their fortune from fraudulent companies and companies that go bankrupt, it is important to find a broker that is insured and have a powerful background. Apart from the background, a decent broker should have excellent service to all of its customers, no matter if the customer holds a practice or a live account. Moreover, there should be an online chat help which is available 24 hours a day and 6 days a week, if not 7. Information about the trading platforms and forex trading itself must also be provided on the company’s website so that people who wish to learn can do research on their own. Since a rich collection of resource on trading is an attraction to customers, it shows that companies that provide good information actually care about their relationship with customers. Ability to provide low spreads is also an attraction to all levels of traders because one does not have to wait too long to recover the spread difference. Thus, a comprehensive research on brokers is an essential task of every novice traders if one wants to be successful in forex world.

A brief summary on several forex brokers are provided below to show and compare the qualities of services that the brokers offer to their customers.

FOREX.com

FOREX.com is an international forex broker which has successfully serviced 240,000 accounts from over 140 countries. FOREX.com is an entity of GAIN Capital Holdings, Inc. which holds offices in New York, London, Tokyo, Hong Kong, Sydney, and Seoul. FOREX.com
is a certified Futures Commission Merchant (FCM) and Retail Foreign Exchange Dealer (RFED) in United States, United Kingdom, Japan, and Sydney. As it is a public company, it provides several disclosures, reports, and financial statements to public. It has won over 33 awards in forex trading over past five years. FOREX.com operates from 5:00pm EST Sunday to 5:00pm EST Friday every week. It offers 3 platforms to trade: FOREXTrader PRO, MetaTrader 4, and eSignal. FOREXTrader PRO is the platform designed by the programmers from FOREX.com, MT4 is widely used in forex trading world and eSignal has superb charting tools for traders. FOREX.com also provides website access to account which also allows trading on the website without the need to download any platforms. Therefore, customers can access and manage their account from any computer. FOREX.com not only has iPhone App and Android App available for free on App stores, but also provides FOREX.com Mobile for BlackBerry. FOREX.com offers over 45 currency pairs, in addition with Gold and Silver.

With FOREX.com, trades are executed almost instantly with the average execution speed of 0.05 seconds which may seem like an instant execution. Trades are transparent, meaning that traders from traders are passed on to the banks directly. FOREX.com also publishes its spreads so that customers can see whether they were given the right price or not. Providing such financial statement also confirm that FOREX.com is a credible broker.

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FOREX.com provides exceptional customer support over the phone or online 24 hour and seven days a week. All the information to manage an account is also provided on the website so that customers can self-service. From my experience, even a customer with a practice account was assigned a broker to help learn the process of trading. One can also request for one-on-one market strategist as an additional market resource.

FOREX.com is an excellent resource not only for professional traders, but also for beginners and even students. It has a “Forex Learning Center” which offers outstanding videos, tutorials, webinars, and online courses to all the customers, including practice traders. The website also provides information separately for beginners and advanced traders, making it less confusing for both classes of traders. Moreover, FOREX.com provides “Forex Trading for Dummies” free of charge.

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To conclude, FOREX.com is one of a few brokers with strong background history and is an excellent choice for both beginner and professional traders because of its low spread on major currency pairs. It also provides outstanding learning resources without restrictions to any particular account type and provides unique customer service that is available 24 hours a day and seven days a week. Figure 50 above is typical and minimum dealing spreads of FOREX.com for a day.

**Etoro**

Etoro is the global forex broker which provides accounts for customers in 140 countries, reaching over 1.75 million users. Etoro’s mission is to “financially empower millions of individual investors, though their simple and innovative online investment platform and active social trading community”. Etoro is a home for various kinds of investors, including beginners and professionals. Everybody is allowed to trade to their heart’s content. To protect people from unnecessary losses, Etoro provides online and phone support from the trading specialists. Forums and social trading networks are also useful tools for traders to share and learn from each other.

Accounts are mostly allowed to trade from 1:2 to 1:400 leverage, depending on the assets deposited in the account. Etoro platform allows a customer to change the leverage level and margin for each trade so that customers can change tactics depending on his risk management strategy. Etoro allow customers to trade in standard lot ($100,000), mini lot ($10,000), and micro lot ($1,000). Deposits on the accounts can only be done in US Dollar, Euro or Great Britain Sterling Pound. Software’s base currency is only offer in dollars, which may be sometimes counter intuitive for most professional traders, but is very useful for traders in America because it require less time to compute back to US Dollar after making a profit. Etoro also offers commission free deposits and trading so that customers do not have to pay extra money.

Etoro opens on Sunday at 5pm (EST) and closes at 4pm (EST) on Friday and operates technical maintenance during Sundays only when market is closed. The website and the platform are optimized for simple and friendly user interface. Website can be viewed in 17 popular languages and customer support offers 8 languages.

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Etoro allows trading with popular MT4 platform like other brokers\textsuperscript{75}. However, practice trading account expired after 30 days and one has to open another practice account or open a live account to continue using it. They also offer android application for MT4 which can only be accessed with live accounts. Etoro live assistant mentioned that about 130 trillion dollars pass through their company each year.

In conclusion, Etoro is another major forex broker which offers insightful teaching videos, excellent customer support and great spreads on most currency pairs. They also have a legitimate press releases and reports published on their website. A summary of currency pairs and their corresponding spreads are provided in the figure below.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{currency_spreads.png}
\caption{Currency Spreads from Etoro\textsuperscript{74}}
\end{figure}


Hot Forex

Hot Forex is an international online OTC forex and commodities broker. Hot Forex offers various account types, software platforms, and trading tools for different investors and companies. Their mission statement is to develop itself into all traders’ first choice in brokerage firms. It opens from 9:00pm GMT on Sunday through 9:00pm GMT on Friday.

One of the major advantages of Hot Forex is that it offers extremely low spreads, even as low as 0.3 pips on EUR/USD pair. It allows customers to open a $5 micro account, which is very invaluable for newcomers as they do not need to invest a lot of money to experience the real trading. For premium account, Hot Forex requests $500 as minimum deposit, which is still a lot lower compared to other major forex brokers.

Another benefit of doing business with Hot Forex is that it allows unlimited free of charge demo accounts. It is also good for beginning traders as well as professionals because they can test different strategies with multiple accounts. Live accounts also get a number of free services and features from Hot Forex, ranging from Forex Signals via text to Free Forex TV.

Like most top forex brokers, Hot Forex does not trade against a trader, letting go all the trades to the banks and calling this policy “Straight through Processing”. Clients also receive technical research and market reports immediately as they are released. Hot Forex accounts can be used with MT4 trading platform which provides all the tools and resources necessary to manage the accounts. Clients can not only access to MT4 via Hot Forex website, but they can also access Hot Forex account via Hot Forex MetaTrader Mobile though PDA, a smart phone, an iPhone or an android device.

Customer support is 24 hours a day and 5 days a week, excluding weekends. Customer support team is very involved with helping experienced and inexperienced traders, including students. We are offered support for our Interactive Qualifying Project by one of their customer support personnel. There are also contests with various prizes for new and existing accounts.

Hot Forex is very useful for trading as well as training in educational settings because of its unlimited time demo accounts. Typical spreads are as low as 1.6 for EURUSD, 1.7 for USDJPY, 1.9 for USDCAD, and 1.9 for USDCHF.

Trading Point
Trading Point is also an international broker focused on customer’s convenience and is founded 25 years ago by experienced market professionals. It operates from Sunday 10:00pm GMT to Friday 10:00pm GMT. Trading point offers micro, standard, and executive account with no minimum deposit, which makes Trading Point a major attraction in the forex world. This feature allows newcomers to experience the excitement of forex trading while it controls the amount that newcomers can bet in order to limit their loss and risk.

Accounts are accepted to deposit money in USD, EUR, GBP, CHF, AUD and JPY. Trading point has over 70 currency pairs and it offers low pips and multiple leverages ranging from 1:1 to 1:500 depending on the account type. The spread is also as tight as 1 pip, a favorite number for forex traders. Trading Point also claims that they are trying very hard to get low spread rates on many currency pairs.

It also asserts that the clients’ accounts are segregated from the company’s funds, meaning that the company will never use clients’ money for any purposes. It also accommodates a fair and transparent trading as other top forex brokers without any third party intervention. Moreover, Trading Point provides articles mostly on forex trading so that customers can learn while they are trading. There is personalized customer service for support through live chat, telephone and email. Every client is provided an account manager to guide though the first trading or get tips and pointers in trading. In addition, its daily fundamental analysis reports and training materials are tremendously useful for professionals in determining the profitable trades.

FXCM

FXCM is top America’s forex trading broker with the motto of providing transparent and fair execution for customers. FXCM pass the trades directly to its competing providers who are competing for smallest bid and ask price. Therefore, best prices are provided to its customers around the clock. It offers “No Dealing Desk” trading which eliminates the interaction between dealers and traders, and guarantees that there is no dealer intervention in the exchanges. It also asserts that liquidity providers cannot see the trades of its customers, so there is no way of manipulation by price providers.

Due to its low spread of 1pip and minimum deposit of $25 attract the dealers all around the world. Moreover, it offers various account types: mini, micro, and standard $10K accounts, thus allowing different types of traders to experience the forex market in diverse ways. FXCM provides various platforms to trade, and among them, Active Trader platform delivers the advanced trading environment with insights into the markets. It can administer fair and transparent trade because all the transactions are executed back to back with institutions worldwide. FXTM offers MT4 demo account with services for 30 days and supplies the currency prices in tenth of a pip for all currency pairs.

FXCM is also known for its resourceful knowledge database on trading forex. It offers free forex trading guide, video library with dozens of videos for basics, trading strategies, and platforms, and forex trading course which provides intensive touch on technical indicators, trading strategies, and many management techniques.

FXCM offers online support for live clients whereas demo account owners can only get offline support as in reading block and Frequently Asked Questions. However, all the guides, tours, and videos compensates for this drawback. FXCM has typical spreads of 2.7 for EURUSD, 2.5 for USDJPY, and 3.1 for GBPUSD, and 3.6 for USDCHF. It allows 2% (50:1 leverage) margin on major currency pairs and 5% margin (20:1 leverage) on exotic currency

pairs. FXCM was awarded with several titles to be the best forex broker over the years with a lot of regulations in several jurisdictions, and, thus, is the most legitimate forex broker in the US.
Appendix E: Example Trading Journal

Trade 1

For my first set of trades I waited for a solid divergence in the market so I could confidently guess which way it was going to be heading. Notice that all of the points to the left of the entry point have a solid downward divergence indicating that the market was going to continue to move down. Notice the parabolic SAR during the downward trends and the upward trends. It seems that the downward ones are stronger than the upward ones verifying to me that there is a strong downward trend occurring. Moving on the red CCI curve seen directly below the market, we see that it is registering -100 meaning that there is a strong downward divergence. The blue RSI indicator shows that the system is between the 30 and 70 portion meaning that the market is neither over-bought or under-bought. With all three of these indicators agreeing that I should sell, I placed two sell orders of 1 standard lot as seen below in Figure 52.

As one can see, the market continued to move as I predicted it. I set my stop loss for both trades at about 35 pips above my entry point and my take profit line to about 25 pips below my starting point. Generally speaking the market continued to move in a downward direction for a few minutes and then it began to consolidate for about 5 minutes. However, notice that during this consolidation period that it was still moving downward even if it was miniscule amounts. This led me to believe that a breakout was soon to follow with it being in the downward direction. With this knowledge in hand, I decided to keep my trades in and not manually end the

Figure 52: Market Image of Trade 1
trades. After a few minutes of waiting a breakout did occur in the downward direction hitting my take profit lines for both trades giving +$250 for one trade and +$240 for the other trade. Notice at the end how both the RSI and CCI indicated that the market was soon to rebound in the other direction so I decided to end my trading for now and take my $500 profit for the day. At this point in time I have made a total of four total trades over the past two days and have registered 5 profitable trades. I have a profit a total of $741 of profit from all of my trades.

Trade 2

For this trade, I watched the market for about two hours and discerned an upward trend for the EUR/USD. Notice how for a few minutes before the entry points, the market moved with a positive divergence and hits a resistance line and bounces back down. Knowing that the market has been moving upward all day I waited for it to start to turn upward again and then place a buy order in the EUR/USD market. Notice how at the first entry point the CCI read +100 and the RSI reads 70 meaning the market is both is moving up and the market is not being over-bought yet. Therefore I believed this trade to be justified and placed it as said above. Figure 53 displays all of the entry and exit points below and how I set my stop loss and take profit lines.

At first the market moved against me and went down slightly for about a minute. It did not fall low enough to hit my original stop loss and I was confident that my original assessment of the market was correct, so I decided to place a second buy order since the price was now
lower than before. I set the stop loss extremely low, which was approximately 10 pips, while the first stop loss was about 20 pips below the entry point. I did this to ensure that I did not loss to much money with this gamble of setting another buy order with the market moving against me at the moment. The way I determined my take profit lines was a little more logical. Remember before that there was a resistance line at 1.37830, and it is a proven fact that the market remembers the price it was originally at. Therefore if the market were to go back up like I expect it would most likely rebound off the resistance line again. Knowing this, I set my take profit line at 1.37800 for both entry points just below the resistance line. As time moved on the market once again moved up to the resistance line and bounced back off like I predicted. As seen in figure two above, both trades closed when the take profit line was reached. One trade game me a profit of $271 for both trades. To this date I have made 7 successful trades resulting in a total profit of $1012.

Trade 3

For my trade, I watched the market for about 2 hours until I felt comfortable with the overall trend with the market. On a whole, the market had been moving down the entire day, so I decided to wait for a high point before I entered in the market. As seen in my trading strategy above, I rarely entre in the market against the overall trend of the day to guard against massive loss. With that said, I waited till I was sure that the market was heading down once again and placed my trade sell order. The market continued to move down slowly but surely, but I didn’t wait for my stop loss to be hit. As explained below, I manually closed the trade because I saw that the market was moving against me and rather strongly. Therefore, I decided to take my small amount of profit and get out. The picture seen below as Figure 54 shows the market trend, my entry point, and my exit point.
As seen in the image above, my choice and getting out of the trade when I did proved to be the right decision. The reason why I chose to get out when I did can be seen in the MACD indicator seen at the bottom of the image. I have spoken little of this indicator in my other trade explanations, because I only use it to spot quick changes in the market. Notice how the white bars dip off very quickly and the red divergence line follows it quite quickly. This indicates a quick change in the market that is hard to see from the other indicators. While the other indicators also show this quick rise in the market, they are not as easily spotted as in the MACD. Therefore, after I noticed the quick change, I decided to manually end my trade and take the small profit I had already received. As stated before, the market did jump up as I predicted and worked its way back up about 40 pips. I believe that my choice to end the trade was correct, even though, about an hour later, the market fell back down again. To this date, I have made 8 successful trades including this one, which adds $90 to my total profit. I have yet to make a unsuccessful trade, therefore I do not see any need to amend my trading strategy. With 8 successful trades I have a total profit of $1,102.

Trade 4

After watching the market for about an hour, I could see no discernible trend arise from the forex market. As stated in my trading strategy, when this happens I have two options for the day; I either do not trade at all or set small stop losses to block against huge losses. I continued to watch the market for a little bit, I thought I saw a place where the market looked as if it was
going to fall. I placed a sell order expecting the market to fall. As stated above, I set my stop loss very low so that I would not lose a great amount on a risky trade. I set my stop loss at 1.38150, a mere 13 pips above my entry value of 1.38018. Normally, I set my stop loss about 30 pips away from my entry, but since I was not certain of what the market would do, I decided to err on the side of caution and set a small stop loss. This was a good choice on my part, since this trade resulted in my first negative trade. Looking at what happened here, I may want to amend my trading strategy when the market takes a similar form as this, but one trade does not warrant a significant change. Seen below in Figure 55 is the image of the market and my entry point.

The first thing to notice is that the market is moving upwards at this particular moment in time. As I stated before, the market had been oscillating all day, so I believed that it would be moving back down relatively soon. I use two exponential moving averages, one using 14 days and the other with 28 days as information basis. Normally, when one crosses the other, it indicates that the market is shifting its direction of movement. Figure 55 shows the exponential crossover that is saw before I placed my sell order. I tried to get my order in before the market actually shifted, which ended up badly for me. As seen above, the market moved against me and eventually hit my stop loss. This was a bad move trying to preempt a market shift, and I should have waited for the market to shift before entering my trade.