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ANÁLISE TÉCNICA APLICADA AOS MERCADOS CAMBIAIS ESTUDO COMPARATIVO DAS COTAÇÕES EUR/USD, GBP/USD E JPY/USD

Cláudio Couto dos Santos

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Dissertação submetida ao Instituto Superior de Contabilidade e Administração de Lisboa para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Contabilidade e Análise Financeira, realizada sob a orientação científica de Doutora Sónia Ricardo Bentes, Professora Adjunta, Finanças e Economia.

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Resumo

Desde a sua origem, a Análise Técnica tem vindo a dividir opiniões entre aqueles que compreendem os benefícios na utilização das suas ferramentas, e aqueles que se recusam aceitar estes conceitos estatísticos. Conceitos como os padrões gráficos, as médias móveis, os osciladores, entre outros têm fundamentos estatísticos. Os cálculos dos indicadores técnicos baseiam-se todos em conceitos estatísticos que utilizam os preços ocorridos no passado.

Utilizando o mercado cambial, especificamente os pares EUR/USD, o GBP/USD e o JPY/USD, algumas das principais ferramentas técnicas serão testadas. Serão postas à prova de modo a determinar se os sinais por elas emitidos são válidos e se são emitidos atempadamente em relação à movimentação do preço.

Verificou-se neste estudo em que situações a Análise Técnica se torna útil e em que situações deve ser posta em segundo plano em relação a uma abordagem mais fundamental. Ferramentas como os suportes e resistências mostraram-se muito úteis especialmente em conjunto com alguns dos indicadores técnicos. Os sinais de compra/venda emitidos pelos indicadores técnicos foram um pouco irregulares em algumas situações pelo que a utilização dos mesmos deve ser feita com cuidado e sempre com a princípio de aguardar pela confirmação em mente.

Palavras-Chave: Análise Técnica, Padrões Gráficos, Médias Móveis, Osciladores, Indicadores Técnicos.

Abstract

Since its origin, Technical Analysis has been dividing opinions between those who understand the benefits in the usage of this tool, and those that refuse to accept these statistic concepts. Concepts like graphic patterns, the moving averages, the oscillators, among others have statistic fundamentals. The calculations of the technical indicators base themselves in statistic concepts which use prices occurred in the past.

Using the foreign exchange market, specifically the EUR/USD, GBP/USD and JP/USD pairs, some of the principle technical tools will be tested. They will be put to the test in order to determine if the signals triggered by them are valid and if they are triggered timely related to the price movement.

It was found in this study in which situations Technical Analysis becomes useful and in which situations it should be placed in the background in relation to a more fundamental approach. Tools like supports and resistances showed themselves very useful especially in conjunction with some technical indicators. The buy/selling signals triggered by the technical indicators were quite irregular in some situations whereby it should be used always with the principle of waiting for confirmation in mind.

Keywords: Technical Analysis, Graphic Patterns, Moving Averages, Oscillators, Technical Indicators.

Index

Figures Index

Abstract

Abbreviations

DJIA – Dow Jones Industrial Average

DJRA – Dow Jones Railroad Average

NYSE – New York Stock Exchange

GATT – General Agreement on Tariffs and Trade

NFA – National Future Association

FSA – Financial Service Authority

EBS – Electronic Brokering Services

MA – Moving Average

SMA – Simple Moving Average

EMA – Exponential Moving Average

RSI – Relative Strength Index

CCI – Commodity Channel Index

MACD – Moving Average Convergence Divergence

1. Introduction

Financial markets, like the foreign exchange market or Forex, attract people´s attention due to the possibilities of profiting from them. But once people start to do some research about how to go about it, they are overwhelmed by the amount of sites that offer full courses and methods to profit from technical analysis. t There are many websites on the Internet that offer simple technical methods that guarantee profit. Some of them are even sponsored by well-known traders and fund managers and sell their services through them. Technical analysis is sometimes presented as an easy way to profit from the markets and that is why, since its origin, there have been many analysts and traders who have been sceptical of it.

Technical analysis had its origin in the 18th century and since then it has been struggling to get some credit. But only when Charles Dow started to predict price movements on the Dow Jones Industrial Average (DJIA) and Dow Jones Railroad Average (DJRA) did it catch some attention. With his theory´s five tenets and the usage of moving averages, people started to believe in some of the technical tools and concepts related to technical analysis. Since then, many people created different and diverse tools to use in their analysis.

There are several concepts and tools available to analysts and traders to predict prices' next move. Concepts like support and resistance levels, trendlines, price patterns, and various others have been developed and used. Support and resistance levels are areas where prices are unable to get through and bounce back or remain there waiting for further developments. This is the basic concept to understand trendlines that act as support and resistance that limit price movements. Price patterns are complex figures that form on particular occasions and can have many trendlines, support or resistance levels. Price patterns were discovered after many years observing price movements, when it started to become clear that prices had, more or less, the same behaviour before the same kind of events. To complement the previous concepts, technical analysis has a lot of tools called technical indicators. There are many types of indicators invented according to their nature and that are always being upgraded. The main categories are moving averages and oscillators and they depend on the type of signal sent by the indicator. The signal differs between them, as the oscillators trigger signals of oversold or overbought situations and the moving averages, as the name indicates, give different types of averages depending on the indicator.

This dissertation will address some of the main tools and concepts of technical analysis and test them on some currency pairs. The pairs chosen were the EUR/USD, the GBP/USD and the USDJPY, due to the fact that they include three major countries' currencies. These currencies are traded in the foreign exchange market. This type of market will be explained along with the three existing types of charts: line, candlestick and bar charts.

The concept of a trend will also be examined, as all the concepts and tools related to it, like the aforementioned support and resistance. The three types of trends - trendlines, gaps, and Fibonacci´s Retracements -, among others, will all be analysed and demonstrated resorting to images taken directly from live market charts. Some of the most famous patterns are included in this dissertation before the technical indicators are explained. Regarding the technical indicators, the mathematical formula will be exposed and the signs they trigger explained.

For the case study, all characteristics of each technical indicator were independently used on the three currencies during the year of 2008. The year was chosen due to the major event that occurred and the impact it had on the markets: the financial crisis following the collapse of a few banks

The technical indicators will be analysed independently in order to study all the signals they triggered based only on their definitions.

2. Technical Analysis

Technical analysis has its origin in Japan in the 18th century with the creation of candlestick charts. These charts were invented to price the different types of rice that were imported to a city called Osaka. Since then, analysts have studied these charts and realised that there were some patterns that formed in identical circumstances along with other concepts developed through times.

Several analysts started observing the market´s movement and began noticing it had a similar reaction on similar events. Technical analysis was born as observations started to be useful to forecast future market movements. Very much like with fundamental analysis, there is a set of tools developed to help trigger signals of market movements. There are indicators, oscillators, graphical patterns, and much more that show that market actors have identical reactions to identical situations over and over again. The difficult part of this process is to forecast the amplitude of the movement, for example, a resistance line can be broken and start a 100 pips bull movement or it could move only 10 pips. Before the movement ends, nothing can forecast its extent. Murphy (1999: 1) describes technical analysis as a *study of market action, primarily through the use of charts*. He establishes three major premises of technical analysis: markets' actions discount everything; prices move in trends; and history repeats itself.

All economic and financial actors accept supply and demand as the major rule for market movements. What Murphy defends is that any fact or event that creates oscillations between supply and demand must be reflected in the asset´s price. When prices are trending upwards, it means that demand is stronger than supply, and when prices are in a descending trend, then the supply is stronger than demand (Murphy, 1999: 2) This premise is also accepted by the fundamental analysis community and comes from the famous Dow theory, which will be explained further. This first premise announced by Murphy (1999: 3) is the most important. Based on the aforementioned supply and demand rule, the technician will not attempt to discover what fact or event causes imbalances between supply and demand; he just lets the market´s charts indicate which direction it is going and takes advantages of it. Appendix 1, Figure 1.1, shows how the market started to give signs of losses when the subprime crisis in the United States of America started to hinting at what was coming. The red arrow indicates the moment when market actors started to be

suspicious and predict bad news coming even before this was confirmed in 2008, six months later.

This may seem quite simple and unrealistic but it is not. Technicians rely on tools like indicators, support and resistance levels, and retracements, among others, also keeping in mind that the charts only reflect the market´s sentiment about that specific asset. They attribute less importance to the reason why the market is moving, only concerned about forecasting the direction as early as possible. In other words, they want to discover the trends and, with it, the second premise is introduced.

There is a common saying about trends that states that they are our best friend, As a matter of fact, they are! As soon as an analyst sees a chart, the first thing he/she must look for is the ongoing trend. The concept of a trend and all its characteristics will be explained later, but, for now, it is important to clarify that a trend is nothing more than the direction that the market is taking. Using figure 1.1 again as an example, the beginning of a downtrend after the first sign of crisis is clear.

Last but not least is the premise that makes it possible to forecast markets through technical analysis. If history was not to repeat itself then there would be no point in observing the market because what is happening today would not happen ever again, so "[…] *the key to understanding the future lies in a study of the past*". (Murphy, 1999: 5).

From the outset, fundamental analysts have criticised and underestimated technical analysis´ methods. They say that *using patterns and indicators to predict its behaviour is no different and no less primitive than reading entrails of a dead animal in order to divine your future*. Schlossberg (2006: 25). This idea could not be more wrong!

Technical analysis is based on patterns observed and catalogued that occurred in the past. With more than one hundred years of observation, the market has shown its cycling properties. To exemplify, in his book, Schlossberg (2006: 25) uses the example of a person that he calls Mr. X, and the capability of another person to determine his movements. It is obvious that without any observation, no one would be able to predict what time he leaves to work in the morning. But maybe with the possibility of observing Mr. X for more than one week, one would be able to predict the time he will leave home tomorrow. This prediction would be based on one week's observation, so what would happen if the person watching Mr. X´s movements observed him for months or even years? It would probably make him capable of determining Mr. X´s movements seven days a week, or maybe tell

which month Mr. X is likely to go on holiday. He would start realising that on Fridays he works from home, that on Monday and Thursday he takes his kids to school, and so on…

3. Foreign Exchange Market

The Foreign Exchange Market, also called Forex, FX market or spot currency, consists in a market where about 1.9 trillion dollars (1.4 trillion euros) are traded in just one day. To have an exact idea of the volume of this market let us compare it with the biggest stock market in the world, the New York Stock Exchange (NYSE). According to the NYSE database (www.nysdata.com), January, which had a trading volume equal to June, which was the best month of 2013, amounted to a volume of 60 billion dollars, that is 0.06 trillion dollars. These numbers translate into high liquidity.

The Forex market was created after the gold standard monetary system of 1875. This monetary system consisted in a country´s government allowing its currency to be freely converted into fixed amounts of gold and vice versa. Before this, all international payments were made in gold and silver. However, this system had a flaw, in that the value could be affected by external events, like the discovery of a new gold mine. Even if a discovery was made abroad, the amount of money that each country had was affected by this new quantity of gold supplied. With the gold standard monetary system, each country had to specify the right amount of gold it would trade for one ounce of gold. That 'price' had to be backed by a substantial gold reserve. This led to the first exchange rates, which was the difference between the prices of gold in two countries.

With the beginning of World War I, the gold standard lost its value due to all the military projects that had to be created as a result of the tension with Germany, which led to governments starting to print off money beyond their gold reserves. After the war, governments all around Europe started to use the gold standard again but it was all in vain because World War II started. Learning from their own mistakes, even before the end of World War II, the Allied nations began to prepare a monetary system to cover the void that the war left behind.

It was at Bretton Woods, New Hampshire, in 1944, that more than 700 representatives from the Allies convened to create what was called the Bretton Woods System of international monetary management. Not only the monetary system, a method of fixed exchange rates, was created, but international agencies to oversee economic activity, like

the International Monetary Fund (IMF), were also set up. The U.S. dollar replaced the gold standard to become a primary reserve currency, the only currency that is backed up by gold. The Bretton Woods System came to an end in 1971 at the hands of President Richard Nixon, when he announced that gold y would no longer be exchanged for U.S. dollars held in foreign reserves, due to the series of balance payment deficits leading to the shortage of gold in the U.S. treasury.

The Bretton Woods System left behind a legacy that was incorporated into three agencies created in 1940: the IMF (International Monetary Fund), the International Bank for Reconstruction and Development and GATT (General Agreement on Tariffs and Trade).

Unlike the stock market, which is full of rules and constraints, in the Forex market there are no rules. The market regulates its actors by its 'own hands' that is, if an investor has some unwanted attention he will not be fined or sent to prison. The process is much simpler: when the other markets' actors know about the bad procedure, they will refuse to have a commercial relationship with the 'bad' actor and the word will spread. Still, one should not misjudge this market and think it is a wild west out there. There are regulatory agencies that oversee the major money centres around the world. For example, all foreign currency transactions are regulated by the National Futures Association (NFA), while the Commodity Futures Authority (FSA) in the United Kingdom is regulated by Financial Service Authority (FSA). Each country or region has its own agencies that oblige each member firm to obey to strict rules.

The market structure is something more complex, as we seen in Figure 2.1 of Appendix 1, showing that the market hierarchy starts with the major banks such as Citibank, UBS, Deutsche Bank and Bank of Tokyo.

These major banks use the Forex market trade among them directly or through the Electronic Brokering Services (EBS) or the Reuters Dealing 3000-Spot Matching. These two companies, EBS and Reuters compete fiercely to win market share from each other. The currencies offered by both companies are more or less the same, so the liquidity offered is what gives advantages to each company. The EBS platform offers more liquidity in EUR/USD, USD/JPY, EUR/JPY and EUR/CHF, whereas Reuters offers more liquidity in the following pair: GBP/USD, EUR/GBP, USD/CAD, AUD/USD and NZF/USD. The credit relationship between the major and medium-sized banks and EBS and Reuters is what will determine the prices of the currency pairs and the market´s liquidity.

Next in the hierarchy stand the retail market makers, hedge funds and commercial companies. These actors are the primary hedgers in the market and their interest is to offset their business risks. All these companies have import and exportation costs, international payrolls, and international loans with their interest rates that force them to pay attention to currency price movements. (Schlossberg, 2006: 5)

The hedge funds´ main objective is to speculate in order to take advantage of major economic and political trends. They also generate large volume of transactions so that the market moves in directions that will favour their interests.

Within the 'Retail Traders' group, stand he world´s biggest central banks that participate in the market for a variety of reasons. Some of them just want to adjust their books and foreign reserves. Others, like the People´s Bank of China, just day trade billions of dollars at a clip if they think they have an edge and will often pocket millions of dollars in profit for their reserve vaults. And there are even those that just want to manipulate or defend their country´s currency. (Schlossberg, 2006: 6)

Another great feature of the Forex market is its extended schedule, opening 24 hours a day 5 days a week, from 10 P.M. West European Time on Sunday to 10 P.M. West European Time on Friday. Figure 2.2 of Appendix 1 shows the hours when the main indexes are working in comparison with the Forex Market.

Finally, the universally agreed currencies' basic quotation is that the price will be quoted to four or more decimal points and each of these points are called *pips*. *Pip* is an acronym for '*percentage in point*' and is the smallest unit used in pricing a currency pair. A currency pair and not a currencies' price is used here because in the Forex Market all currencies are quoted in comparison with another. That is why they are referred to as EUR/USD, GBP/USD, USD/JPY, etc. To better understand the relation between the two currencies, one can think of it as a scale. Using the EUR/USD as an example, there is the EUR (also called the base currency) on the left side of the scale and the USD (the counter currency) on the right. If the EUR is strengthening, then the chart will rise. On the other hand, if USD begins to strengthen, the chart will start to descend.

Figure 2.3 shows how the EUR was stronger than the USD until February 2013 and how from that month onwards the USD started to strengthen and, accordingly, push the prices down.

4. Market Concepts

There are some terms that are often used in the trading activity and in Forex market analysis that are crucial to know.

In the trading activity there are two possible market orders: to buy or go long and to sell or go short. When a trader goes long it means that he is buying the base currency believing that it valorises. If the market rises like the trader forecasted, he will be able to exchange the same amount on the base currency for a bigger amount of the counter currency. If the trader goes short it means that he is forecasting a decrease in the pair´s price or he is predicting the counter currency will strengthen. In this position, what happens is exactly the opposite of a long position when the trader sells the base currency for the counter currency and when the market shrinks he will exchange his counter currency for a bigger amount of the base currency. Closing a position is selling a long position or buying a short position.

When a trader decides to go long or short he has two very useful tools to protect himself from a bad forecast called limit and stop order. The trader sets a price that is lower than the current one and if the price decreases at that point, the system will automatically buy the asset. A 'sell limit' has the contrary logic, a maximum price that the trader is willing to short sell the currency pair is chosen. There is also the 'stop order', a tool whereby the system will automatically close the position if the set profit or loss is reached.

Besides these possible actions available to the actors, there are other terms that are often referred to when talking about market analysis. The first two that will be explained refer to the market´s sentiment: bearish and bullish. These terms are not exclusive to the Forex Market and are used in all financial markets. The term 'bearish' is used when a market is going down. The reverse sentiment is 'bullish', which means exactly the opposite, that the asset´s price is rising.

When analysing a market, the analyst is looking for a trend. When that trend is found, another thing that is important to pay attention to is the momentum. The idea of momentum is the possibility that the currency pair continues its trend. If not, it means that the price is losing momentum.

5. Ways to display prices

The three mostly used ways to display an asset´s price are through a line chart, a candlestick chart or a bar chart. All these charts are built with two axis (x,y), the X axis being the temporal indicator and the Y axis the price indicator.

To explain each price representation, a chart from the second semester of 2008 of the USD/JPY currency pair with daily periodicity was used. The particularity of this chart is that each figure represents price movements for one day. The periodicity can be weekly, daily, and hourly, or even by the minute, whichever suits one's analysis. The three charts will represent exactly the same period to make comparing them easier.

5.1. Candlestick Chart

Due to their incredible ability to produce descriptive images of the price´s action in a highly compressed manner, Japanese Candlesticks, illustrated in Figure 5.1.1 of Appendix 1, are the tool technicians like the best, attributing them almost mystical powers . (Schlossberg, 2006: 43)

In the 18th century, Japanese rice traders came up with this system to represent this good´s price movement through time. However, the man who popularized this graphical representation and all its advantages for technical analysis was Steve Nison (Murphy, 1999: 43). Founder and President of 'www.candlecharts.com', Steve Nison 'was the first to receive the Chartered Market Technician (CMT) designation from the Market Technicians Association (MTA) and was nominated for the MTA´s "Best of the Best" for Price forecasting/Market analyses'.

Schlossberg (2006: 43) defends that candlesticks alone can be 'almost useless' and that their full potential is reached when used in conjunction with other technical indicators. That is true because there are signals that are sent through the candlestick that need to be confirmed through an indicator, otherwise the confirmation coming from the candlestick will arrive too late. The purpose of any analysis is to act as soon as possible, even if it means taking action after the price has already started its movement. In that case, the position will be opened with extra confidence because confirmation has been triggered.

Candlestick charts are built with four variables: open price, closing price, highs and lows reached within the period. The visual appeal and information contained in each candlestick

is what makes this chart so useful. Figure 5.1.2 shows the anatomy of both types of candlestick.

The opening and closing price builds the 'body', which can be green or red and black or white depending on the analyst's convenience. If the body is green or white it means that the opening price is lower than the closing price. But if the body is red or black it means that the price has shrunk and that the opening price is higher than the closing price. According to Murphy (1999: 298), black and white are used because, when printing, the result is always the same. It was developed by the Westerners, as the Japanese used red and green colours. The lines that show the highest and lowest price reached on the day have many names, such as 'wicks', 'hairs' or 'shadows'. (Murphy: 1999: 298)

Knowing what is represented in candlestick charts is very important in order to understand some patterns.

5.2.   Bar Chart

This graphical representation is very similar to the candlestick chart but the information is shown through a bar with two ticks. These ticks represent the opening and closing price but there is no body, as shown in Figure 5.2.1 of Appendix 1.

In this type of charting, even with the same information as the candlestick chart, the visual perception is not so easy and friendly. The fact that the figure is fully coloured makes it difficult to see the highs and lows of the period, which, as will be shown later, are crucial to determine support and resistance levels. The anatomy of each bar is shown in Figure 5.2.2 of Appendix 1.

5.3.   Line Chart

Last but not least, there is the well-known but much simpler line chart. This chart offers a more basic visualization, as seen in Figure 5.3.1 of Appendix 1, of the price´s movement because it only takes into consideration one price, which is normally the closing price. The line is formed by connecting each period´s closing price. In the books consulted and Internet sites viewed, few used this chart type to forecast, but Schlossberg (2006: 41) defends that 'it is precisely because of [their] simplicity that line charts can be a valuable tool for quickly ascertaining trend or trend exhaustion'. Basically, what it means is that as this chart eliminates all of the market´s 'visual noise', what one sees is nothing but the core price movement.

The line chart is a good tool to get an overview of the asset´s price movement, but if the objective is to analyse it in depth, it is better to use the candlestick chart. This will be better understood when the main technical tools are explained further on.

6. Dow Theory

Dow theory was much like a seed that was developed years later. It was one of the first technical analysis ideas ever and it was the foundation of every aspect of it. This idea is unanimous among students and researchers.

Charles Henry Dow[1] was born in 1851 in Sterling, Connecticut and spent most of his life helping his mother managing their family farm due to early losses. When he was only 6 years old his father Charles Dow and two older brothers died. Although close friends remember him as having ´the measured speech of a college professor´, Dow never went to college. In 1969 he started working for a journalist called Samuel Bowles III who owned a local newspaper called *Springfield Republican*. Bowles started mentoring Dow, sharing with him his view that a journalist must possess the astuteness to know which news is worth publishing. Years later Dow became the night editor at another newspaper, the *Providence Star*, where he met Edward D. Jones.

In order to pursue one of his many dreams, in 1879 Dow left his job and went to New York City to seek work as a reporter on mining stocks. Mining stocks are also called commodities and include gold, silver, and other mineral goods. With his reticent, quiet-spoken attitude, Dow impressed some people and got hired at the *New York Mail and Express* preparing financial reports and producing some critiques.

On July 3, 1884, Dow published a composed average of stock prices that became the first index ever created. He composed a stock market average of the closing prices of eleven stocks. These stocks belonged to nine railroad companies and two manufacturing firms. His objective was to provide a good indication of the economic health of the country. Later on, in 1897, the index was substituted by two other indexes that he thought represented the country´s health better. Those two indexes were composed of 12 industrial stocks and 20

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1 American National Biography Online

rail stocks. The final modification in the industrial index occurred in 1928 when the number of stocks rose to 30. (Murphy, 1999: 23)

Dow´s index is still operational nowadays and his work has received ample recognition. Unfortunately, he never wrote a book enunciating his discoveries and registering his theory. Still, many people managed to compile and organize all his ideas from his work and editorials published in *The Wall Street Journal* and published them as 'Dow´s Theory'. From 1903 until now much research has been done and published on this matter.

The six tenets that support Dow´s theory will be explained and developed in the next topics.

6.1.   The Prices Discount Everything

An asset´s price, for in this work the assets are currency pairs, is the result of two forces, bulls and bears, fighting each other. If the price rises, it is a sign that bulls are gaining force but if it is descending, it is well-know that bears are on top. This constant 'fight' between these two forces results in a price that pleases both sides. However, this seemingly price that pleases both sides does not maintain itself for long. Soon one of the sides will push towards a price that it considers to be more appropriate. This constant change of mind by the market actors comes from external factors that influence the market sentiment. A bear is not always a bear and a bull is not always a bull; depending on the market, opinions change or are even maintained, but with more conviction.

Entities like central banks, governments, rating entities, and major companies, among many others, ,influence the market and make it move. In other words, the currency pair reflects all these knowable factors that influence and affect the supply and demand forces. This is the basic tenet of Dow´s theory, and the first lesson an investor or trader should learn before entering the market.

When describing this tenet, Murphy (1999: 25) refers to an extreme example on how an 'act of God', like an earthquake, occurs, the markets discount it. Even with today's technology, predicting earthquakes is a practically impossible task. Still, if one observes the currency price of the affected country, it is possible to know exactly when the earthquake occurred.

6.2. The Market Has Three Trends

Before developing and explaining this tenet, Murphy (1999: 25) explained what a trend is in Dow´s definition. According to Dow, an uptrend is *a situation in which each successive rally closes higher than the previous rally high, and each successive rally low also closes higher than the previous rally low*, a downtrend being exactly the opposite, a 'successively lower peaks and troughs'. These definitions continue to be endorsed nowadays.

Dow related the behaviour of trends to tide, waves and ripples by considering that they are divided into three parts: primary, secondary and minor. The primary trend works like a tide whose direction can be determined by paying attention to the wave's movement, also known as the secondary trend. If a wave is reaching more into land it means that the tide is flowing in, if not, it is ebbing. The same conclusions can be drawn when analysing the market.

Figure 6.2.1 shows the EUR/USD movement between May 2011 and June 2012, and the main downtrend is clearly visible. But this downtrend is not always going down, as there were certain periods when the currency pair went up, like in October 2011.

The secondary trend is nothing more than corrections made to the primary trend. There is a very useful technical tool called Fibonacci Retracement to forecast these corrections in order to benefit from them.

According to Dow, there are still minor trends, or fluctuations, that occur in the secondary trends.

6.3. The Market Has Three Phases

After dividing the trends, Dow focused on the primary trends and discovered that the primary trend is divided into three phases: accumulation phase, public participation phase, and distribution phase.

The accumulation phase is when astute investors take action and enter the market. This is, if the previous trend was down and the market assimilated all the 'bad' news, the first investors enter the market at this phase to take advantage of the new trend that is starting.

Next comes the public participation phase, which means that investors are now clear that a new trend is starting. It occurs when prices begin to rise rapidly and business news improves, capturing the attention of normal investors.

The last phase, the distribution phase, is when newspapers and other business and economic news sources have the confirmation of a new trend and start issuing bullish/bearish news. During this phase, the speculative volume increases and the unobservant investors open their positions. In many cases, the astute investors who opened their positions in the accumulation phase start to close those positions now, before the last investor enters the trend and it starts to lose momentum.

6.4.   The Averages Must Confirm Each Other

The title of this tenet remits to a market that is not the one being studied in this dissertation because, as mentioned earlier, Dow theory was created and developed by observing the stock market, not the Forex market. However, it does not mean that it cannot be applied to the latter, because there are no average indexes for currencies and the same kind of information could be obtained through other indicators.

Murphy (1999: 27) explains that Dow used both his averages to prove this tenet. Since the Industrial and Rail averages are the best representation of the U.S. economic health, a new trend in the stock market must be confirmed by both averages. If the two averages change trend, it means that there is a new ongoing trend. If they start to drift apart, it means that the previous trend is still ongoing.

When transposing this principle into the Forex market, these averages are also very useful to determine the movement of the US Dollar, because, if the economy shows good signs, the interest in this currency starts to increase. Indexes are another tool used to support this tenet because each country´ major indexes are nothing but an average of the major stocks that are exchanged in its market.

6.5.   Volume Must Confirm the Trend

Even though Dow considered volume to be an important factor to confirm price signals, he recognised that volume was a secondary signal of price change. (Murphy, 1999: 27)

The volume indicator shows the amount of transactions made in a determined period and the rule says that *volume should expand or increase in the direction of the major trend*. In other words, during an uptrend volume increases as prices move higher and diminishes as prices fall. The inverse happens when a downtrend is ongoing. (Murphy, 1999: 27)

6.6.   A Trend Is Assumed to Be in Effect Until It Gives Definite Signals That It Has Reversed

Murphy (1999: 28) relates this tenet to a physical law that states that an object in motion tends to continue in motion until some external force causes it to change direction. The same happens with a currency that has an ongoing trend; the trend will continue until an external factor changes its course. The changing factor can be either fundamental or technical in nature.

Despite all the tools available to aid the investor to detect these changing factors, it is not easy to be sure which particular information will have a strong impact in changing the trend. A normal secondary correction in an existing trend and the first leg of a new trend in the opposite direction look exactly the same in a chart, so the investor must be provided with tools that will aid him differentiate these movements. This will be the difference between failure and success.

7.   Chart Analysis

7.1.   Trends

The most elementary definition of a trend is given by Schlossberg (2006: 59) who describes it as 'higher lows for an uptrend or lower highs for a downtrend, both of which form stutter-step patterns in the price action'. A trend is like a direction that is being taken by the currency, but one should not be misled into thinking that the trend moves on through a straight line, as the course *zigzags* a lot as shown below in Figure 7.1.1 of Appendix 1.

Figure 7.1.1 represents the price movement of the EUR/USD currency pair in the second semester of 2013, showing an obvious uptrend in the price movement. Besides the evident uptrend, there are some higher peaks and troughs that shake up the market but do not break the trend. These corrections or retracements work like a two step forward, one step backward and often shake off insecure traders, leading them to closing up their positions.

The forex market is very peculiar in this aspect because it has strong trends that derive from its major economic themes that seize the market for long periods of time. The speculation around these matters goes on for extended periods due to its long-term

decisions and the effects they cause. These trends are the technical analysts' main goal and this is why trading books often start with a dictum that says *the trend is your friend*.

7.1.1. Trends´ directions

A market can develop in one of three directions. It can be following an uptrend (Figure 7.1.1.1 of Appendix 1), a downtrend (Figure 7.1.1.2 of Appendix 1) or be moving sideways, like in times of uncertainty or between two trends as seen in Figure 7.1.1.3 of Appendix 1. Murphy (1999: 51) calls this sideways trend a *trading range* because it reflects equilibrium between the two forces making the market *trendless*. This scenery is propitious to traders' loss because of their tendency to use technical tools and systems. Technical tools and trading systems are very focused on detecting markets that are moving up or down, so when the markets start to move sideways, frustration kicks in and consequently the losses start to show.

7.1.2. Trends´ classification

As mentioned previously, a trend is not exactly a straight line, which is normal due to the market corrections that occur. Those corrections are other trends that form during smaller periods of time and which are included in the bigger trend. Each trend is a portion of its next larger trend and each trend is classified according to three categories: major trend, intermediate trend and near term trend. This classification works like a guiding line when analysing trends because, in fact, there are almost infinite trends ongoing. These trends could cover minutes, hours or even years. It is up to the investor to follow the one that best suits its trading system. (Murphy, 1999: 53)

According to Murphy (1999: 52), Dow theory classifies a major trend as one that is in effect for longer than a year, but he disagrees with the use of this classification in future markets. Given that this market operates in a shorter dimension than the stock market, the major trend should be the one that is in effect for over six months. Despite this small disagreement with Dow theory, Murphy agrees with the other ranges for the intermediate and near term trends, three to many months and two to three weeks top, respectively.

With reference to Figure 7.1.1, the major uptrend can be observed throughout the second semester of 2013, but there are 3 intermediate down trends in the same period: from the

half of June to the beginning of July, the end of August to the beginning of September and between the end of October and the beginning of November.

Just like Murphy assumed that he disagreed with Dow´s classification, there are many traders who also disagree. The main reason for this is the fact that there are long-term investors and short-term investors. Obviously, what is a long-term for a short-term investor could be a short-term trend for a long-term investor.

7.2. Support and Resistance

These concepts are related, or, to be more precise, they are the explanation for every peak and trough that happen throughout the evolution of a currency´s price. Previously, when the trend's concept was explained, Figure 7.1.1 showed that a trend does not develop in a straight line and that there are corrections that occur during it. These corrections are limited by support and resistance levels like the ones represented in Figure 7.2.1 and Figure 7.2.2.

Murphy (1999: 55) describes a support level as *a level or area on the chart under the market where buying interest is sufficiently strong to overcome selling pressure*. In other words, a support level represents a price area where the bulls gain strength in order to overcome the bear side of the market. The concept of resistance is identical to that of support, but inverted, because a resistance is an area where bulls are not able to continue imposing their uptrend strength so the price does not rise anymore. A resistance level resists a rise in the currency´s price and a support level protects the price, preventing it from descending.

In order to demonstrate that technical analysis is not some scheme used by lazy investors and that there are more fundamental supporting technical tools than believed, the following is a story used by Murphy to explain the psychology behind support and resistance levels.

Murphy (1999: 59) separates market participants into three categories: the long, the short and the uncommitted. Using this classification and supposing one is facing a scenario of the end of a downtrend at support level and the beginning of an uptrend, those who have already purchased their contracts and opened their positions are called the long ones. The short ones, as the name indicates, are those who are still on the selling side. Finally, there

are the uncommitted ones who either remain on the selling side or have not yet made up their minds on whether they should open a long position.

Assuming a scenario where, after fluctuating at a support line, the price of a currency pair starts to go up, the longs are in heaven with their long positions summing profits. Their only regret is not having bought more when the price remained near the support line but maybe if the price dips a little they will have an opportunity to make that acquisition. At this moment the shorts are having a rough time seeing their losses accumulating because they are on the wrong side of the market. Even more than the longs, the shorts are praying for some kind of price correction that makes the currency pair drop and get them closer to the breakeven point to close their selling positions and thus reduce their losses. When this correction starts to take shape, the more nervous investors will start closing their positions, contributing to a further drop in the price. Afterwards, the other shorts will gradually start closing their positions, making the selling volume rise until there are no short positions opened. This will create a new support level because there are no more actors to pull the price down. What will happen now is that the uncommitted who, to date, have not made up their minds will grab this opportunity to open long positions to make some profit. However, they are not the only ones doing so, as the longs who have been waiting for a dip to open more buying positions will do so now, and the shorts who want to make up for their losses will also enter the market. The volume of currency that is bought will drive the currency pair up returning to its previous uptrend. Even if due to superior forces the price continues to fall, it will only increase the buying eagerness of the three groups.

A support or resistance becomes more important when it leads to more trading. There are three ways to ascertain if the amount of trading is important enough to make the support/resistance relevant: the amount of time the price stays in the support/resistance area; the volume; and the moment when the volume starts to rise.

Murphy (1999: 61) ends his topic saying that technical analysis does not work by some kind of magic produced by a couple of lines and drawings and that *chart analysis is actually a study of human psychology and the reactions of traders to changing market conditions.*

With the psychology behind support/resistance explained, the next phenomenon is the reversal of these two areas. When a support level is broken, that is, when the price does not stop falling and goes through this area, it transforms what was once called a support into a

resistance. When bears win over the bulls by driving the currency pair to surpass that obstacle, they will not allow handing over that 'territory' again. The same thing happens when a resistance area is broken and turns into a support level.

This technique seems simple and easy to use but there is one thing that is complicated, which is when to consider that the support or resistance level was actually broken. Various rules are used, such as percentage penetration or the amount of time spent by the market beyond that area to determine if the penetration is valid. Still, the most reliable way to be sure that the support/resistance level was actually broken is to wait for it to move away from that area. The more the currency pair deviates from the support/resistance area, the more the market will believe in the reversal.

7.3.   Trendlines

A trend is formed by higher lows for an uptrend and lower highs for a downtrend. During this process, successive lows and peaks occur, which are considered market corrections. These corrections are the key to obtaining useful trendlines. (Schlossberg, 2006: 59)

A trendline is a 'dynamic area of support and resistance' so, to draw these lines, the first peak or trough and the last must be connected. (Pring, 2002: 137) However, an investor cannot wait for the last low or peak, otherwise he will never make a profit, because, by the time he finds the last market correction, it will be too late,as the trend will be over. Figure 7.3.1 of Appendix 1 shows two trendlines in the EUR/USD currency pair that work like channel lines. Channel lines are basically two trendlines, one working like a support area and the other as a resistance level that delimit the trend´s area. As Pring (2002) writes *constructing trendlines is very much a matter of using common sense rather than applying hard and fast rules* and this is because it is not some geometrical theorem that is applied on the same occasion giving the same results. To draw a valid trendline there must be several adjustments in order to include the maximum peaks and troughs.

To start, the analyst must find strong evidence of a trend so that he can start analysing the peaks and troughs to connect1 4(a)4(us 184.46 Tm 0 Tc[( )] TJ)-9(is)] TJETBT1 0 0 1 290.09 273.29 Tm

Murphy writes (and most authors appear to be unanimous about this) that after drawing a line with only two peaks or lows, if a third peak or low touches the trendline and bounces off, it means that the trendline is valid. After determining its value, each trendline has its own importance depending on three variables, which are the length of the line, the number of times it has been touched and its angle. (Pring, 2002: 144)

The length is the first thing that jumps right off the chart because if it is a trendline that has been valid for the last 10 years it is far more reliable than a trendline that started last week. Pring (2002) uses the phrase *big trends result in big signals, small trends in small signals* to emphasise the importance of a good long lasting trend.

The number of times a trendline has been successfully tested is also another sign of its quality. A trendline that is successfully tested is the one that reached the currency pair and bounced off. The more often this happens, the more important the trendline is. But one should be very cautious when these encounters happen because of the support/resistance reversal phenomenon that was introduced earlier. There are small penetrations that analysts must be aware of so that they do not catch them by surprise by turning into a trendline break. This may be a signal of a market correction maintaining the downtrend, like the one shown in Figure 7.3.2 of Appendix 1 or a signal that a new trend is forming.

The angle of the trendline is also something to pay attention to because a very sharp trendline is hard to maintain and soon will end. This kind of trenline is very important because it could mean a new trend is starting.

To take advantage of a trendline, the investor, after drawing a valid trendline, just has to wait for the market to touch the trendline working as a support level to open a long position and wait for the market to touch the trendline used as a resistance area to close that position and open a short one.

7.4.   Price Gaps

Price gaps are a price range within which there is no trading. Ping (2002) gives a possible explanation saying that it reflects strong psychological motivations like fear or greed. These formations happen when the open price is above the closing price of the previous period in an uptrend, and the opening price is under the closing price of the previous period, in case of a downtrend. In both scenarios, an empty vertical space between both periods is created. Price gaps only occur in bar charts and are more common when the chart is daily. Figure 7.4.1 of Appendix 1 shows a price gap between 28 and 29 April 2014.

Many authors like Murphy (1999) and Pring (2002) divide the gaps into three types. Depending on its nature, a gap can be considered a breakaway gap, a runaway gap or an exhaustion gap.

The breakaway gap is related to the completion of an important price pattern and precedes a significant market move (Murphy, 1999: 94). This gap must not be confused with something that happens only when a new trend starts to form. The main characteristic is that it occurs when the price breaks out of a price pattern, emphasizing the bullishness or bearishness of the breakout, depending on which direction it takes. (Pring, 2002: 104) The main indicator that confirms the end of the price pattern is the rising of the trading volume. Normally these gaps occur under heavy volume.

Figure 7.4.2 is a good representation of a gap of this type. When that market starts to develop out of the flag, a price pattern that will be explained later, a gap occurs before the price develops in order to break the existing support.

The second gap category is called the runaway gap and occurs in a continuous market movement. It is not involved in any change in the price direction or any price pattern, it occurs on a moderate volume setting and is like a price 'slip'.

Murphy (1999) considers that in an uptrend market these gaps are a positive sign but in a downtrend panorama the effect is the opposite, signalling some market weakness. He also gives another name to this type of gap, which is measuring gap. He says that this gap represents the half point of the trend and that doubling the movement already achieved gives us the probable extent of it.

The last type of gap is called exhaustion gap because it appears at the final impulses of the ongoing market move. After the breakaway and exhaustion gaps occur, investors must start looking for this last gap. It does not mean that there could be more than one runaway gap in a trend, but if this final gap appears it means that the ongoing trend is losing its momentum. At this point, trading must also reach its top volume because all investors are closing their previous position and opening new ones to be able to take advantage of the new possible trend.

Since technical analysis is all about the study of psychological attitudes, gaps are very important. This is because the market will not forget this emotional extreme and will probably turn into a support or resistance area (Pring, 2002: 106).

7.5.   Fibonacci Retracement

Fibonacci is the most popular mathematician in trading because of a sequence of numbers that Schlossberg (2006) refers to as mystical. His real name was Leonardo of Pisa and he lived between 1170 and 1250. His discovery competes with the famous Fischer Black and Myron Scholes, the creators of the options pricing model, Black and Scholes.

Fibonacci´s sequence of numbers is calculated through the following formula:

$$P(n) = P(n-1) + P(n-2) \qquad (6.5.1)$$

'*P(n)*' represents the number of the sequence that is being calculated and '*n – 1*' the previous number and '*n – 2*' the 2nd number behind '*n*'. In other words, the next number is calculated from the sum of the two previous numbers. In order to start the sequence, the two first numbers of the sequence, called seeds, must be chosen. Fibonacci´s choices for the seeds were 0 and 1 and the sequence obtained was: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, and so on…

This sequence has several neat mathematical properties that Pring (2002), Schlossberg (2006) and Murphy (1999) refer to:

- The ratio between a number to its next higher converges to 0.618 and the ratio between a number to its next lower converges to 1.618. The number 0.618 is called *phi*. But this property is only applied after the first four numbers.

- The ratio 1.68 multiplied by the ratio 0.618 equals 1.

- Taking three adjacent numbers and squaring the middle one and multiplying the two outside ones, the difference between the two results will always be 1.

- The last funny fact about Fibonacci´s sequence is that the sum of 10 adjacent numbers is equal to the result of multiplying the seventh number of the selected adjacent numbers by 11.

Schlossberg (2006) quotes a series of tests done by a professor at Lock Haven University of Pennsylvania called Donald Simanek who tried to find proof throughout the universe that Fibonacci´s ratio and sequence is the critical value to understand the universe. He

studied the flowers´ number of petals and found several that corresponded to Fibonacci´s numbers, although there were always some that were the exception. In another study of the planets´ orbit, he discovered that many planets´ rotations respect Fibonacci´s ratio but four of them did not. These planets are Pluto, Neptune, Venus and the Earth.

However, failure to prove that Fibonacci´s numbers are the answer to understanding the universe does not render it useless. In the forex market´s charts, his ratio is observed very often and '*phi*' has an important role in technical analysis.

'*Phi*' is used to draw levels that traders follow in order to make their trades. Figure 7.5.1 of Appendix 1 illustrates a trendline with these levels, also called retracement levels or Fibonacci retracements, and shows how they condition the market. The retracements are done after drawing the trendline that connects the 'absolute swing low to the absolute swing high'. Then a line at 50%, that is half way through the trendline's total length is attached to it, and two more lines are attached at 61.8% ('*phi*') and 38.2% (1 minus '*phi*') of that very same line (Schlossberg, 2006: 102)

Fibonacci´s retracement works like support and resistance levels but they must not be seen as precise lines where the price will either break through or bounce back. Schlossberg (2006: 106) compares them to an *elastic rubber band that dynamically absorb[s] price action in a broad zone before the price resumes its original move.* The retracement must be seen as areas where analysts must pay extra attention to the market´s movement. Schlossberg (2006) justifies the success of these numbers due to the fact that they represent proportions of about one-third and two-thirds of the total value of the move, and these quantities are related to human psychology. Since these numbers are well known by all market actors, including the media, they have a strong influence on it. Even the media, when doing their forecasts and analyses sometimes support their speech on these numbers.

7.6.   Price Patterns

A Japanese candle pattern is a psychological depiction of trader´s mentality at the time. It vividly shows the actions of the traders as time unfolds in the market. The mere fact that human react consistently during similar situations makes candle pattern analysis work. (Murphy, 1999: 301)

The market usually moves either in an uptrend, downtrend or sideways, so technical analysts who can anticipate the next price path will be in a better position to make some profit on it. To help them achieve their goal, over the years analysts have been collecting a

series of price patterns, which, for a good market observer, hint of what is coming. The price patterns are divided into two categories: reversal and continuation.

As the name indicates, reversal patterns are those that indicate that prices are about to change direction. In other words, if the market is in an uptrend, these patterns show that a downtrend is about to start, and vice versa.

Figure 7.6.1 shows, through the EUR/USD pair, the most common way the market reverses. First, there is an uptrend that finishes in the middle of March 2008 and gives place to a series of peaks and troughs between a support and a resistance level (coloured in blue). These highs and lows correspond to a phase when the market is transiting from the previous uptrend to a downtrend. It is a very important phase and technical analysts must be sharp in order to catch the new trend as soon as possible. In this transcending phase, the two forces (bulls and bears) find some equilibrium but in the end only one will win and move the market its way. However, one should be cautious because, as in all other concepts and tools examined in this work, it is not a dogma and it does not always happen this way, since the market can move sideways. One example that invalids this technique is a natural disaster. Supposedly, a major earthquake strikes the United States of America between March and August causing the economy to collapse and devaluating the US Dollar, strengthening the Euro in the process. That would make the EUR/USD currency pair price continue to rise. This is why it is very important to keep an eye on the world´s major news in order to avoid unpleasant surprises.

Figure 7.6.2 illustrates another common way for the market to reverse, albeit a more unstable reversal. The fact that the two forces did not measure strengths for some time indicates that it did not have time to consolidate. It is probable that the gains or losses are overextended and there is a major probability that it will suffer a serious setback. (Martin J. Ping, 2002: 65)

The other existing price patterns are the continuation patterns, which are nothing but a pause in the market from an ongoing trend. The reason could be that it is near the overbought or oversold condition, or a waiting period for an expected indicator to be released.

Price patterns are also categorized from the amount of figures that it involves. That is, there are price patterns that use 1 to 5 candles, like those in Figure 7.6.3, and there are others far more complex that are measured over time, not according to the numbers they

include, as shown in Figure 7.6.4. These complex patterns are formed by a series of smaller price patterns and other candlestick formations.

7.6.1. Simple Candle Patterns

These patterns are formed by no more than 5 candlesticks and they can signal reversal or continuation points. Appendix 2 shows a list of numerous patterns with the matching image. The listed patterns have their denomination below, with the plus or minus sign after them, which indicate whether it is a bullish for the plus sign or bearish for the minus sign.

A few patterns from each category will be explained and illustrated. The goal is to make reference to as many patterns as possible so there will not be any repeated pattern. Of course, each bullish pattern has its bearish correspondent and vice versa.

7.6.1.1. Bullish Reversal Patterns

7.6.1.1.1. Hammer

Hammer is a bullish reversal pattern candlestick that typically appears after a downtrend. It is usually used as an important signal of the market´s momentum. During this period the currency pair experiences strong selling by market actors, but near the end bulls recover, closing near the opening price. Thinking about this but bearing in mind that the market has been bearish makes a lot of sense. This is why this is a Bullish Reversal Figure.

This figure is only complete and acknowledged as a hammer when the lower shadow is at least twice the height of the body. In figure 7.6.1.1.1.1 there are two perfect hammers, but in the charts they do not always look exactly like these. One should be prepared to find some candlesticks that are indeed hammers, but the highest price of the period is a few pips higher.

Knowing this pattern can be very useful but one should not forget that on its own it is not enough to open a trade. One should always wait for the next candlestick to start and check if the trend is changing using tools like support or resistance levels, or Fibonacci´s retracement. There are also technical indicators.

7.6.1.1.2. Engulfing Pattern

This pattern is always composed of two candlesticks and consists of a smaller red or black candlestick that is followed by a bigger green or white one. What makes this sequence of candlesticks so special is that the body of the second candlesticks must totally engulf the first candlestick. Figure 7.6.1.1.2.1 of Appendix 1 represents this candlestick pattern.

Once again the market´s loss of momentum is shown and the bigger the second candlestick the better it signals that the market´s trend is about to change. Once again it is important to use other tools to support a possible long position.

7.6.1.1.3. Three White Soldiers

This three-figure pattern is the most powerful reversal pattern because it leaves no doubt about the trend change. It is a rare formation and consists of three large white or green candlesticks as shown in Figure 7.6.1.1.3.1. This pattern is called Three White Soldiers because ancient Japanese technicians had their candlesticks in black and white, as explained previously.

During these three days the prices will be retested by new highs, but by the end of the day sellers always regain some strength, pushing the price down. In this pattern, the price dynamics is turned around as the virtuous cycle takes over and prices reach new highs as bulls take control of the battle against bears.

7.6.1.2. Bearish Reversal Patterns

7.6.1.2.1. Shooting Star

This one-figure pattern is a very popular Japanese candlestick and in this case it represents a change of direction from the price. It is formed when the price is pushed higher and continues the uptrend, but then is rejected and falls rapidly, leaving behind a long wick. This long wick should be at least half of the candlesticks´ length.

This pattern indicates that the bulls' uptrend momentum has been lost and bears have gained strength pushing the price down. This figure is stronger if it is preceded by a long green or white candlestick. It is important that this happens, otherwise the reliability of this

pattern weakens. Another excellent sign of its reliability is if the shooting star forms after a gap between the last candlestick and itself. This pattern, represented in Figure 7.6.1.2.1.1 of Appendix 1, is often seen near strong resistance levels.

7.6.1.2.2. Doji Star

The main characteristic of this single-figure pattern is that the candle´s body is very small or even non-existent, as seen in Figure 7.6.1.2.2.1 of Appendix 1. Even with the opening and closing prices very close to each other, this figure usually has long wicks.

This Figure shows the final candlestick of the uptrend followed by the Doji Star and by a red candlestick confirming the change of trend. This shows a balance or indecision between market actors, and, for this reason, it is an excellent signal of the end of a trend. Once again, analysts must always wait for the next candlestick to form in order to obtain confirmation because even if bulls and bears are on equal footing, a key indicator changing this situation can be published, supporting the continuation of the trend.

Apart from its bullish or bearish nature, if there are strong support or resistance levels in the market, this figure is expected to appear.

7.6.1.2.3. Abandoned Baby

This is an extremely rare pattern but when it appears, one should always look for a good confirmation from another indicator, such as a moving average. If it is confirmed according to Figure 7.6.1.2.3.1 Appendix 1, it will be almost secure for investors to open a position in order to take advantage of that trend change.

This three-figure pattern combines already explained concepts into one. First of all, following the last uptrend candlestick, a gap is formed and, it shows that there are actors moved by greed (Pring, 2002: 104). After this price gap a Doji Star is formed showing that the bears have found strength to stop the bulls and stabilize the price movements. What happens next is a complete change of sides, whereby the market actors stop buying the currency pair and start a massive selling. This change of sides is so big that another gap is formed before the currency starts to fall.

7.6.1.3. Bullish Continuation Patterns

7.6.1.3.1. Rising Three Methods

The Rising Three Methods, illustrated in Figure 7.6.1.3.1.1 of Appendix 1, is a bullish continuation pattern that consists of a market correction. As mentioned earlier, an up trending currency does not rise in a straight line and there are corrections along the way. This pattern consists of those corrections.

The pattern starts in the first day with a long green or white candlestick that rises according to the trend. Throughout the three following days the price starts to fall, forming three red or black candlesticks with relatively small bodies. These relative small bodies remain in the first day´s range, like the price found a support in the opening price of the first day. To confirm the continuation of the trend, a green or white candlestick forms, continuing the trend.

Investors must be very careful with this pattern because it only confirms itself in the last second when the price finds the support created by the first day´s opening price. These three days are considered to be the *period of rest* (Murphy, 1999: 305) but if the price closes lower than the first day´s opening price, investors must wait to see if the market is only testing the support or whether a change of trend has started. This confirmation can be obtained through some technical indicators. Sometimes the third day does not form a red or black candlestick, forming a green or white candlestick instead.

7.6.1.3.2. Neck Line

This candlestick pattern includes two secondary patterns that are the 'On Neck Line', illustrated in Figure 7.6.1.3.2.1 of Appendix 1 and the 'In Neck Line', illustrated in Figure 7.6.1.3.2.2 of Appendix 1. The psychology behind both patterns is the same but there is a detail that differentiates them.

The 'On Neck Line' pattern starts with a long green or white candlestick that follows the bullish trend and the following day´s candlestick opens after a gap from the previous day´s closing price. In order to conclude the pattern, the second day´s closing price must be higher than the previous day´s low.

What makes the 'On Neck Line' pattern different from the 'In Neck Line' pattern is that the last one, instead of closing higher than the previous day´s low, closes at the previous days´ closing price or beyond that level.

Once again this is nothing but a corrective move by the market as a gap is formed, but automatically the price returns to its last strong price of the ongoing bullish trend.

7.6.1.4. Bearish Continuation Patterns

7.6.1.4.1. Separating Lines

This peculiar pattern consists of two candlesticks that have the same closing price as shown in Figure 7.6.1.4.1.1 of Appendix 1. The first candlestick is red or black and continues the ongoing bearish trend and, on the following day, a gap occurs, descending the opening price of the next period´s candlestick. What happens is that this candlestick will close at the same price as the previous one.

Considered to be a continuation pattern, the separating lines could mean disaster for the most unwise investor because the reliability of this pattern is only confirmed after the next candlestick. As explained earlier, analysts must always find some kind of confirmation through an indicator or wait for the next period´s candlestick, but in this case they should be extra careful. Even if the pattern is true and the trend continues it is a warning that bears could be losing strength.

7.6.1.4.2. Thrusting

In this bearish two-figure pattern, after a bearish candlestick a gap occurs and the next candlestick opens with a lower price. In order to complete the pattern the second candlestick must close higher than the previous´ closing price. Figure 7.6.1.4.2.1 of Appendix 1 illustrates this peculiar candlestick pattern.

This is not a common pattern but when it appears it works as an excellent signal of a trend continuation. Of course, it has its dangers but the way to avoid them is to be patient because all this pattern needs for confirmation is for the second candlestick to close. Investors must not open any position before the close of the second candlestick as it could rapidly turn into a Shooting Star, making it a reversal pattern.

7.6.2.   Complex Candlestick Patterns

Now with the simple patterns shown and explained it is time to introduce the concept of a complex pattern. Knowing the simple candlestick patterns will be useful when analysing complex patterns.

These kinds of patterns do not really have a specific amount of time to develop and be completed. In some kind of way the goal is to wait for specific events that signal the patterns' next phase. It is important that the simple patterns introduced earlier are not forgotten because they are one of the tools available to signal important events throughout the candlestick pattern. Technical indicators are the other set of tools available but those will be explained later.

Two examples of reversal patterns and two of continuation patterns will be given. There are many more patterns but these are the most common and a good example to start introducing these concepts.

7.6.2.1. Reversal Patterns

7.6.2.1.1. Double/Triple Tops and Bottoms

Schlossberg (2006: 114) introduces this price pattern as 'proof" that price movements just 'express trader sentiment' through successive retests of a support or resistance area. It is nothing but a *common sense interpretation of a battle between buyers and sellers*. (Pring, 2002: 83)

For obvious reasons, the double top is often referred to as the "M" pattern and the double bottom is referred to as "W". A triple top or bottom has exactly the same principles and characteristics as double patterns, the only difference being that the support or resistance level is tested three successive times instead of just twice.

A double top starts during an uptrend with the currency's price reaching a new high represented as point A in Figure 7.6.2.1.1 of Appendix 1. The price stops rising when it encounters a strong resistance and is supported by an increase of the trading volume. At the reversal point the volume reaches its highest level. Once the resistance is reached, the price bounces back, creating a valley before the bulls attempt their second test. The low created by this price bounce often reaches and sometimes even breaks the trendline that has been

supporting the uptrend (Point B in Figure 7.6.2.1.1 of Appendix 1). Analyst must be careful and wait for the price to bounce back from this trendline because if they open a long position before the confirmation they might find themselves on the opposite side of the market. This happens because what was believed to be a double top is actually a trend reversal without the second top. Once the price starts to bounce from the uptrend trendline it should rise until it reaches the resistance that stopped the price earlier at point A. It is normal for the volume to be lower now compared to the first time the price reached this resistance area.

The next phase is the last one and the most important because at this point nothing guarantees that a double top is on the way. When the currency pair's price reaches the resistance level for the second time it should bounce back and start to fall, reaching the up trendline and breaking it until it reaches the price reached at point B. This is another important point because it is the last confirmation needed to start opening positions in order to take advantage of the trend reversal. To complete the double top pattern the price should fall below that price. If it does not continue to fall it could mean that the price is developing sideways. (Murphy, 1999: 120)

This "M" pattern has its most important point at the first trough created between the first and second resistance bull tests (Point B). This trough is the goal price for the currency pair after it breaks the up trendline in order to confirm that the trend is changing. Murphy (1999) alerts that this pattern is overused throughout the financial markets and most of the potential double tops end up being something else.

The double bottom or the "W" pattern has exactly the same contours but instead of forming at the end of an uptrend, it forms at the end of a downtrend. In a downtrend when the price finds a support to bounce it is the first signal that a double bottom is starting to form. The next signal to wait for is the resistance that stops the price from rising further and makes it fall again. Once the price bounces again from the support of the first bottom, the down trendline should be broken and the price should rise beyond the price peak between the two bottoms.

From a short-term view, this pattern presents some opportunities for investors to scalp some money. If they pay attention and get the market signals, they might have at least two short term opportunities to make money. At the beginning of the trend the currency pair's investors have the first opportunity to go short or long depending on the ongoing trend, but

this first opportunity is the most risky because, at this point, nothing signals that the trend is changing, it could only be a market correction. Then, an investor who is paying the right amount of attention to the market will be suspicious about the formation of a double top or bottom and will take advantage of the peak or trough formed between the tops or bottoms and will open a long term position when the confirmations after the second bounce start to show.

Often a double top or bottom becomes a triple top or bottom and the tip to avoid losing money is to wait for the currency pair's price to break the support or resistance area that stops the price between the first two bounces. If after the second bounce the price starts to move again towards that point, investors could be in the presence of a triple top or bottom.

Figure 7.6.2.1.2 of Appendix 1 illustrates a double top that happened at the end of 2013 in the USD/JPY currency pair. It could even be called a triple top because in just one week that support above 105.4000 was tested twice. Figure 7.6.4 of Appendix 1 shown previously illustrates a perfect double bottom in the GBP/USD currency pair.

7.6.2.1.2. Head and Shoulders

The name given to this pattern has its origin in the fact that it resembles a human body with its two shoulders with a head in the middle. The Head and Shoulders and the Triple Top are two very similar patterns. The main difference is that the second peak is higher and there are specific details about the support and resistance levels involved. Not only Schlossberg (2006) but also Pring (2002) and Murphy (1999) consider the head and shoulders pattern to be the most reliable within the reversal the patterns.

Schlossberg (2006) identifies three distinctive stages for a head and shoulders to form after a prolonged uptrend:

- The left shoulder forms (Point A in Figure 7.6.2.1.2.1 of Appendix 1) without any particular signal because it is just the continuation of the ongoing uptrend. Once this high is reached, just like in the double top, the price falls until it reaches the existing up trendline represented as line (1) (Point B in Figure 7.6.2.1.2.1 of Appendix 1).

- When the up trendline is reached, the currency pair takes a massive rally until it reaches a new high shown as point C in Figure 7.6.2.1.2.1 of Appendix 1. This new

price is higher than the previous peak (left shoulder). Afterwards, a new fall happens, pushing the currency pair near the left shoulder´s support at point D. By now the up trendline has already been broken. This trendline is represented in line (1).

- At last, bulls make their last attempt and push the currency pair higher until it reaches point E. This price could be higher or lower than the one reached at point A. But, once again, the currency pair falls and this time it will break the support area from both shoulders, called *neckline* and represented in line (2).

This pattern is divided into three phases that correspond to both shoulders and the head. The head and shoulders is a pattern that consists of one final rally of the ongoing trend before it changes. This final rally is accompanied by smaller rallies, although not necessarily equal. Martin J. Ping (2006) adds that *if the two shoulders were trends of intermediate duration, the first shoulders would be the penultimate advance in the bull market, and the second the first bear market rally.* In other words, the left shoulders still belong to the bull market but the right shoulder already belongs to the new bear trend. The period when the head is formed is when both forces are measuring strengths.

Line (2) in Figure 7.6.2.1.2.1 of Appendix 1 has an important role in this pattern because it sets the final price to be broken for the pattern to be complete. This support line links the two lows (Points B and D) that separate the head from the shoulders. Once the price drops from Point E and breaks through the pattern, it is complete and a downtrend is born. As usual, the new trend should increase volume, as new short positions are open. But *neckline´s* use does not end here because often a return move happens and the currency pair bounces back, sometimes reaching and even breaking the line that was once a support and now becomes a resistance. Murphy (1999: 106) adds that volume may become useful to determine the size of the bounce because *if the initial breaking of the neckline is on very heavy trading, the odds for a return move are diminished because the increased activity reflects greater downside pressure [and] lighter volume on the initial break of the neckline increases the likelihood of a return move.* Volume is a very important indicator to pay attention to

Just like in every pattern, the head and shoulders has its contrary pattern, called the inverse head and shoulder. It forms at the end of a downtrend and signals a reversal to an uptrend.

7.6.2.2. Continuation Patterns

7.6.2.2.1. Triangles

Triangles are considered to be continuation patterns and it is consensual among many authors that there are three types of flags:

- Symmetrical triangles

- Ascending triangles

- Descending triangles

Murphy (1999: 130) adds that there are some chartists who consider a third type of triangle but here only the three main ones will be examined.

A symmetrical triangle is represented in Figure 7.6.2.2.1.1 of Appendix 1 and, as can be seen, the price becomes tighter and compressed as the pattern forms. Usually this pattern has at least two lower highs and two higher lows. In other words, it takes a minimum of four reversal points to consider it to be a symmetrical triangle. The triangle ends when the support or resistance area is broken in order to continue the ongoing trend. This pattern requires the concepts on how to draw a trendline explained previously, including that at least two points are needed to draw a trendline.

This pattern is a perfect example of fundamental and technical tools working at the same time because of the obvious struggle between the longs and the shorts to take over the market. Neither the bulls nor the bears are able to take control in these market conditions. (Schlossberg 2006: 128)

Figure 7.6.2.2.1.2 of Appendix 1 shows a real symmetrical pattern in the USD/JPY currency pair that was formed in 2014 between the middle of May and the beginning of November. It is important to keep in mind that the graphical examples given are often too perfect and in real market charts they do not always appear exactly like that. In Figure 7.6.2.2.1.2 there are highs and lows that do not reach the resistance or the support levels.

A symmetrical triangle has the particularity of having a time limit for the currency pair to resolve and that point is called the *apex*. This point is where the two trendlines meet, but usually the currency pair breaks one of them before that point is in the direction of the previous trend. That signal is given by a candlestick closing beyond the trendline, transforming what previously was a resistance into a support.

Due to its continuation nature, the volume in this pattern begins to shrink as it starts to form. Once the market acknowledges that the currency pair is pausing, investors put their positions on stand-by waiting for a confirmation that the ongoing trend will continue. Volume will start to increase again when the currency pair breaks the support or resistance *level* and confirms the trend continuation.

Volume is also important as the pattern develops depending on the ongoing trend. What usually happens is that if the symmetrical triangle forms during an uptrend, the bounces within the pattern will go along with a volume increase, while the peaks will have their corresponding volume at lower levels. Murphy (1999: 135) refers to these volume levels as being noticeable after *close inspection*, so one should not expect these variations to be big.

The next triangle is ascending and related to a bullish scenario. In other words, it could appear in a bullish continuation scenario or in a reversal pattern in a downtrend. The main feature and difference from the symmetrical triangle is its higher lows and even highs as shown in Figure 7.6.2.2.1.3 of Appendix 1.

The higher lows show the bulls' consecutive attempts to stop the currency pair´s price from decreasin and the fact that they are able to do it shows they are gaining strength, making that support stronger. On the other side, the bears are also struggling to control the market by preventing the price from increasing more than the resistance level that is a horizontal line. As time progresses and the pattern develops, the distance between the support and resistance lines becomes narrower and what normally happens is that the bulls' buying pressure accumulates and breaks through the resistance, continuing or starting an uptrend. Schlossberg (2006: 130) states as a general rule that in this pattern the price should have at least three highs and two lows for the pattern to qualify as an ascending triangle.

Once again, the tenet that a broken resistance becomes a support and vice versa is very important in this pattern, because when the horizontal resistance is broken the area should be considered to be the price range of a stop order. Bears may try to push the currency pair back down to test this area once again and analysts must be cautious and understand what

bears are capable of. The stop order must not be above the support line nor on top of it, a little gap should be given under it.

Figure 7.6.2.2.1.4 of Appendix 1 shows another triangle formed in the USD/JPY currency pair. This time it started in the beginning of 2006 and was completed by breaking the support line near the end of April.

Finally, there is the descending triangle, which is basically the opposite of the ascending triangle. This pattern has both reversal and continuation natures and is related to bearish scenarios. Instead of higher lows and even highs like in the ascending triangle, a descending triangle is formed by lower highs and even lows that eventually result in a break through the support line as shown in Figure 7.6.2.2.1.5 of Appendix 1.

7.6.2.2.2. Flags and Pennants

The flags and pennants are brief pauses in the ongoing market movement, and even with different names and shapes, they tend to appear at the same places and both are quite common. They are usually formed after a sharp movement of the market and they *represent situations where a steep advance or decline has gotten ahead of itself* (Murphy: 142) and the market is just taking a breath in order to resume the trend. Murphy (1999: 142) defends that flags and pennants are 'among the most reliable of continuation patterns and only rarely produce a trend reversal'.

Once again volume plays an important role in confirming that this pattern corresponds to a market correction and not to a trend change. During flags and pennants the activity drops, waiting for the break through to start increasing again.

Murphy (1999: 145) announces 8 important commonalities between these two patterns:

- Both form after a straight line move on heavy volume that is called *flagpole;*

- After that, the volume stabilizes and the currency pair starts to develop sideways;

- The volume increases again when the trend resumes its original direction;

- Both occur about halfway in the market move;

- The pennant resembles a triangle;

- The flag resembles a slopped rectangle;

- In downtrend scenarios these patterns take less time to develop than in uptrends;

- Both patterns are very easy to find because they are common patterns that occur in financial markets;

As can be seen in Figures 7.6.2.2.2.1 and 7.6.2.2.2.2 of Appendix 1, even when sharing the same nature and conditions to form, flags and pennants have different shapes. The flag resembles a parallelogram and in a scenario of a downtrend, these trendlines will have an uptrend direction and in the case of an uptrend, they will have a downtrend direction. In short, a flag usually has the opposite direction of the ongoing trend. On the other hand, the pennants are identified by two converging trendlines and their orientation is more horizontal regardless of the ongoing trend.

Murphy (1999: 143) writes that these short-term patterns should be completed within one to three weeks. This prediction is confirmed by Pring (2002: 99), who states that a flag that takes more than four weeks should be treated with extra attention and the same characteristics are confirmed for pennants when he says that pennants develop under exactly the same conditions […] and have the same characteristics. Each pattern is completed when the resistance in an uptrend scenario or the support in a downtrend scenario is broken and the trend is resumed. These breakthroughs should happen under strong volume increase.

8. Technical Indicators

8.1. Moving Averages (MA)

Moving Averages are the most used and well-accepted indicators by technical analysts. What makes them so popular is the fact that they can be easily quantified and tested and, unlike other technical concepts and tools, the signals offered by moving averages are precise and not open to debate. (Murphy, 1999; 195)

Like the name implies, moving averages are averages of a certain amount of data and owe their name to the fact that the body of data is always changing. This constant change happens because of its 'moving' feature, which calculates the average of the last x periods until the present. Each day a new close is added and the first day´s closing price of the previous series will be subtracted.

The main purpose of a moving average is to identify and signal when a new trend has already begun. This indicator is not used for prediction, but as a confirmation because it does not anticipate, it reacts, and consequently lags the market action. Its signals are not useful to take action preventing a new trend because when they are sent the new trend has already started. What is great about moving averages is that they eliminate market noises and act as a smoother.

The number of periods included to calculate the average is very important because it gives different signals. For example, a 20-day average has more marked reactions to price changes than a 200-day average. And the price used for the calculations also sends different signals. The moving average can be calculated through the opening or closing prices and even the highs or lows. However, the most commonly used price is the closing price, although these criteria depend on each investor´s strategy.

8.1.1.   Simple Moving Average (SMA)

As the name suggests, this is the simplest moving averages created until today. The average calculation used in this indicator is as simple as it could be, consisting in summing the last *x* periods' closing price values of the currency and dividing by the *x* amount of periods summed. Formula 7.1.1.1 is the mathematical representation of the sum of the closing prices (*Pc*) divided by the number of periods averaged (*n*).

$$SMA = \frac{\Sigma\ Pc}{n} \qquad (7.1.1.1)$$

SMA is, just like all other moving averages, a much lagging indicator, but this feature does not make it less important because it represents the consensus price of the market. In addition, the SMA also gives an approximate idea of the currency pair´s market value.

Figure 8.1.1.1 of Appendix 1 shows how the SMA is usually plotted on the chart. Pring (2002) lists a series of technical principles that are used to interpret this indicator:

- Because of its smoothing feature, the SMA could work as support or resistance. The more often the SMA is touched by the currency pair, the more significant it becomes.

- If a SMA is adequately chosen it should reflect the ongoing trend and its violation should confirm a change in trend.

- The more periods it covers the greater will be the significance of the crossover signal. A crossover is any penetration of the SMA by the currency pair´s price.

- A reversal in the SMA is much more reliable than a crossover. This last principle is not as reliable because once the SMA reverses, and due to its lagging condition, the trend should already have started.

Still, these principles do not apply only to the SMA.

The choice of periods included in the average calculation depends on the type of market that is being analysed. If the market is a short-term type there is no use in plotting a 200 period SMA on the chart because it will be too smooth. The same happens the other way around, if the analysed market is a long-term one, a 20-day SMA will have too much noise and become useless.

Murphy (1999) refers some criticism of this way of calculating a moving average. The first is that through this technical indicator only the last *x* days influence analysts′ decisions, so if a major event happening two weeks earlier is still coaxing the markets, it will not be weighted in their decision, as only some of the recent consequences will be taken into account. Consequently, the other criticism Murphy referred to is that all periods have the same weight. The next moving average is an attempt to correct this.

8.1.2.   Exponential Moving Average (EMA)

The invention of this moving average was an attempt to correct an aspect that has been criticized, which is the fact that the SMA weights all the periods included equally. What the EMA does is to attribute more weight to the most recent periods and less to older ones. Thus, the EMA is more responsive to recent price movements, therefore eliminating some of the inherent lag of a moving average. But just like Schlossberg (2006) warns, it could *distort the overall tone of price action by underweighting events further past that may have an important effect on future market movement.*

There are several formulae on how to calculate an EMA, some of them very different. Given that Schlossberg (2006) is one this work′s main sources, his formula of this

technical indicator is quoted here. Still, one should be aware that there are many other ways. Nowadays, the broker´s software generates the graphical representation of the EMA automatically, so analysts have few or no chances of calculating it by hand. This does not invalidate the importance of knowing the concepts behind each technical indicator to analyse and understand it.

In order to explain how an EMA is calculated, let us assume that it is a 10 period EMA. The last day´s value is multiplied by 10 while the 9th value is multiplied by 9 and so on. The number resulting from these multiplications is then divided by 10 as a regular average.

Figure 8.1.2.1 of Appendix 1 shows an exponential moving average plotted on the exact same currency pair during the same time frame as the one in Figure 8.1.1.1 of Appendix 1. The line is not as smooth when compared to the SMA, but one notices that the less smooth areas appear after periods of bigger volatility. This is because the most recent periods are more weighted. So this kind of moving average still does not solve all the criticism made about this type of technical tool.

Many more moving averages and crossover systems have been created to filter false signals. A most common crossover system is to plot two exponential moving averages on the chart, one short-termed and the other long-termed. The rule is to wait for the short-term moving average to cross the long-term one from bottom up in order to open a long position. If it happens the other way around, the short-term moving average crosses the long-term one from above to the bottom, and a short position should be considered.

Figure 8.1.2.2 of Appendix 1 shows an example of this system through the USD/JPY currency pair from the beginning of 2006 until April of 2007, with its short-term moving average in green and the long-term in blue. When the green line crosses the blue line from bottom to top there is a buy signal and when it crosses from top to bottom there is a sell signal. A candlestick chart and a line chart have both been merged in Figure 8.1.2.2 of Appendix 1 to better understand the signals sent by this system.

8.1.3.   Bollinger Bands

John Bollinger, a financial analyst who has contributed immeasurably to technical analysis, created the Bollinger Bands. Used to detect trends and trend reversals, he uses statistical concepts like *standard deviations* to measure price volatility and obtain buy and sell

signals. The result is a pair of bands that show the standard deviations above and below a moving average based on the closing price. The main graphical feature of this tool is that the bands contract and expand, showing the volatility of the currency pair in the past. If volatility increases, the two bands will deviate from each other, but if that was not the case and there was little volatility, they will come closer. The other way to take advantage of it is to plot two Bollinger Bands on the chart with two different settings: one must be with a standard deviation of 1 and the other with one of 2, and the result will be that shown in Figure 8.1.3.1 of Appendix 1. The figure shows the USD/JPY price movements from mid-September 2009 until the beginning of April 2010, with the two Bollinger Bands plotted on the same chart. The reason why there are two bands plotted on the chart is that they create three different areas: the buying and selling areas and the *no man´s land*, as Schlossberg (2006) calls it.

The thinner black lines are the bands that have a settled standard deviation of 1 and the thicker blue lines are the ones with a setup of 2 as standard deviation. The area between the upper bands is the selling area and the area between the bottom two bands is the buying area. The *no man´s land* is the area between the two black lines of the Bollinger Band with a standard deviation of 1. This technical tool can be compared to the hand-drawn trendline concept but with the particularity that the bands act as dynamic trend channels adjusting to the recent volatility. Schlossberg (2006) describes a system to take advantage of this setup by extracting buy and sell signals from the analysis of the price movements and the two bands.

The first rule of this system is that a trend changes when the price closes within the buy or sell areas. The importance of the price closing inside one of those areas is high because only that convinces market actors of a trend change. But this is not the signal analysts must look for. The signal only exists when the price dips into the *no man´s land* or when the price bounces back after touching the 2 standard deviation bands.

The criteria used to open a position are very strict and cautious. To open a position the price should enter the buying or selling area and dip to the *no man´s lad′*, or it should touch the 2 standard deviation band. But in order to close, the only movement needed is for the price to touch the opposite 1 standard deviation band and exit the *no man´s land.* Through the constant search for a solid trend reversal signal, the work conducted by John Bollinger has been able to reduce effectively the risk of the open positions.

Schlossberg (2006) justifies this extra attention to reducing inherent risks of these positions also advising that the *key to positioning in a trend-based setup is to minimize the amount of losses for the countless times you will inevitably be wrong, rather than to maximize the gains for the few times that you will be right.* He also adds that trends are not the rule , as they are the exception and an investor should only enter the market in the most advantageous circumstances he can get.

8.2. Oscillators

An oscillator is a different kind of technical tool mainly because its usefulness is fully harnessed in non-trending markets. In these markets, prices fluctuate between a trading range, making it impossible to apply trend following systems. With the creation of oscillators, sideway trends can now be useful to obtain profit. Oscillators are not limited to sideway trends, they can be used in conjunction with other indicators on up or down trends because the signal that the oscillator sends is when the currency pair is overbought or oversold. It can also send some signals of the trend's momentum, giving analysts an idea of the trend´s strength.

Usually, oscillators are plotted on a horizontal band on the bottom of the chart, not like the moving averages that overlap the price chart. In this band, sometimes there is a midpoint line that separates it into two halves, often called the *zero line* (Murphy, 1999; 227). Both bands have a scale starting at the *zero line* with the top band finishing at 100 while the bottom band finishes at -100. When the oscillator´s line reaches one of these areas, it means that the currency has gone too far, too fast and a correction or consolidation is about to happen. So, the general rule inherent to this tool is that the investor must consider opening a long position when the currency pair reaches the 100 area on the oscillator and a short position when it reaches the -100 area.

Murphy (2006) considers that the three main uses of an oscillator are:

- The usefulness of the oscillator becomes greater when it reaches extreme levels, warning that the currency is overbought or oversold, making it vulnerable;

- When the price action and an oscillator reach extreme levels, it gives a strong warning that something is wrong and that the market might change unexpectedly;

- The *zero line* can be used to obtain trading signals in the price trend´s direction;

8.2.1. Stochastic

This oscillator started as a popular indicator among futures investors. Old but robust, this oscillator has its supporting theory based on the fact that in an uptrend prices tend to close near the upper end of its trading range, but as the trend matures, the tendency for prices to close away from that point becomes more obvious. Invented by Dr George C. Lane, stochastic signals the moment when the closing prices start to cluster around the lows and signal a trend reversals. (Pring, 2002; 230)

A stochastic is formed by two normalized and bounded values that cycle from 0 to 100 and its graphical representation is shown in Figure 8.2.1.1 of Appendix 1. The first line of this equation is %K and is calculated using the following formula:

$$\%K = 100 \ \times \ \frac{Close\ at\ End\ of\ Period\ n - Low\ for\ entire\ Period\ n}{High\ for\ Entire\ Period\ n - Low\ for\ Entire\ Period\ n} \qquad (7.2.1.1)$$

The second line is called %D and is a smoothed version of the %K line. Its formula is:

$$\%D = 100 \ \times \ \frac{High\ for\ Entire\ Period\ n}{Low\ for\ Entire\ Period\ n} \qquad (7.2.1.2)$$

8.2.2. Relative Strength Index (RSI)

In June 1978, J. Welles Wilder introduced a tool that would become the mainstay of technical analysis, which he called Relative Strength Index (RSI). This tool, which today is mandatory in every technical software, works like a stochastic comparing the strength of the currency pair to its price history. Used in a variety of ways, this indicator pays more importance to recent data and with its built-in smoothing functions it filters the market´s noises (Schlossberg, 2006; 82).

Just like the stochastic, the RSI is normalized and bounded by a range that goes from 0 to 100, but in this case usually there is no line dividing the band into two. Using the following formula, this oscillator compares the number of times the closing price is above the

opening price and vice versa, and with that information it determines the strength on the currency pair.

$$RSI = 100 - \frac{100}{1+RS} \qquad (7.2.2.1)$$

$$RS = \frac{Average\ of\ n\ days\prime\ up\ closes}{Average\ of\ n\ days\ \acute{}\ down\ closes} \qquad (7.2.2.2)$$

The majority of authors and analysts use the RSI with 14 periods (*n*). In order to choose the right amount of periods one should always bear in mind that shorter periods make the oscillator more sensitive, widening its amplitude. Graphically, the RSI must reach the upper and lower extremes for an equilibrium must be found, so that the swings are pronounced but not in a sensitive way. (Murphy, 1999; 240)

Figure 8.2.2.1 of Appendix 1 shows how a RSI is plotted on the chart and its behaviour according to the currency pair´s movement. It should be noted that on the three major peaks shown in this EUR/USD chart the RSI line either touched or broke through the 70 line. This line is the frontier where analysts receive the signal that the currency is now overbought compared to the latest closing prices. The 70 level is an important mark for analysts, as well as the 30 level, which is the frontier for the oversold area.

The fact that a currency reaches one of these areas does not mean that a change reversal signal has been sent, as there must always be a comparison with the price movements. In term of probabilities, when the RSI enters one of these areas it signals that it is very likely that the price will change its direction, and it must be seen as a possible opportunity. In technical analysis, patience is a virtue and one should always wait for further confirmation.

Another common method is to use the RSI as a divergence detector. Divergences between the currency pair´s price and the RSI that happen in the oversold or overbought areas are good signals that the trend is about to change. When this occurs analysts receive a previous warning that smoothing might be about to happen, which gives investors the opportunity to study the possibilities and be prepared for them.

Pring (2002) also gives another use to the RSI when utilised in conjunction with trendlines. The trendline concept can be used to study the RSI to achieve market signals. Instead of

plotting the trendlines on the price chart, they are plotted on the RSI band, creating resistance and support levels for the indicator´s line. When one of these trendlines is broken, buy and sell signals are sent. This is possibly due to this tool´s smoothing feature that softens the price movements giving a truer picture of the price direction. (Schlossberg, 2006; 83)

RSI is also often used as a proxy for volume to detect the more active periods of time. The 70 and 30 levels send volume signals to those who have a volume-based strategy.

8.2.3. Commodity Channel Index (CCI)

Invented by Donald Lambert in 1980, this technical tool is very similar graphically in itsinterpretation of the RSI, although resorting to more sophisticated tricks in its calculations. It started as a solution to solve engineering problems regarding signals and was later adapted to the commodities market. Ken Wood eventually used it on a variety of financial instruments and markets. (Schlossberg, 2006; 91)

As an oscillator, the main objective of this tool is to measure deviation, but what Lambert intended when developing this complex technical indicator was to normalize the momentum readings. What he did was to calculate what he called the typical price, which is an average calculated not only through the closing price but also using the high, low and opening prices. He managed to include a whole array of prices during the selected time range.

$$CCI = Typical\ Price - \frac{SMATP}{0,015} \times Mean\ Deviation \qquad (7.2.3.1)$$

The acronym "SMATP" stands for a 20 period simple moving average of the typical price. The0.015 constant was included for graphical purposes so that approximately 70% to 80% is included in the -100 and +100 range. The CCI´s band is divided into two by a zero line and like the stochastic oscillator, there are areas, which, when reached by the price line, mean that it is overbought or oversold. In this case, those areas are above +100 and bellow -100.

Figure 8.2.3.1 of Appendix 1 shows a daily chart of the USD/JPY currency pair with the CCI band plotted at the bottom. The *no man´s land* is coloured in light brown and the frontiers divide it from the overbought or oversold areas.

The way to trade with this technical tool is not to open positions when it reaches the oversold or overbought areas because when that happens, it means that the trend will continue its way. So, one of the ways Schlossberg (2006: 92) referred is to actually buy the currency pair when the price breaks the +100 level and sell when it breaks the -100 level. The second way is to open a short position when the CCI line is returning to the *no man´s land* from the overbought area and open a long position in the opposite movement, when the CCI line breaks from the bottom -100 level. This system is basically waiting for the trend to lose its strength to take advantage of it. Nonetheless, there is a drawback to it because the CCI is a moving average of a moving average, and the signal can only be sent after the price has started its movement. However not everything is bad because, as a result investors are more cautious and do not place themselves in a counter-trend position. They may not take full advantage of the trend reversal but the decision will be taken with confidence.

As an oscillator, there is always the possibility of using the CCI as a divergence indicator. If the price diverges from the CCI line through higher highs in the price line and the CCI does not follow it, a short position should be considered and maintained even if the price does some higher highs. The reasoning is the opposite when this happens with lower lows in the price line and the CCI is beyond the -100 level.

8.2.4. Moving Average Convergence/Divergence (MACD)

This technical tool was invented by Gerald Appel in 1978 and is a form of trend-deviation indicator using two moving averages. It helps analysts understand the price behaviour better from the dynamics between these two lines. The time span for these two lines is adjustable to each investor but the most common are the 12 and 26 periods. During Appel´s research, he commonly used 8 and 17 periods but he also agreed that good signals were triggered from 12 and 25 periods (Pring., 2002: 229). The two moving averages are calculated on an exponential basis and what the MACD basically does is to plot the difference between them. The 12 period MA is the faster to react to price changes

compared to the 26 period MA, and this leads to a constant convergence and divergence between them

Figure 8.2.4.1 of Appendix 1 shows 2012´s price movements of the GBP/USD pair with the MACD´s line in blue. For now our only concern about this line is to explain a very simple method of trading using just the MACD line and the zero line. The rule is to buy when the MACD line crosses the zero line from bottom to top and sell when the opposite movement occurs.

Yet, calculating the MACD line and plotting it on the chart is just the first step to structure the whole technical indicator, which has the same name of one of the lines that composes it. There is also a second line called the *trigger line* consisting of a 9 period MA which, in conjunction with the MACD line, gives buying and selling signals according to the position they are at. Similar to the MA crossover system, when the MACD line crosses the *trigger line* upwards, a buy signal is sent; but if the MACD crosses this line from top to bottom, it triggers a sell signal. Due to its calculating nature, the price actions are quicker than them so the signals are triggered with some delay but if, on one hand this appears to be a disadvantage, on the other hand the triggering of these signals is *much more accurate than mere moving averages crossovers*. (Schlossberg, 2006; 87)

The third and final component is the MACD histogram, which consists of the red bars plotted in the MACD band in Figure 8.2.4.1 of Appendix 1. The distance between the MACD line and the *trigger line* determines the height of each bar and its main goal is to signal momentum loss in the actual trend. The MACD histogram has its zero line so it reaches positive and negative values depending on the MACD and the position of the *trigger lines*. A crossing of the histogram bars from negative values to positive values signals that the MACD line crossed the *trigger line* upwards generating a buying signal. When the inverse happens, a selling signal is triggered. However, the real value of the MACD histogram

9. Case Study

Now that all concepts and technical tools have been examined and practical tips have been given, they will be used to analyse three of the top currency pairs during the year of 2008. This year is chosen because of the major breakdown suffered by all financial markets worldwide due to the beginning of the financial crisis.

The currency pairs that will be analysed are the EUR/USD, GBP/USD and USD/JPY. All charts are from 2008 with a daily periodicity and all the technical tools and concepts will be applied to each semester of 2008. All tools will be used individually so that each buying and selling signal triggered is analysed and its usefulness examined.

In 2008 the world faced its most dangerous financial crisis since the Great-Depression that started in 1929). Besides the many previous events that led to it, the 2008 crisis started to unfold in the beginning of 2008 with the Bank of America agreeing to purchase Countrywide Financial Corp., the largest American mortgage lender.[2] Along with other factors like the increase in the interest rate and subsequent decrease in the house market in the United States, the result was a mortgage crisis with many banks starting to go bankrupt. Among these lenders were Merryl Lynch and Lehman Brothers, and panic hit the markets in September 2008.[3]

9.1.   EUR/USD

Figure 9.1.1 shows the price movement of the EUR/USD currency pair throughout 2008. As the crisis was building up, the EUR/USD currency pair was bullish due to the events mentioned above, which made the EUR stronger. As panic spread everyone started to invest in the safe heaven U.S. Dollar, which explains the bearish 2nd semester of 2008.

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[2] http://www.britannica.com/EBchecked/topic/1484264/The-Financial-Crisis-of-2008-Year-In-Review-2008
[3] http://en.wikipedia.org/wiki/Subprime_crisis_impact_timeline#2008_in_general

Fig 9.1.1 EUR/USD, 2008

Source: www.tradingview.com

During January and the first week of February the currency pair developed sideways as shown in Figure 9.1.2 but on 8 February an uptrend began to form. This bullish period finished on 22 April with the trend changing to sideways and the price starting to move within two of the 0% and 38.2% retracement levels, as shown in Figure 9.1.3.

These trends are confirmed by the 20 period SMA (green line) and EMA (blue line). During the sideways periods, the EMA shows more volatility because of its exponential feature, which weights higher recent closing prices.

As the EUR/USD currency pair developed sideways, the SMA and the EMA moved horizontally, but once the currency pair breaks through these lines from bottom to top, it starts to deviate from them confirming the uptrend. When it changes the trend resuming to sideways, the MAs stabilize and once again develop in that direction. In short, during the 1st semester of 2008, the EUR/USD had two horizontal trends and an uptrend.

Fig. 9.1.2 EUR/USD, 1st Semester of 2008, SMA and EMA

Source: www.tradingview.com

In Figure 9.1.3 there is a chart with the Fibonacci Retracements drawn from a trendline starting on the low reached on 22 January and finishing on the high reached on 22 April. It is clear that each of the retracement levels works as support and resistance areas and some of them overlap the psychological levels of round numbers, like the 38.2% retracement level coinciding with the 1.5400 price level.

The sideway trend of the beginning of 2008 that ended on 7 February reached its highs on 15 and 1 February. Both tested the 1.4900 level but closed near the 70.8% retracement level. The lowest lows were reached on 22 January, a level used as the 100% level for the Fibonacci Retracements. The second low was shared with the starting price of the new uptrend on 7 February.

The uptrend, which started on 7 February and finished on 22 April, developed almost in a straight line besides two corrections that happened between 18 and 26 March and between 27 and 1 April. This abrupt bullish period was too steep, already signalling that it would be very difficult for this bullish movement to continue this momentum, and that was what happened.

The final sideway trend that developed from 10 April until the end of August (shown when the 2nd semester is analysed) had its highest highs on 22 May and on 9 June. Both highs were stopped by the 14.5% retracement level. The lowest lows were also stopped by a retracement level, this time by 38.2% on 8 May, 4 June and 13 June. Both retracement levels were also psychological levels.

Fig 9.1.3 EUR/USD, 1ˢᵗ Semester of 2008, Fibonacci Retracements

Source: www.tradingview.com

As can be seen in Figure 9.1.4, during the sideway trend at the of 2008 selling signals were triggered by the price movement and the Bollinger Bands on 16 January and 1 February as the price left the area between the upper bands. During the same period, the buying signals were triggered on 22 January and 12 February. This last buying signal lasted until 20 March when the market made the first correction. Despite the depth of the correction, it only lasted three days before resuming the uptrend. If investors were patient enough before panicking and closing the long position, the same position could have been closed on 1 April when the second correction was made. This second correction was longer, but by the third day after the price triggered a selling signal, it was almost certain that the price only rallied until the 1.5600 level and was bouncing back. Still, investors who were really secure of their positions only closed their long positions and opened a short one on 24 April.

Then, the currency entered a sideway trend and triggered buying signals on 12 May and on 17 June. The selling signals were triggered on 28 May and on 9 June.

Fig 9.1.4 EUR/USD, 1st Semester of 2008, Bollinger Bands

Source: www.tradingview.com

Figure 9.1.5 shows the same EUR/USD chart but this time with a 14 period RSI band plotted on it. During the sideway trend of January and beginning of February, the RSI followed the price movement without triggering any buying or selling signals. The resistance support concept can be used on the RSI band itself and through it a resistance line at 60 becomes evident. Keeping it in mind, a buying signal was timidly triggered when the RSI line broke the resistance on 26 February and it increased until the overbought area was reached. At this point investors must be very careful waiting until the RSI line starts approaching the *no man´s land*, as happened on 20^tMarch, when it decreased. These were the only consistent signals triggered by the RSI during this period.

However, another phenomenon can be observed in this chart, the so-called 'divergence' between the price movement and the RSI line. During April the RSI moved sideways as the price continued to rise. When a divergence occurs, it usually means that a major change in the currency pair´s price might happen soon. In this case, what happened was that the trend changed from up trending to sideways.

Fig 9.1.5 EUR/USD, 1st Semester of 2008, Relative Strength Index (RSI)

Source: www.tradingview.com

Fig 9.1.6 EUR/USD, 1st Semester of 2008, Commodity Channel Index (CCI)

Source: www.tradingview.com

The CCI plotted on the chart in Figure 9.1.6 is a 20 period CCI with its *no man's land* coloured in light brown, while the oversold and overbought areas are shown in white. Small signals were triggered during the first sideway trend as the CCI line reached and returned from the oversold and overbought areas twice. On 15 January and on 1February, when the price reached the psychological resistance of 1.4900, a selling signal was

correctly triggered as the currency pair followed it and fell to lower levels. When the price of the currency pair reached this support level, buying signals were also activated on 22 January and 12 February.

The first green candlestick of the uptrend formed on 8 February, but the CCI signal only triggered the buying signal after the weekend, on the 12th. This second time the CCI line entered and exited the oversold area, staying there much longer and reaching a much deeper level. Compared to the other signals triggered during the sideway, this was a much stronger signal.

On 26 February the CCI lines entered the overbought area, showing that the uptrend´s end could be near. Yet, until 23 April the CCI line kept entering and exiting this area consecutively, with the price always rising. This divergence signals a possible change in the market.

After this period the CCI line fell to the oversold area before triggering a buying signal. Weaker signals were activated on 28 and 30 April and on 6May, but the real signal was only sent on the 9th of that month. It must be pointed out that on the previous day the candlestick that was formed was a Doji Star, which is a well-known reversal pattern.

At last, following the sideway trend, the CCI line triggered selling signals on 27 May and on 9 June, and a buying signal on 16 June. July began with the CCI line on the overbought area.

Figure 9.1.7 is a EUR/USD chart, this time with the MACD band plotted on it. This technical tool triggered the buying signals on 29 January and on 19 February and the selling signals were triggered on 18 January and on 6 February. It was quite late by comparison with the RSI and the CCI, but the histogram also included in the band showed a loss in momentum on 23 January and on 12 February for the buying signals and on 11 January and 1 February for the selling signals that were triggered. The sideway trend is confirmed by the fact that both MAs develop around a *zero line* area.
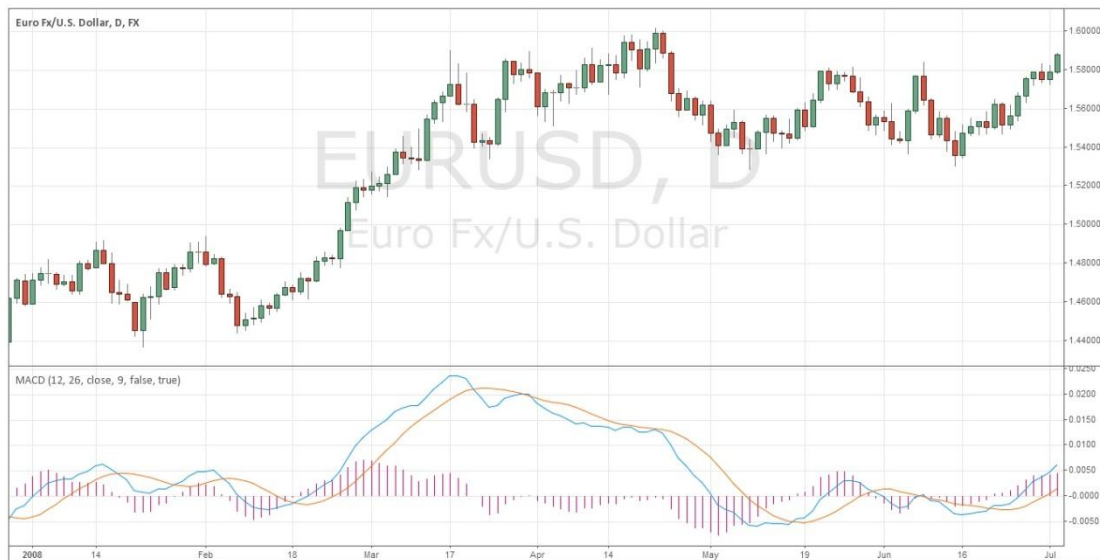
Fig 9.1.7 EUR/USD, 1st Semester of 2008, Moving Average Convergence Divergence (MACD)

Source: www.tradingview.com

The buying signal triggered on 18 February preceded the new uptrend and it only triggered the respective selling signal on 21 March. It also confirmed the uptrend by drifting away from the *zero line*. Once again, a divergence situation occurred with the price rising and the MACD lines falling. One notes how the histogram was at negative levels until the price reached the 38.2% and the MAs started to get closer until a buying signal was triggered on 16^tMay. Once more, the buying signal was triggered after the price had already started its bullish movement but, again, the histogram showed loss in the momentum since 5 May.

On the 27 May the histogram signalled a loss in momentum, confirmed by the MAs selling signal on 30 May. A shy selling signal was triggered later on 9 June as the price reached the 14.5% retracement level and the histogram started decreasing on the 5th. At last, on 16 June the histogram showed the first signal of momentum loss and a buying signal was triggered on 20 June, with the price already making its bullish movement towards higher levels.

In order to complete the 2008's EUR/USD analysis, the same tools will be used and studied for the 2nd semester. Figure 9.1.8 shows the 2nd semester´s chart of the EUR/USD currency pair with a 20 period SMA and EMA and the 1st semester Fibonacci retracements levels. It is noticeable how the retracement levels still act as resistance points, especially during the two bullish attempts made on 21 August and 22 September.

Fig 9.1.8 EUR/USD, 2nd Semester of 2008, SMA and EMA

Source: www.tradingview.com

After analysing the MAs, the downtrend is confirmed until the middle of November when these lines started to go horizontal. Afterwards, they showed an uptrend until the end of 2008, besides the fact that the EMA line got under the MA line, triggering a signal that a trend change might be about to happen. This is because the EMA line reacts quicker to changes in the price of the currency pair.

During downtrend, the price movements, in conjunction with the Bollinger Bands, triggered few signals useful for investors, as shown in Figure 9.1.9. On 22 July, a selling signal was triggered, which coincided with the beginning of the new downtrend. The price remained always on the lower band of the 2 standard deviation setup, giving no signs of changing direction. The correction that happened on 21 August as a candlestick closed over the lower band of the 1 standard deviation setup Bollinger Band, but the next one resumed the trend immediately. The biggest correction, which had its high on 22 September, triggered a buy signal on 17 September. The selling signal that resumed the downtrend was triggered on 29 September.

When the EUR/USD price entered the sideway trend between 27 October and 1 December, on two consecutive times the price broke through the lower band of the 1 standard deviation setup, but no clear signal was triggered. One notices how the bands converge during this trend, showing low volatility right before the candlesticks started to rise, and follow the upper band of the 2 standard deviation setup Bollinger Bands.

On 25 November a new high was reached as the downtrend finished and a selling signal was triggered on 27 November. This signal is quite controversial because the candlestick that triggered it formed a small hammer that can be interpreted as a reverse signal.

A price reversal occurred on 2 December, which was not clearly signalled by the Bollinger Bands, but the fact that the price tests the band with 1 standard deviation setup signals a strong support level. This level is a psychological barrier as it is a round number, 1.2600, and was confirmed when the currency pair´s price started a steep up movement breaking the 1 standard deviation setup band and following the 2 standard deviation setup band.

On 18 December the currency pair´s price paused its upward movement and a selling signal was triggered on the 29th when the price closed under the band with the 1 standard deviation setup.

Fig 9.1.9 EUR/USD, 2nd Semester of 2008, Bollinger Bands

Source: www.tradingview.com

On the 2nd semester of 2008 the RSI line continued to develop within the two channels that had been limiting the RSI line during the sideway trend that had been dominating the market since May. But on 5 August the support line was broken and the RSI followed the price´s down movement until it reached the oversold area on 8 August. The RSI line kept falling until 18 August when it triggered a good but quick buying signal before reversing

and starting a move towards the *no man´s land*, breaking its frontier on 21 August. The RSI line followed the ongoing correction and peaked on 22 September before falling and entering the oversold area on the 26th. Some EUR´s market actors tried to change the currency´s trend by strengthening the EUR currency but the USD was stronger resuming the downtrend.

On 12 September the EUR/USD price made a correction through a peak that reached its high on 22 September. Once the downtrend was resumed the RSI started to fall again, entering the oversold area on 2 October. A week later, the RSI line touched the frontier of the oversold area and fell again, but it should be pointed out that the low is higher than the previous one reached on the 12[th,] as the currency pair price reached a lower low. On top of it, on the 13th the RSI line left the oversold area and reached a higher high the following day but the price did not break the resistance level of the 9th of October´s high. Once again there is a divergence between the price movement and the RSI, showing that a change in the market might be about to happen. That change was the transition from a downtrend to a sideway trend.

Fig 9.1.10 EUR/USD, 2nd Semester of 2008, Relative Strength Index

Source: www.tradingview.com

On 29 October the RSI line left the oversold area, reaching a new high compared to the one reached on the 14th, which could be a sign of a new uptrend. But when the next day´s candlestick closed, the signal could become invalid because of the Doji that formed, which is a reverse kind of candlestick formation.

From this day on a divergence occurred between the price and the RSI line, and while the RSI was in an uptrend the price was moving sideways. This went on until 1 December, when both started to rise until the RSI line reached the overbought area on the 16th. The selling signal was triggered on the 18th when the RSI line followed the price downwards and reached the *no man's land* the following day.

As Figure 9.1.11 shows, the CCI indicator started the 2nd semester of 2008 triggering three selling signals, but in each of them the time spent by the CCI line in the overbought area and the levels reached were smaller, giving a signal that the trend might be changing.

Fig 9.1.11 EUR/USD, 2nd Semester of 2008, Commodity Channel Index

Source: www.tradingview.com

Once the currency pair started to downtrend, the CCI line followed that trend piercing the oversold area on 24 July. This movement could be perceived as a buying signal according to the indicator´s definitions, but, as Figure 9.1.11 shows, two days later it entered the oversold area again.

A buying signal was triggered on 19 August due to a little pause on the downtrend, but later, on 1 September, it showed that the downtrend might continue when the CCI line entered the oversold area again. The correction that occurred during the second half of September was signalled by the CCI line when it triggered a buying signal on 12 September and a selling signal on the 23rd. The downtrend was then resumed and the CCI line fell drastically to the oversold area. On 13 October a buying signal was triggered, but

just a week later, a selling signal was triggered. This time the CCI line reached a new low and bounced back to the *no man's land,* triggering a buying signal on 29 October.

Between 29 October and 21 November the CCI line followed the currency pair´s price on its sideway trend. A buying signal was triggered on 21 November and the area that seemed to serve as a resistance point for the highs reached on 4 and 13 November were broken and the oversold area was reached on 24 November. Two days later, a selling signal was triggered once the price reached the active resistance line that contained the currency pair´s price on 30 October and on 5 November. One should note how the CCI line reached a higher low on 1 December, indicating that the price might rise.

That was what happened from that day onwards and the price rose for two weeks. The CCI entered the overbought area on 8 December and followed the uptrend, going beyond the 200 level. It must be pointed out that the frontier to the overbought area is at the 100 level. But, as with most steep movements, it was not able to keep the momentum and in just two days it reached its highest high, on 18 December, and the CCI fell from the 200 level to the *no man's land.* Until the end of 2009 the CCI fell to the middle of the *no man´s land* following the price movement, signalling that after that steep up movement made by the EUR/USD price, the downtrend might soon be resumed.

Fig 9.1.12 EUR/USD, 2nd Semester of 2008, Moving Average Convergence Divergence

Source: www.tradingview.com

The MACD started the 2nd semester of 2008 with the fast MA testing the slow MA on the 9 July but it was only later, on the 22nd, that it really got through and triggered a selling signal. This signal was strong because the fast MA drifted apart from the slow MA and kept a good distance from it until 19 August, when they started to converge. The convergence resulted in a buying signal on 26 August. One sees how both MAs are now below the zero line and remained there, triggering a selling signal on 4 September. On 16 September, due to the market correction, a buying signal was triggered. This signal was triggered two candlesticks after the formation of a hammer with almost no body and the MACD histogram showed a loss in the trend momentum, predicting the correction that the market made next.

On 24 September the MACD histogram showed a loss in momentum in the market correction, which was later confirmed by a selling signal triggered on 1 October. Afterwards the downtrend was resumed and the price and the MACD moved along the same way. This smoothness ended with a buying signal triggered on 3 November as the MACD lines started to converge from the price movements. While the EUR/USD pair was moving sideways, the fast MA broke the slow MA from the bottom to the top and both began to rise, getting closer to the zero line. They only converged with the trend when the EUR strengthened up and created the steep up movement seen in the first two weeks of December. The loss in momentum of this steep movement was triggered on 19 December by the MACD´s histogram and the selling signal was only triggered on 31 December.

9.2.   GBP/USD

Figure 9.2.1 shows the price movement of the GBP/USD currency pair during 2008. This currency pair also suffered the same changes as the EUR/USD on the 2nd semester due to the same reasons.

Since the beginning of 2006 the GBP had been stronger and an uptrend had been dominating this currency pair since then. This trend stagnated in the beginning of 2008 until the month of July, when everybody started to move their money to the US Dollar because of its *safe heaven* statute.

Fig 9.2.1 GBP/USD, 2008

Source: www.tradingview.com

In order to analyse the Fibonacci Retracements on the 1st semester of 2008, the trend line had to be drawn from the second week of November 2007 until the middle of January 2008.

The chart shows the GBP/USD price falling during the last two months of 2007 and making its corrections on the 61.8%, 50% and 23.6% retracement levels. During the 1st semester of 2008 the 1.9400 level acted as a support level, stopping the downtrend in the middle of January and not letting the price fall beyond this level. As mentioned earlier, round numbers are strong psychological levels of resistance and support.

The 50%, 38.2% and 23.6% retracement levels are the most important during this 1st semester of 2008 as they condition the price movement.

Fig 9.2.2 GBP/USD, 1st Semester of 2008, Fibonacci Retracements

Source: www.tradingview.com

After the end of the downtrend, which was ongoing since 2007, the 1.9400 psychological level was tested three times, forming a triple bottom. The first bottom was reached on 22 January and a perfect second and third bottom was reached on 7 and 2 February. The last two bottoms are considered to be perfect because the price bounces perfectly on the support level and returns to that level before starting the uptrend that lasted almost a month.

During March and using the 50%, 28.2% and the 23.6% retracement levels as resistance areas, a Head and Shoulders was formed. As a reverse pattern, it signalled a reverse on the up movement that started after the triple bottoms occurred on 22 January, 7 and 20 February.

Figure 9.2.3 shows the Head and Shoulders pattern on a bar and line chart. A characteristic of this line chart is that the area below is coloured. Both are a zoom made in March in order to isolate the Head and Shoulders pattern. Both shoulders and head are pointed in three curved lines and the neckline is in a canted line. It shows how the price breaks the neckline once the pattern is completed and stays in that area, testing it before breaking it upwards. When the price breaks the neckline, it rises until it is stopped by the existing resistance level of the right shoulder of the pattern. The reason why a line chart is also

included in Figure 9.2.3 is because it is much easier to visualize the pattern in this kind of charts.
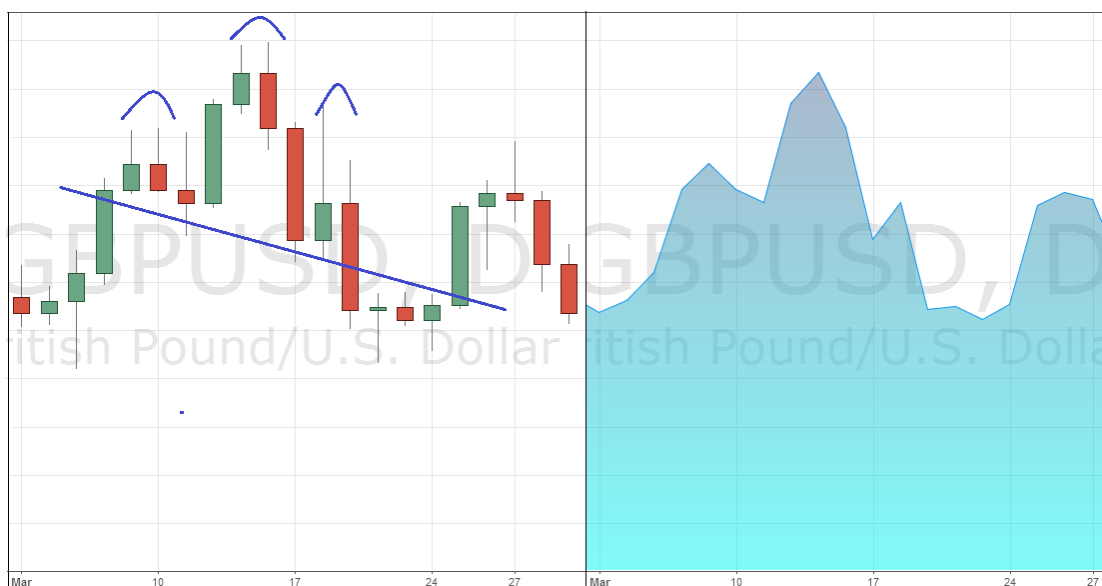
Fig 9.2.3 GBP/USD, 1st Semester of 2008, Head and Shoulders

Source: www.tradingview.com

When analysing 2008 as a whole, like in Figure 9.2.1, it is obvious that the side trend is followed by the GBP/USD currency pair during the first semester of 2008. Figure 9.2.4, with the SMA and EMA plotted, shows how it started 2008, ending the previous ongoing downtrend and remaining levelled until the beginning of the third week of February, when it bounced to an uptrend. After the Head and Shoulders pattern the currency pair went sideways until nearly the end of May. Until July the price moved sideways, as confirmed by both MAs.

Depending on the time span used on the chart, conclusions might be different. It is very important to have a view of the *big picture* of the currency pair. As seen when comparing Figure 9.2.1 and 9.2.3, if investors had only studied the 1st semester without observing the chart encompassing a longer time span, they may have been misled. Thus, the analysis of the SMA and EMA points out the peaks and troughs within the sideway trend.

Fig 9.2.4 GBP/USD, 1st Semester of 2008, SMA and EMA

Source: www.tradingview.com

When analysing the Bollinger Bands in Figure 9.2.5, the previous downtrend was confirmed in the beginning of 2008 by the fact that the price was developing between both lower bands. On 16 January the currency pair´s price seemed to trigger a buying signal because it opened in the *no man´s land* coming from the area between the two lower bands. But there is a factor that makes this signal invalid, as the chart confirms. The price did not reach the 2 standard deviation setup band, which shows that the signal that was triggered might not have been strong enough. The real buying signal was triggered on 22 January when the candlestick opened on top of the lower 2 standard deviation setup band, even piercing it, before rising and closing above the lower 1 standard deviation setup band. When analysing the Fibonacci Retracements, the psychological level of 1.9400 was signalled as the support of the previous downtrend, so what happened next was that the market continued to test this area. On 1 February a selling signal was triggered and the price rallied until it reached the 1.9400 support level, and once there, it bounced back, triggering a buying signal on the 12th, but a week later the support was tested again. This time the bounce was the impulse needed for an uptrend that lasted almost a month.

Until 13 March, the price stayed between the two upper bands that followed the uptrend. This movement ended with a selling signal triggered on 17 March as the price broke through the upper 1 standard deviation setup band and found support on the same lower band. Two weak buying signals were triggered during this downtrend on 2 and 17 April.

On the 16th, a buying signal was triggered but, due to a market correction, the price only rose after the weekend, on the 20th.

This buying signal marked a pause in the GBP/USD currency pair´s price, as it stayed sideways until the buying signal of 16 June.

Fig 9.2.5 GBP/USD, 1st Semester of 2008, Bollinger Bands

Source: www.tradingview.com

The RSI had an interesting behaviour at the end of the downtrend from 2007 onwards, as seen in Figure 9.2.6. One should notice how the RSI kept testing the frontier of the *no man´s land* as the price kept reaching lower lows. Later on, the end of the downtrend was confirmed when the RSI line reached a higher low even with the price testing the 1.9400 support level. At the third bottom this happened again.

Then what happened was that the RSI followed the up price´s movement until it reached the overbought area exactly when the price reached its highest high on 13 March. From then on, there was nothing much to analyse in the RSI line movement as it remained in the *no man´s land* for the rest of the semester.

Fig 9.2.6 GBP/USD, 1st Semester of 2008, Relative Strength Index (RSI)

Source: www.tradingview.com

In Figure 9.2.7 the CCI line pointed out the end of the previous downtrend, reaching a low level inside the oversold area and triggering a buying signal on 22 January. The technical indicator´s line even bounced back and entered the *no man´s land* but immediately resumed the downtrend, following the price. As the price bounced, reaching the psychological resistance of 1.9900 on the 30th, the CCI line triggered a selling signal as it started to fall, making its way to test the support level of 1.9400 again. This selling signal was triggered on 1 February. The next two bottoms that complete the triple bottom formed during this period had their buying signals triggered after reaching the support level on 11 and 21 February.

After the uptrend that followed these events, the currency pair´s price broke the 1.9900 psychological resistance and the CCI line reached the overbought area, remaining there until the GBP/USD currency pair started to fall. Then it started a downtrend before pausing and developing sideways until nearly the end of the 1st semester of 2008. The selling signal was triggered on 17 March as the price started to fall. On 2 April, a buying signal was triggered due to the ongoing market correction which later resumed the downtrend. The same happened on 16 April when another buying signal was triggered due to a correction of the ongoing trend.

Before the price reached its lowest low on 14 May, the CCI line entered the oversold area on the 7th and remained there until the 16th, when a buying signal was triggered and the price rose to find a resistance around the 23.6% retracement level. This resistance level

67

also prevented the CCI line from entering the overbought area. On 16 June, a buying signal was triggered and the price rose until it tested the 2.0000 psychological level and the CCI line entered the overbought area. By the beginning of July, the CCI line was already following the price as it fell.

Fig 9.2.7 GBP/USD, 1st Semester of 2008, Commodity Channel Index (CCI)

Source: www.tradingview.com

The MACD indicator in Figure 9.2.8 started 2008 on low levels and even with the GBP/USD still bouncing after each support tested, it only triggered a good buying signal on 15 January. The next triggered signal was on 7 February, but it was weak because when it was triggered, the price was already near the psychological support that existed on the 1.9400 level. One way to possibly take advantage and make some pips of this signal was through the histogram that signalled a loss in the momentum on 31 January. On 20 February the fast MA crossed the slow MA but for a very brief period of time, as it instantly bounced and the MAs started to diverge.

On 19 March a selling signal wastriggered, signalling the end of the uptrend started on 21 February. This time the histogram was not so useful because it did not trigger a clear signal of momentum loss, reaching the same high three times. After the third time the signal of momentum loss is real and in fact coincided with the first red candlestick. However, with three possibly wrong signals, one can never be too cautious. This kind of movement made by the MACD´s histogram is due to the corrections that occur in the market during this trend. One notices that during the downtrend started on 17 March, the histogram also does not trigger clear signals. This downtrend shows its first sign of weakness when the MAs

trigger a buying signal on 18 April and almost two weeks later a selling signal. The signal that the downtrend is ending is also triggered by the fact that, after the buying signal on 18 April, for a short period of time they move sideways. After the selling signal that was triggered a couple of weeks later, on 1 May the MAs rally for the last time following the price.

On 12 May the histogram starts to show some momentum loss, confirmed by the buying signal triggered on the 20th by the MAs. When the price reached the resistance area around the 1.9600 psychological barrier, the histogram started to show again some loss in the momentum of the up movement. The selling signal was triggered almost a week later, on 4 June. The histogram signal was much more useful because the signal triggered by the MAs arrived a day before the down movement reached the previously tested support of the 1.9400 and formed a Morning Star. On 12 June the last signal was triggered and it was a buying kind of signal due to the up movement that started on 16 June and went on to the 2nd semester. The histogram started signaling the change in momentum on 16 June, which was quite a good signal considering that the real signal was triggered just three days later. The month ended with both MAs moving apart.
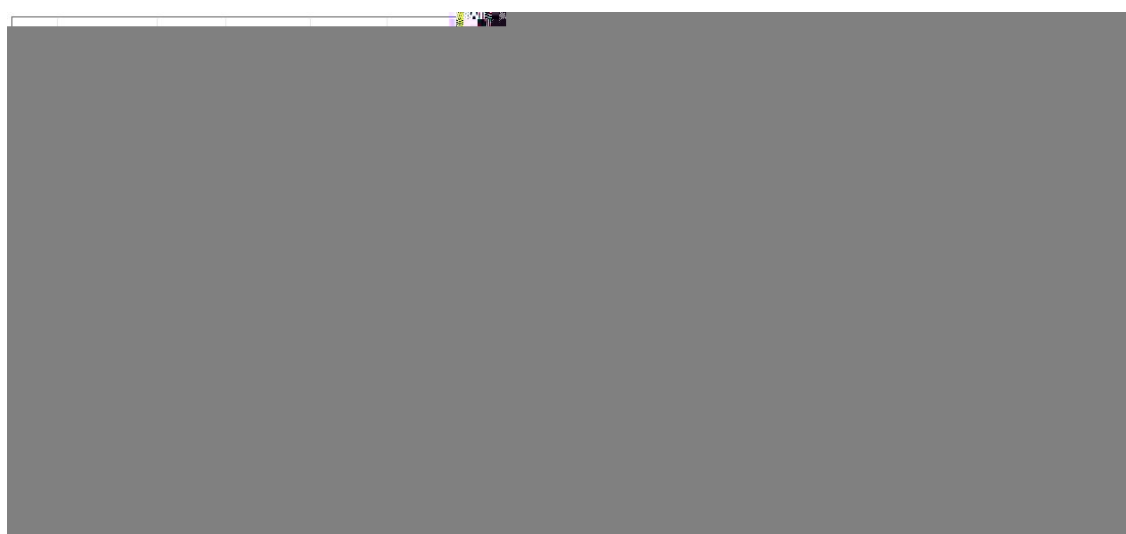
Fig 9.2.8 GBP/USD, 1st Semester of 2008, Moving Average Convergence Divergence (MACD)

Source: www.tradingview.com

What happened during the 2nd semester to the GBP/USD currency pair was quite similar to what happenned to the EUR/USD currency. Figure 9.2.9 shows how the USD strengthened from the beginning of August onwards. On the EUR/USD currency pair, this rally started

during the 2nd half of July and entered a sideway trend for the last two months, while the GBP/USD stayed donwtrend until the end of 2008.

Figure 9.2.9 is a very good example to study the relation between two types of levels used as support and resistance: the Fibonacci Retracements and the psychological levels. Often these two kinds of levels overlap but not all the time. The 2nd semester started off with the price stagnating around the 2.0000 psychological resistance. The highest price reached on 15 July, which was 2.01503, was the point selected to draw the trendline for the Fibonacci Retracements. On the 24th the price started to give signs that the trend might be about to change as the price started to fall away from the 2.0000 level. On 13 August the price went through the 76.4% retracement level and started to test the 1.8500 psychological support two days later.This support was only broken on the 26th, but until then the price fluctuated between the 1.8500 level and the 76.4% retracement level.

On 8 September another psychological level was attained as the price reached the 1.8500 level and bounced up. It must be noticed that, after the price reached the 1.7500 level, it bounced back up and on 15 September, a candlestick much resembling a Morning Star but with a larger body denoted some doubt within the market. It then tested a break through on the 1.8000 level but the price retracted, closing slightly above the 61.8% retracement level. On the following day, t17 September, the currency pair´s price rose, breaking through the 1.8000 level until it reached 76.4% retracement.

The same thing happened in the 1st half of October, when the currency pair´s price reached the 1.7000 psychological level and bounced back, stagnating around the 50% retracement level. On 14 and 15 October the 1.7500 level was tested twice and from 24 October to 11 November, a series of bounces between psychological levels occured and the 23.6% retracement level once again offered some resistance on 4 and 5 November before it rallied.

From this day on the downtrend on GBP/USD lost strength and the lows reached were not as deep as before. It even seemed that the curency pair changed trend and started going sideways, but technical analysts are aware that a downtrend occurs when the currency pair´s price keeps reaching lower lows, so effectivly the GBP/USD currency pair maintained its downtrend until the end of 2008.

Fig 9.2.9 GBP/USD, 2nd Semester of 2008, Fibonacci Retracements

Source: www.tradingview.com

Fig 9.2.10 GBP/USD, 2nd Semester of 2008, Simple and Exponential Moving Average

Source: www.tradingview.com

As seen in Figure 9.2.11, the 2nd semester started, with the Bollinger Bands very close to each other due to the low volatility affecting the currency pair. Due to this factor, the selling signal triggered on 3 July is considered to be weak and even the one triggered on the 22nd, which originated the downtrend, could have been useless.

Once the downtrend started developing, the price remained between the two lower bands, which signalled that the down movement still had its momentum. The momentum was only

broken on 12 September, right after a bullish hammer formed, when the 1 standard deviation setup band was broken by the currency pair´s price. The movement was the usual market correction, on 29 September a selling signal was triggered and the downtrend was again resumed. The trend ended with the buying signal triggered on the 24 November.

The signal triggered on the 24th offered the possibility to make some pips, but not that much because of the psychological resistance that prevented the price from rising. So, the price fell again into the 'ready to buy' area between the two lower bands. The price did not stay long in this area as a buying signal was triggered again on 8 December. The year of 2008 ended with the GBP/USD currency pair closing beyond the 1.4500 psychological support, after a selling signal triggered on the 18th. On the 30th, a bullish hammer formed, indicating that the price might bounce from that level.

Fig 9.2.11 GBP/USD, 2nd Semester of 2008, Bollinger Bands

Source: www.tradingview.com

Due to the downtrend, the RSI line, after it entered the oversold area on 8 August, kept entering and exiting this area, as seen in Figure 9.2.12. The RSI line entered the oversold area on this day and only left it on 12 September. However, the buying signal was actually triggered on the 11th when the RSI line started to rise, before leaving the oversold area. This movement on the RSI line was due to the correction that started that day and reached its high on the 22nd, before the RSI line started to fall, and follow the price as it resumed the downtrend.

It must be pointed out that the RSI line started to enter and exit the oversold area due to the corrections that occurred in the trend during this period. On 11 November, the line entered the oversold area but the low reached was higher than the low attained on 27 October, showing loss in the trend´s momentum. On 24 November the RSI line left the oversold area for the last time, and remained within the *no man´s land* while the currency pair was unable to reach deeper lows.

Fig 9.2.12 GBP/USD, 2nd Semester of 2008, Relative Strength Index (RSI)

Source: www.tradingview.com

Much like the other indicators, the signals triggered during periods with low volatility are not very good because price movements do not go through a large amount of pips. That is what happened with the selling signal triggered CCI on 3 July, shown in Figure 9.2.13.

After the selling signal triggered on the 18th, the CCI line fell with the currency pair´s price until it entered the oversold area on 1 August and remained there until it triggered a buying signal on the 21st, exiting the area just to re-enter it on 28 August.

On 11 September, a valid and good buying signal was triggered due to the big correction that occurred afterwards. The signal was triggered on the day that a bullish hammer formed, hinting at the next movement. The signal showing that the correction might be over and the downtrend resumed was triggered on 25 September, two days after a bearish hammer was formed. What happened next was that the CCI line rallied, entering the oversold area on 6 October and a couple of buying signals were triggered during the next month due to small corrections. Those buying signals were triggered on the 13th and 29th,

and all the movements made by the CCI line followed the GBP/USD price as it resumed the downtrend. Still, signs of weaker momentum were given by the amount of corrections made after the one that started on 11 September. Until this big correction, the downtrend was developing smoothly, showing that the bulls, in other words, the USD 'fans', started to have trouble continuing its strength´s momentum.

The buying signal was triggered on 21 November with another correction that made the currency pair´s price test 1.5500 psychological level. The next correction, which had its high on 17 December, did not trigger a buying signal. The CCI line touched the frontier of the oversold area and bounced, reaching the frontier of the overbought area on 15 December. This correction was the only one that made the CCI line reach the overbought area and trigger a selling signal on the 18th. There was a divergence between both lines, which signalled a change in the GBP/USD. The trend change only happened in March 2009 but signals were being triggered already at the end of 2008.

Fig 9.2.13 GBP/USD, 2nd Semester of 2008, Commodity Channel Index (CCI)

Source:

As seen in Figure 9.2.14, the MACD did not trigger any good signal during the month of July due to the low volatility of the currency pair during this period. On the first day of July the histogram showed a loss of momentum in the ongoing market movement as the price reached the 2.0000 psychological resistance. The real signal is triggered on the 8th, which is late, and the buying signal triggered on the 15th had the same characteristics.

On the 24th, a selling signal was triggered by the MAs of the MACD, which was signalled by a weak decrease of the histogram columns. This was the moment that has been referred as being highly fundamentally based but the MACD gave signs of the importance of the new born downtrend. Once the fast MA crossed the slow MA from above to bottom, both MAs started diverging at high speed. They only converged again on 15 August but two weeks later they diverged again, showing some disturbance in the downtrend, which was confirmed by the correction that was made on 11 September. This correction had its buying signal triggered on the 12th, which was very good, taking into consideration the delay sometimes observed in some triggered signals. The very next signal triggered by the MACD´s MAs was once again too late, as it was triggered on 1 October, six days after the downtrend had been resumed. The histogram sent its warning on 23 October. After the price started to fall in the beginning of August, the MAs start to move away from the zero line, confirming that a downtrend was dominating the currency pair´s price movements. In other words, the USD was stronger than the GBP.

After a couple of tests made by the fast MA to the slow MA, a buying signal was finally triggered on 21 November. The histogram warned about this buying signal , but as the histogram did not reach the low levels of the first test, the loss of momentum was triggered on 17 November. During the month of December the MAs started to approach the zero line, a signal that, in conjunction with the fact that the currency pair lows were not as deep as before, showed that the downtrend was losing its momentum. Before 2008 ended, the MAs still triggered a selling signal on 24 December before the GBP/USD currency pair reached its lowest low of the year.

Fig 9.2.14 GBP/USD, 2nd Semester of 2008, Moving Average Convergence Divergence (MACD)

Source: www.tradingview.com

9.3.   USD/JPY

The last currency pair to be analysed using exclusively technical tools is the USD/JPY. JPY is considered to be one of the major currencies in the Forex market, along with the USD, EUR and GBP. The Japanese currency has unique factors that also make it a safe heaven, which explains the currency pair´s price behaviour in August 2008, when the JPY started gaining strength over the USD. Those factors are the low rates maintained by the Bank of Japan, which are more appealing to investors when the rest of the world´s markets are less volatile. This factor, together with an excellent trade balance, attracts investors to place carry trades and this is the reason why the USD/JPY price was in a downtrend from August 2008 until the end of the year.

Fig 9.3.1 USD/JPY, 2008

Source: www.tradingview.com

Figure 9.3.1 shows how the first semester of 2008 is divided into two phases: the initial downtrend that started in the beginning of the year and ended in the middle of March, and from that period until the end of June, when the price moved in a slight uptrend. The SMA and EMA plotted on the chart of Figure 9.3.2 show there was a brief pause on the downtrend during the month of March before the trend changed in the beginning of April, lasting until the end of the first semester of 2008. It must be pointed out that the pause in the downtrend really started in the middle of January and the downtrend actually ended in the middle of March. This demonstrates the slight lag that exists in the moving averages tools.

In Figure 9.3.3, the Fibonacci Retracements plotted on the chart show that often the levels coincide with the psychological barriers imposed by round numbers. Almost all the retracement levels in this figure are overlapping a psychological barrier. One must not forget that the retracement levels must not be used as fixed levels, they must be analysed as elastic levels.

The pause in the downtrend that occurred during February was due to a support on the 106.0000 psychological level that made the price bounce back until it reached the other psychological level of 108.0000. During this bounce back, or market correction, the 38.2% retracement level had its influence on the price movement. One notices that the price bounced on the 106.0000 level, for the first time still in January, and stayed between it and

the 38.2% retracement level. The price only broke through this level on 13 February and for the next 10 days it stagnated between the 108.0000 level and the 38.2% retracement level. When the downtrend resumed and the USD/JPY´s price started to fall, there was still a little resistance offered by the 61.8% retracement level and the 102.0000 level in the beginning of March.

Fig 9.3.2 USD/JPY, 1st Semester 2008, SMA and EMA

Source: www.tradingview.com

After the currency pair´s price reached beyond the 96.0000 level, the trend changed and a new uptrend was born. This uptrend had consecutive tests and breakthroughs along the way. It started on 24 March when the price bounced off the 96.0000 level, and reached the 101.0000 level bouncing back to the 99.0000 level. When the currency pair´s price reached this last level, it immediately bounced back and broke through the 101.000 level. This kind of event kept on happening along the uptrend, the price kept stopping on a resistance level and bounced back to the previous one, transforming it into a support.

On 18 April the 103.0000 level was broken, from bottom to top, and the price entered a short pause as it developed between two channels lines, the 105.0000 levels, which coincided with the 50% retracement level, and the 103.0000 level. This last level was also the 61.8% retracement level area, as the price closed between these two levels during this period. The uptrend was resumed on 5 June when, after a bounce back under the 105.0000 level, the price started to rise rapidly. The 1st semester ended with what seems to be a

market correction after the USD/JPY´s price bounced back of the 108.0000 psychological resistance.

Fig 9.3.3 USD/JPY, 1st Semester 2008, Fibonacci Retracements

Source: www.tradingview.com

The Bollinger Bands in Figure 9.3.4 started in 2008, confirming an ongoing downtrend in the USD/JPY currency pair as the price kept moving within the two lower bands. On 24 January, the price exited this area for the first time, triggering a buying signal. However, this signal was cancelled by a bearish hammer that formed on the very next day. Nevertheless, on the next day another hammer formed, this time a bullish one. It showed some doubt in the currency´s movements, which was then confirmed once the bands started to converge, showing low volatility in the currency as it developed and even entered the area between both upper bands. When the price broke through the 1 standard deviation setup upper band, the bands started to diverge, signalling that the market was either resuming the previous trend or changing direction. The selling signal triggered on 21 February gave a hint that the market might resume the previous trend, but with the bullish hammer formed on the 22nd, it would be wise to wait a little longer. During the next couple of days, the downtrend was resumed and the bands immediately diverged, and the price entered the area between the two lower bands until 17 March, when it reached its lowest low and changed direction.

The new uptrend´s buying signal was triggered on 24 March and was confirmed during the next days, when the price fell but found resistance in the 1 standard deviation setup lower

band. On 1 April, the price rallied and tested the upper band of the previously tested band. During the following week no clear signal was triggered because the price surrounded the 1 standard deviation setup upper band. On 18 April, the price entered the area between both upper bands and stayed within those boundaries during the uptrend.

Due to the currency´s price pause on the uptrend, selling signals were triggered on 8[t] and 15 May. The first low reached the USD/JPY currency on the 9th and 12th and only tested the 1 standard deviation setup lower band, so no buying signal was triggered by the Bollinger Bands. On 15 May another weak signal was triggered as the 14[th´] candlestick closed beyond the 1 standard deviation setup, but the following day´s candlesticks closed in the *no man´s lan'*. This was not a very good signal but, by now, analysts might already have been suspicious that the price was having difficulty breaking the 103.0000 and 105.0000 psychological barriers.

On the 27th a buying signal was triggered and the price rose, breaking through the 105.0000 resistance level and remaining between the upper bands. At this point the bands started diverging as the upper ones followed the price up movement. Once the price reached the 108.0000 level, even closing beyond it, it was not able to keep the momentum and started to fall, triggering a selling signal on 20 June. The 1st semester finished with the price falling near the lower 1 standard deviation setup band and the bands converging, showing that the uptrend might be pausing.

Fig 9.3.4 USD/JPY, 1st Semester 2008, Bollinger Bands

Source: www.tradingview.com

The analysis made previously of the other currency pairs has shown that often there is nothing much to say about the RSI behaviour. During the 1st semester of the USD/JPY currency pair it was no different, as seen in Figure 9.3.5. Due to the trends that dominated this currency during this period, the RSI line did not trigger strong signals.

These factors do not mean that the RSI indicator is useless and that no information can be taken from it. For example, since the beginning of 2008, the RSI line was around the frontier to the oversold area as the price fell until it was stopped by the 106.0000 psychological support, confirming the loss in the downtrend momentum. After the price reached the 106.0000 level on 21 January, as it developed sideways the RSI line started rising to the middle of the *no man´s land* as the price bounced until it reached the 108.0000 level. It must be pointed out that after 13 February, when the price reached the 108.0000 psychological level, each time the price reached the same high, the RSI reached lower highs, hinting that the downtrend might be resumed.

The downtrend was actually resumed and as the price fell, the RSI line entered the oversold area days before the downtrend finished. On 17 March a real buying signal was triggered by the RSI line during the entire first semester. Afterwards, the RSI line followed the price uptrend.

Fig 9.3.5 USD/JPY, 1st Semester 2008, Relative Strength Index (RSI)

Source: www.tradingview.com

Figure 9.3.6 shows the CCI´s line started in 2008 deep in the oversold area as it came from a downtrend that had been ongoing for the past three months. A buying signal was

triggered on 9 January, right after a bullish hammer formed, but on the very next day the price fell again, returning to its original direction. By the time investors were waiting for some kind of confirmation, the price fell again, and taking in consideration that it happened after a steep fall of the price, it was extremely likely that it would only be a correction.

The CCI line maintained itself around the frontier to the oversold area until the 23rd, when the price bounced on the 106.0000 psychological support level and started to move up. Then it continued to rise, entering the overbought area on the same day the price reached the 108.0000 resistance area. The CCI line started to drop much quicker than the price until a selling signal was triggered on the 19th, but, on the next day, it entered the overbought area again only to trigger a selling signal on the 21st. As the price kept falling, the CCI line followed it deep into the oversold area, where it remained for quite a long time. Some small corrections happened until the price reached its lower low on the 17th, confirmed by the CCI line, which signalled that it could really be the lowest low. This time the CCI line did not go as deep in the oversold area as the low this line reached on 29 February.

On 21 March a buying signal was triggered and afterwards, even with the bounce made by the price, the CCI line took an uptrend. During the following month it kept entering and exiting the overbought area as the currency pair´s price bounced during its uptrend. On 6 May, a selling signal was triggered when the price bounced on the 50% retracement level and fell to the 38.2% retracement level. This bounce would not have attracted an analyst´s eye if, on 9 May, the CCI line had not fallen to the middle of the *no man´s land*. The previous bounces did not have the same effect on the CCI line, pushing it to a lower low.

The high reached on 14 May was dangerous due to the fact that the peak reached by the price was lower than the one reached on the 2nd of the same month. The CCI line also casts doubts, as it only touched the frontier of the overbought area. Both price and CCI line seemed as if the USD/JPY was about to start a new downtrend due to the new low highs. The next trough reached on22 May, which was the same day that the CCI triggered a buying signal, complicated the analysis even more. This was due to the divergence between the price and the CCI line as the indicator´s line reached a lower low and the price did not. This last bounce had too many divergent factors to consider opening a position, and the currency pair was too unstable.

On 2 June a selling signal was triggered, a day after a Doji Star was formed, which consists of a known reversal pattern. However, this correction did not last long as, on the following

day, the price rose again to test the 105.0000 level, which was also the 50% retracement level. On 16 June another price bounce started as the price reached the 108.0000 level. The price fell quite softly after reaching the resistance but the CCI line fell, triggering a selling signal on the 18th. By the end of July the CCI line was reaching the frontier to the oversold area and the price testing the 50% retracement level.

Fig 9.3.6 USD/JPY, 1st Semester 2008, Commodity Channel Index (CCI)

Source: www.tradingview.com

Figure 9.3.7 shoes the CCI line plotted on the chart and, due to the steep fall in the JPY/USD in the beginning of 2008, the MACD´s MAs were diverging as the price fell, despite the minor correction that took place. But on the 22nd, as confirmed by the histogram, , the MAs started to converge and show less strength on the Japanese Yen´s side. This loss in momentum occurred on the first bounce made by the currency pair´s price after it reached the 106.0000 level. A buying signal was triggered on 28 January due to the pause in the downtrend during the end of January and almost the whole month of February. The selling signal that confirmed the downtrend resumption was triggered on 27 February. As the price did not reach the psychological resistance and bounced back, the histogram did not trigger a clear signal. The signal existed but it was difficult to indicate when it was triggered because it kept falling and rising.

After the downtrend´s lowest low was reached, on 17 March, the MACD´s histogram triggered a signal of momentum loss on the next day, which was a warning to the buying signal triggered by the MAs on the 25th. Once the 23.5% resistance was broken by the price, the MAs started to diverge and rise above the zero line, indicating that an uptrend

was ongoing. After the price resumed the uptrend converging with the MACD´s Mas, it only stopped on 2 May as the price reached the 50% retracement level. A selling signal was triggered on 8 May.

As the currency pair´s price moved sideways, both MAs approached the zero line until a buying signal was triggered on 29 May and started rising again, diverging and moving away from the zero line. There is still a last correction before the end of the 1st semester, which originated a selling signal triggered on 24 June.

Fig 9.3.7 USD/JPY, 1st Semester 2008, Moving Average Convergence Divergence (MACD)
Source: www.tradingview.com

The 2nd semester, shown in Figure 9.3.8, started with a lower low than the one reached by the end of June, s usually a sign of loss in the momentum´s trend. If the USD/JPY was to maintain the uptrend, it would not have reached a lower low than the one reached in the previous correction. From this low an uptrend dominated the currency pair as the USUSD gained strength, until it reached the 110.0000 level.

A strong downtrend began, as Figure 9.3.9 indicates, through the SMA and EMA, after this psychological resistance was reached due to fundamental factors. The downtrend was quite steep during the following four months, but, like any trend, some corrections occurred due to the support areas reached by the price, like psychological barriers and Fibonacci Retracements. On 16 September, the 104.0000 level made the price stagnate for some time before resuming the trend and breaking this level. The 99.0000 level, which was the same

as the 50% retracement level, also prevented the price from falling, making it bounce back to the 102.0000 level. The biggest correction occurred when the currency pair´s price reached the 23.6% retracement level. For the first time on 24 October, the price tested a few pips beyond the 91.0000 level and closed much higher than the retracement level; the second time, on the following day, the 25th, the price only tested the 91.0000 level and closed on the 23.6% retracement level; finally, on the 28th, the price crossed a few pips the 23.6% retracement level and bounced back to the 98.0000 level. All already referred psychological levels or retracement levels are areas where the price found support as it kept on falling and bouncing on each level. The downtrend reached its lowest low on 17 December and ended in 2009 bouncing from this low.

Fig 9.3.8 USD/JPY, 2nd Semester 2008, Fibonacci Retracements

Source: www.tradingview.com

Fig 9.3.9 USD/JPY, 2nd Semester 2008, SMA and EMA

Source: www.tradingview.com

The market corrections that reached theirs lows on 27 October and 17 December formed
the same candlestick pattern, engulfing pattern. Figure 9.3.10 shows a zoom made of the
period when both patterns formed and they are marked with a blue circle. The engulfing
pattern is a well-known reversal pattern that consists in a second candlestick´s body being
bigger than the complete first candlestick. On both scenarios the patterns formed in a
situation of change in the USD/JPY´s price direction.

Fig 9.3.10 USD/JPY, 2nd Semester 2008, Engulfing Patterns

Source: www.tradingview.com

On 3 July the price broke the lower 1 standard deviation setup, triggering a buying signal before it bounced again reaching a new low. When this low was attained, on the 16th the price rose, triggering a good buying signal on 17 July. The uptrend that lasted until 19 August, when the selling signal was triggered, developed within the upper bands.

During the downtrend the buying signals that were triggered were not good ones because analysts would have concluded that it was only corrections made to the currency pair´s price. The technical reason for this is that the buying signals were mainly triggered after the price bounced off either at a psychological support or at a Fibonacci´s retracement. The buying signal triggered on 22 December could also have been a weak signal but, once the price started to rise on 31 December and reached the area between the upper bands, it signalled that the trend could have met its end on the 17th low.

Fig 9.3.11 USD/JPY, 2nd Semester 2008, Bollinger Bands

Source: www.tradingview.com

As expected, due to the dominance of a downtrend through almost the entire 2nd semester, the RSI indicator did not trigger any obvious signals. On 8 October a buying signal was triggered due to the correction made for some days. On 24 October the same happened and, at last, the lowest low also triggered a buying signal on 17 December.

After the correction that reached its low on 24 October there was a slight divergence between the RSI line and the price. The price kept falling but the RSI line developed between two channels until 12 December, when both converged again and fell for the last

time in this downtrend. The slight divergence between the price and the MACD´s line shows that the downtrend was already losing momentum at that point.
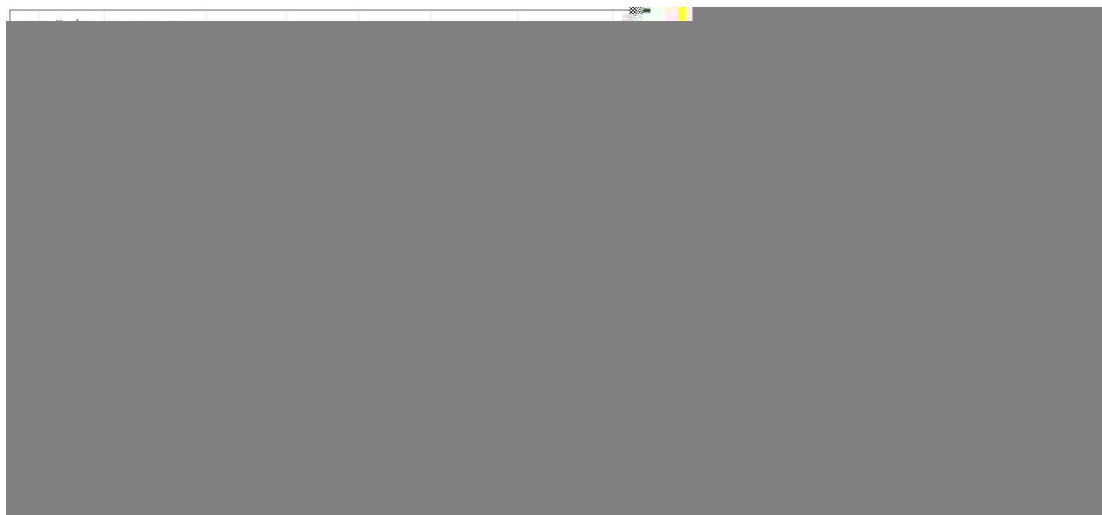
Fig 9.3.12 USD/JPY, 2nd Semester 2008, Relative Strength Index (RSI)

Source: www.tradingview.com

The already analysed new low reached on the 16th originated a buying signal on the following day. This was also the low where an uptrend started that lasted until the middle of August, when the Japanese Yen started gaining strength, pushing the currency pair´s price down. During this period the CCI line entered and exited the overbought area a few times until it triggered the biggest selling signal on 18 August. The movement that occurred on the CCI line after that selling signal showed that a change in trend might happen soon.

Quickly it reached the oversold area and started the typical in-and-out movement around the oversold area frontier. Most of the buying signals that had been triggered were cancelled the following day by a fall in the CCI line. The first good buying signal was triggered after the 24th low, on the 28th, but it did not last long because once the price reached the 100.0000 level it resumed the downtrend and the CCI line´s behaviour returned to the usual when the currency pair is trending downwards. On 17December, the day when the downtrend ended, the CCI line also reached its low and bounced back until a buying signal was triggered on 22 December. It would be nerve wrecking opening a long position

when this signal was triggered due to the testing of the 90.0000 level that occurred over the next days before rising.

Fig 9.3.13 USD/JPY, 2nd Semester 2008, Commodity Channel Index (CCI)

Source: www.tradingview.com

The second semester started with both MAs above the zero line as the price rose near the end of the first semester, but during the first two weeks of July they got near this line, showing some loss in the momentum. On 23 July a selling signal was triggered and it was a good one since the price rose in the following month. This uptrend ended with the histogram showing a loss in momentum on 12 August and the confirmation given through the selling signal triggered on the 20th of the same month. It must be noticed the MAs started to approach the zero line and broke through it into the negative area, thus confirming the downtrend.

After this selling signal the MAs started to diverge, a sign of strength in the ongoing price movement, in this case with everything pointing to a downtrend. The MAs started to converge before the market corrections started to be made. The first weak signal to be triggered took place on 25 September as a small pause stagnated the currency pair´s price between the 102.0000 and 108.0000 levels. The buying signal triggered on 17 October had the same conditions, and at this point it is important to differentiate between a possible change in trend and a market correction.

On the last day of October another buying signal was triggered and for the next two days it was possible to profit from it despite the fact the it was triggered a couple of days after the perfect moment. From 11 November until the selling signal triggered on 1 December, there

was a lot of noise on the MAs values but again there was a slight divergence between the price and the technical indicator. Even with the price clearly falling, the MAs remained horizontal before falling after the 1st of December´s selling signal. This is the signal that the momentum of the downtrend has been lost and its end might be near.

On 18 December, a day after the downtrend reached its lowest low, the MACD´s histogram showed loss in momentum and a buying signal was triggered three days later, on the 23rd. Both MAs started to diverge and, most importantly, they began rising in the zero line direction, which shows that the downtrend might be really over.

Fig 9.3.14 USD/JPY, 2nd Semester 2008, Moving Average Convergence Divergence (MACD)

Source: www.tradingview.com

10. Conclusions

Technical Analysis bases its tenets on prior movements made by the asset´s price past behaviours to predict future movements. Since the 18th century, when technical analysis was born in Japan, technical analysts have been observing the market and trying to catalogue some patterns that occurred during similar occasions. For over 200 years, some rules have been created using different technical tools and indicators that trigger selling or buying signals. The result is a set of rules that, in a way, simplify market analyses and opportunities for profit to a point that investors do not need to know anything about finance and financial markets. They just need to wait for different variables to be arranged in a pre-determined way to be able to open a position.

Charles Dow, the mentor of Technical Analysis, created five tenets to support his theory and, as a matter of fact, they ended up proving to be valuable tools for market analysis. The first one was that prices discount everything. Whereas this is absolutely true, to some extent it is not technical because prices discount fundamental events. A price does not change direction just because the RSI, for example, is triggering signals that the asset is oversold or overbought. The trend changes because, after analysing the fundamental indicators that are issued, market actors change their minds and expectations. The second tenet is that the market drives itself through three possible trends and this is a valuable starting lesson for both fundamental and technical analysts. The third tenet states that the market has three phases, the accumulation phase, the public participation phase and the distribution phase. It is also very useful for technical analysts when they see a new trend forming because they can expect different types of behaviours from the price depending on which phase it is at. The fourth tenet relates more to stock indexes than to the foreign exchange market, as it says that averages must confirm each other. However, it does not mean it is not useful to technical analysis because even without averages that are directly related to the currency pairs as they are to stocks, the indexes of each country, which include the major companies, can be related to the behaviour of its currency. Finally, the fifth tenet is based on a technical factor: volume. It states that volume must confirm the trend but as it is known, on Forex charts there is not a volume indicator as in the stock charts. Through time t some volume indicators have been created but they are not as reliable as the one used in the stock market. So even with his strong contribution to technical analysis, Charles Dow had to base himself on some fundamental aspects to support his theory.

Tools like support levels, resistance levels, and trendlines are useful when analysing the market from a technical viewpoint because they are directly related to fundamental behaviours. Support and resistance levels are areas where the contrary forces of the ongoing trend strengthen and stop the price from developing. This shows that even with one of the forces, bulls or bears, having control over the price's direction, there is a price level market actors believe to be the maximum or minimum value given to the currency price, or any other asset. These market actors are not only ones against the ongoing trend. There are also those who start to close their positions and change sides because they have the same conviction. This causes a loss in the trend's momentum. This category also includes the Fibonacci Retracements, which can be very useful and valid. However, when using this tool special attention must be paid to psychological levels because they tend to play a much more important role than retracement levels.

The analysis of each technical indicator using the EUR/USD, GBP/USD and USD/JPY pairs points to the conclusion that the signals they trigger are not triggered in a regular form. Their timing also varies. The analysis was made independently and according to the definitions of each indicator. The conditions needed to trigger a selling or buying signal were applied to 2008´s charts. Some combinations were even tested but no valid results were obtained.

The Bollinger Bands turned out to be quite good in certain situations due to their useful signals. However, results seemed to be better when used with the Fibonacci Retracements and taking into account the possible psychological support and resistance levels. The signals triggered were better and useful when the market was in a situation of high volatility. When the market had low volatility, as in the first semester of 2008 on the GBP/USD currency pair, the bands kept very close to each other and the price movements triggered a lot of quick signals. When the currency pair started moving upwards or downwards, the price usually developed within the two higher bands, in an uptrend, and within the two lower bands, in a downtrend.

The Relative Strength Index did not prove to be very useful due to the lack of signals triggered. The RSI was not very sensitive to price movements as it remained within the *no man´s land*. The few signals triggered were mainly during momentum loss of the ongoing trend.

On the other hand, the Commodity Channel Index triggered many more signals and was highly sensitive to price movements. Of course the sensitivity of this indicator can be dangerous due to the weak signals triggered, especially when the price is trending up or down. When the price was in an up or downtrend the CCI line moved around the overbought or oversold areas, triggering many signals that were not quite valid because they were consequences of a simple market correction. The best signals were triggered during sideway trends.

The last and most complex indicator tested was the Moving Average Convergence Divergence. This indicator has three factors that must be observed when analysing the market: the moving averages, the histogram and the position of these moving averages according to the zero line.

Due to its moving MA, the signals are triggered with some delay regarding the moment the price starts moving. There were periods when the buying or selling signal was triggered so late that the price had already changed its behaviour. Besides the delay in the signals, the MAs also had the characteristic of diverging and converging depending on the trend´s momentum. This is very useful to confirm that a new trend is born, as seen on the second semester of each currency pair when the markets started to fall. It also gives a warning sign as it signals that the momentum is being lost earlier than the MAs. With the MAs triggering late signals related to the price movement, the histogram shows immediately that the momentum is being lost and that analysts must pay extra attention to the price and MAs movements in order to open a position to profit. There is also another useful tool to analyse a trend´s direction, which is the zero line. The distance between the MAs and the zero line gives a good indication of the trend´s strength, and the behaviour of the same MAs according to this line has good results when confirming a change in the trend's direction. The results obtained from the analysis of the indicator´s behaviours and signals triggered, as well as of all the other available tools, exposed the flaws of using Technical Analysis as the only instrument to study and predict the Forex market. The signals triggered by the various indicators were irregular in relation to the price movements. The currencies pairs' price does not develop in a straight line and market corrections and whipsaws are always happening. These movements are peaks and troughs that occur during the trend due to momentum losses or reactions to an event that strengthens the opposite force but they are not strong enough to change the major trend. The indicators' reaction to these corrections or whipsaws is mostly identical to the reaction to a trend change, making it difficult for

analysts to determine if it is a valid signal or not. For this reason, the advice is to always wait for repeated confirmation. On the other hand, the analysis of 2008 shows that the confirmation sometimes arrives too late, when the price is already changing direction, thus preventing investors from profiting from it.

While researching and preparing this dissertation some fundamental concepts were examined, enabling testing two approaches: fundamental and technical analysis.

Technical analysis seems to be an easy approach that will give results due to the way it has been being presented throughout the Internet. The simple criterion in these tools is that investors must wait and blindly open their positions according to the type of signal triggered. However, when all these tools start to be used on market charts, this leads to frustration as results start to be worse than expected. The fact that Technical Analysis is based on past movements and behaviours limits its results.

It is true that market actors have similar reactions to similar events, but the effect on the currency pairs can be different due to the surrounding factors that condition it. For example, when the ECB decided to lower the interest rate, the expectations were that the EUR/USD currency would fall due to change in interest made by the market actors. Yet, what really happened was that the currency pair started to move sideways because, from the beginning of May when the ECB hinted that it would change the interest rate, the market started reacting to the news.

The conclusion is that technical analysis is not completely useless because it has a lot of tools, which, if appropriately used, can generate good results. One of these tools is Fibonacci Retracements, in conjunction with the psychological price barriers. This approach must not be the main tool used to analyse the Forex market because fundamental events have much more impact on the currencies. It should be used in a short-term analysis, and also to confirm, or not, some idea.

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Appendix

Appendix 1- Figures
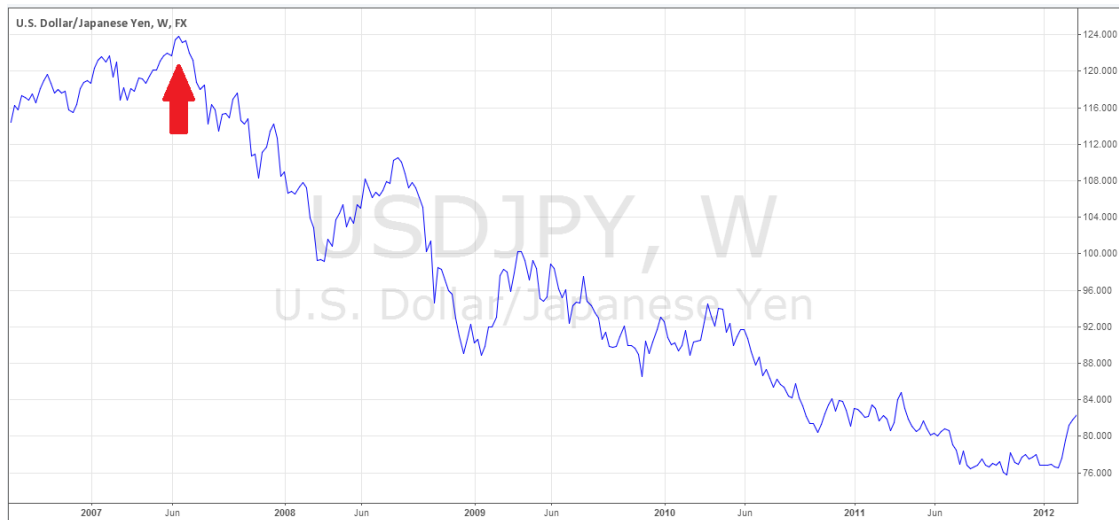
Fig. 1.1 Market Action Discount Everything

Fonte: www.tradingview.com

Fig. 2.1 Forex Market Hierarchy

Source: http://t7foundation.org/learning-center/introduction/market-structure-players/

6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5

London (8–17)

New York (13–22)

Sydney (22–7)

Tokyo (24–9)
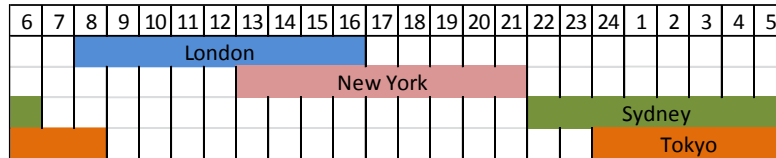
Fig. 2.2 Forex Market Hours (GMT)
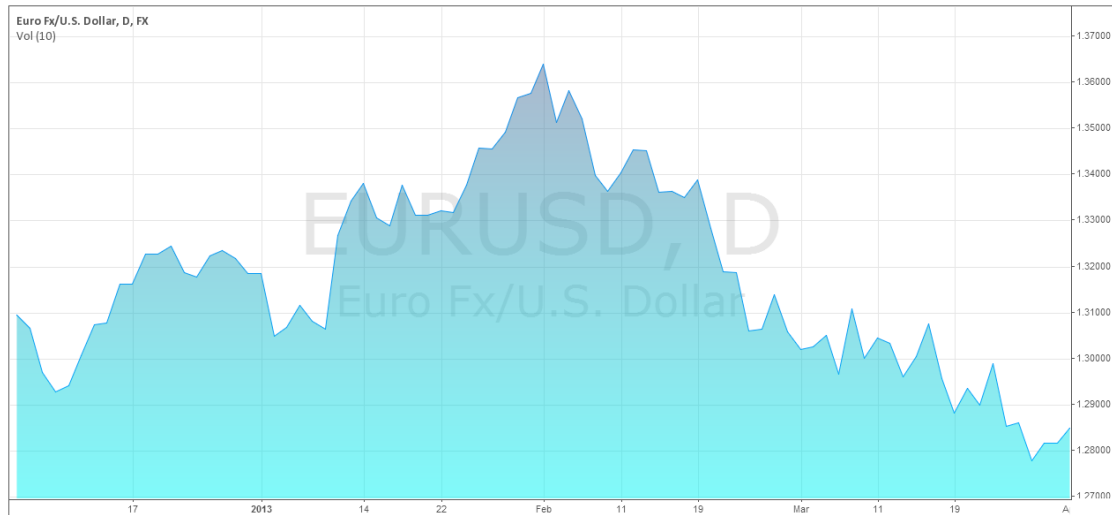
Fig. 2.3 Currency Pair Quotation

Source: www.tradingview.com

Fig 5.1.1 Candlestick Chart

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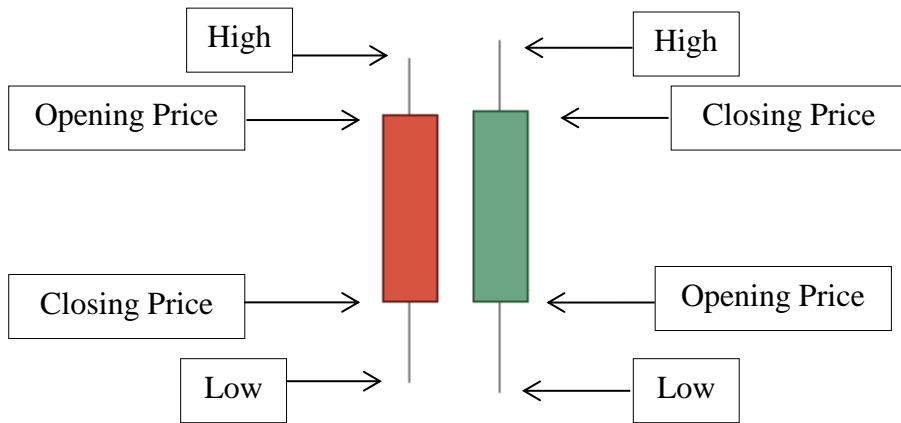
Fig 5.1.2 Candlestick

Source: www.tradingview.com

Fig 5.2.1 Bar Chart

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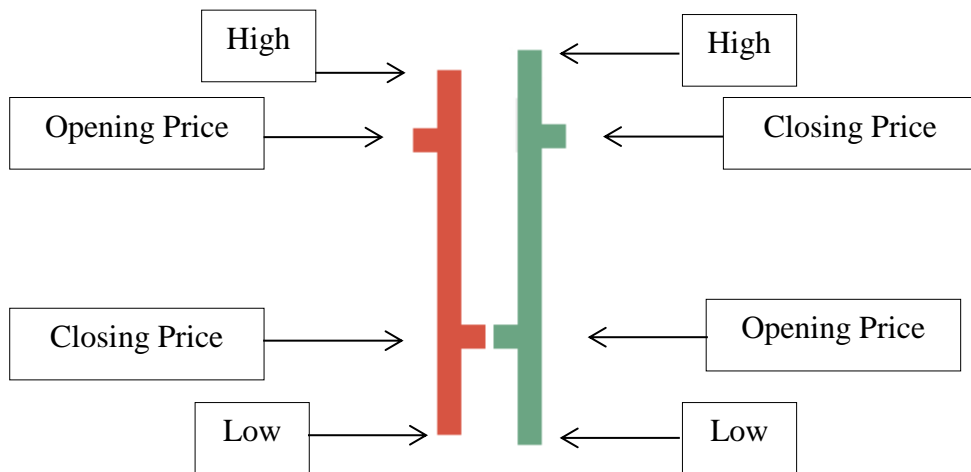
Fig 5.2.2 Bar Figure

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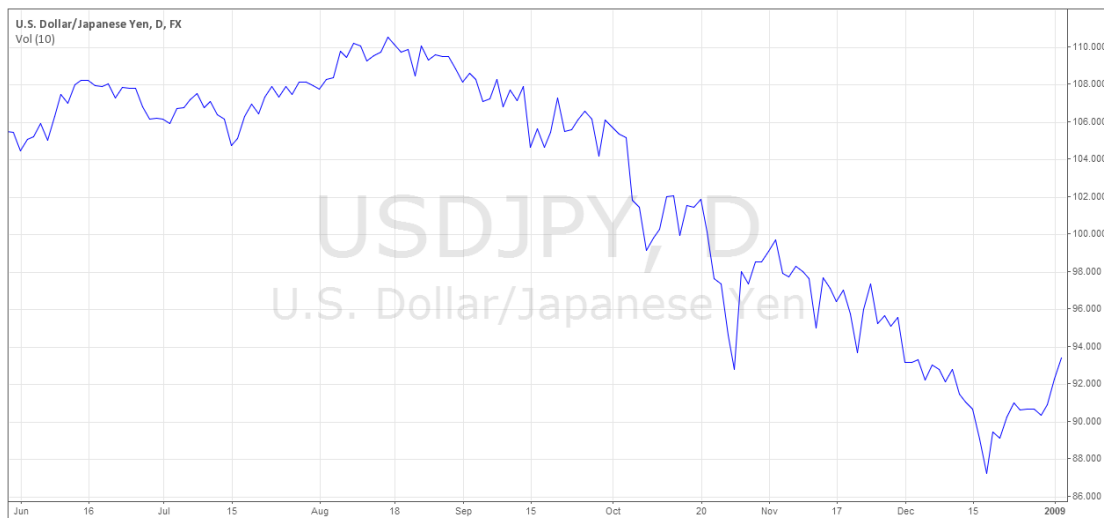
Fig. 5.3.1 Line Chart

Source: www.tradingview.com

Fig. 6.2.1 EUR / USD

Source: www.tradingview.com

Fig. 7.1.1 EUR/USD Trend

Source: www.tradingview.com

Fig. 7.1.1.1 GBP / USD Uptrend

Source: www.tradingview.com

Fig. 7.1.1.2 USD/JPY - Downtrend

Source: www.tradingview.com

Fig. 7.1.1.3 EUR/USD – Sideways Trend

Source: www.tradingview.com

Fig. 7.2.1 GBP/USD - Support Areas

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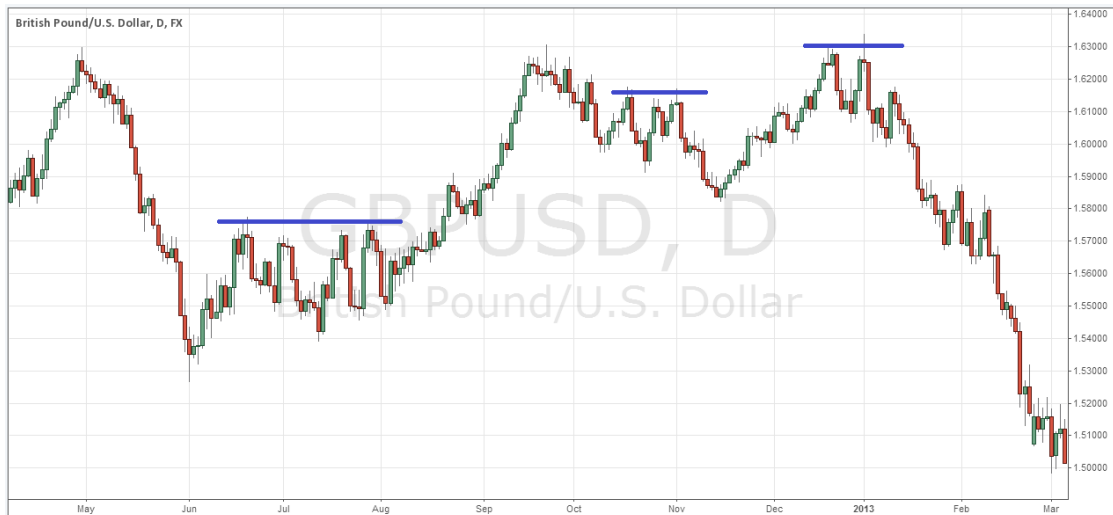
Fig. 7.2.2 GBP/USD - Resistance Areas

Source: www.tradingview.com

Fig. 7.3.1 EUR/USD – Trendline

Source: www.tradingview.com

Fig. 7.3.2 GBP/USD - Trendline Reversal

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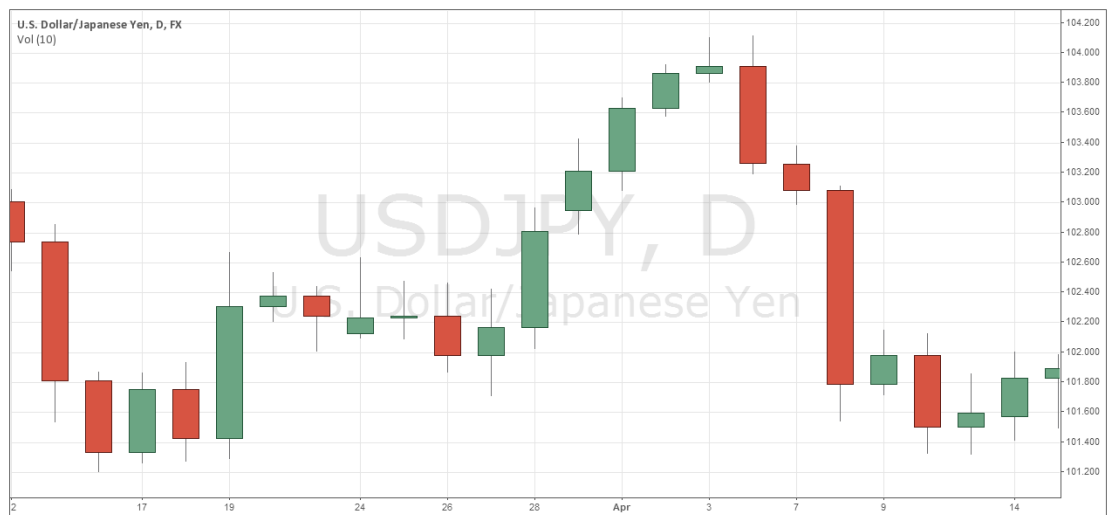
Fig. 7.4.1 USD/JPY - Price Gap

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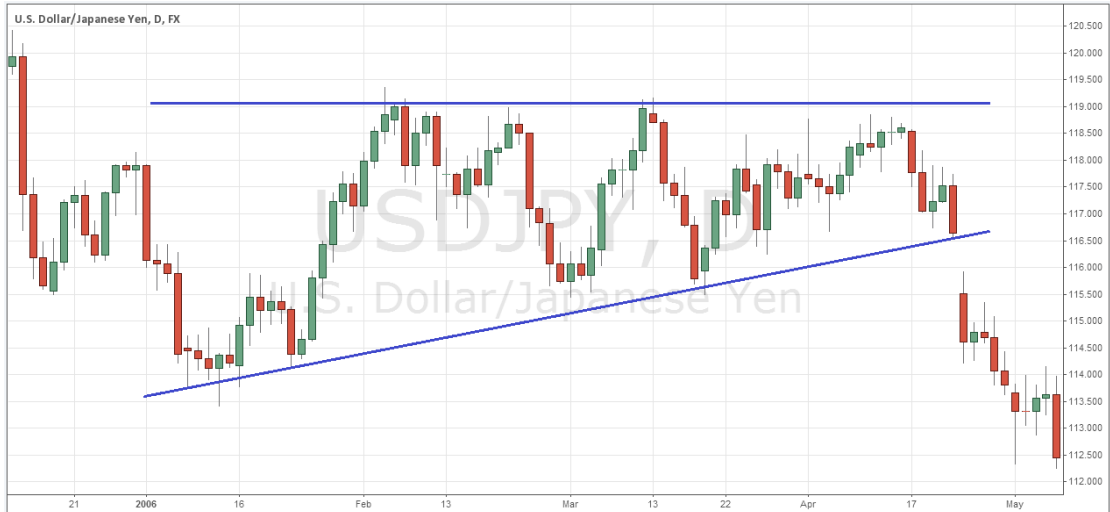
Fig. 7.4.2 USD/JPY - Breakaway Gap

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Fig. 7.5.1 EUR/USD Fibonacci´s Retracements

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Fig. 7.6.1 Normal reversal

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Fig. 7.6.2 V-Type Reversal

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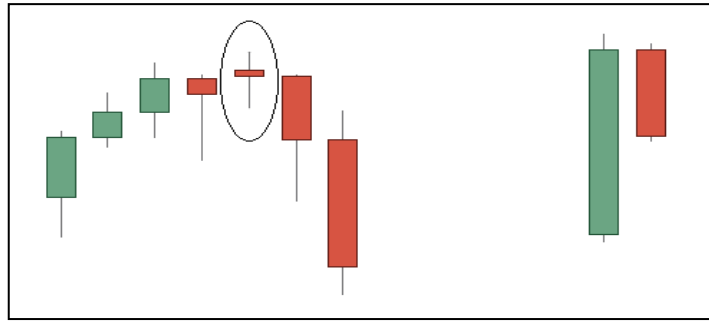
Fig. 7.6.3 Simple Price Pattern

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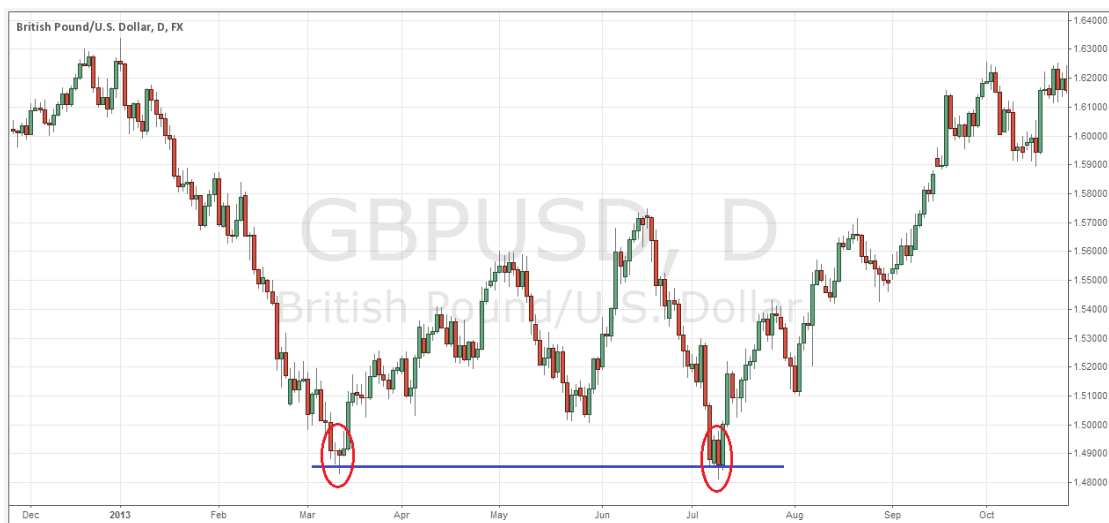
Fig. 7.6.4 Complex Price Pattern

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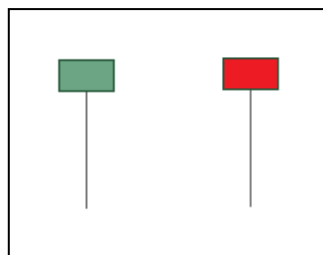
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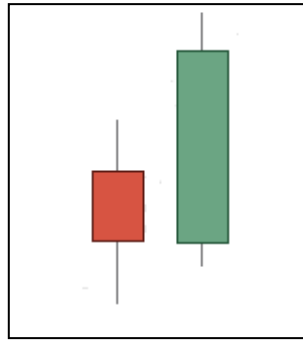
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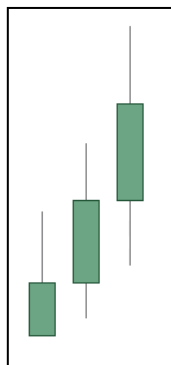
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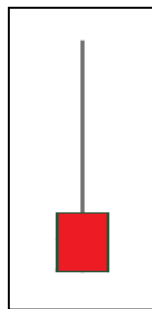
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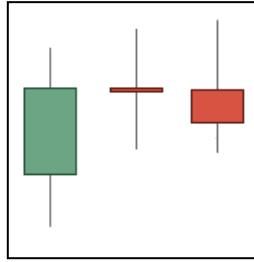
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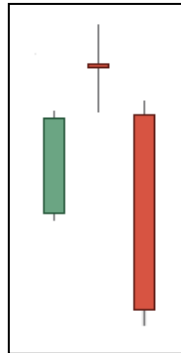
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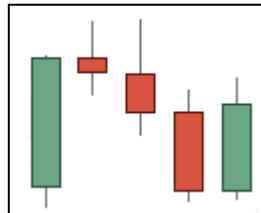
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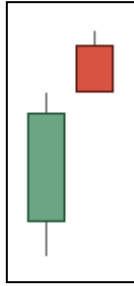
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Fig. 7.6.1.3.2.2 In Neck Line

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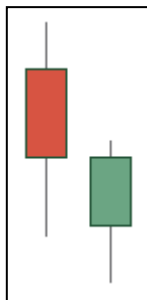
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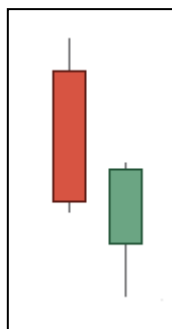
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113
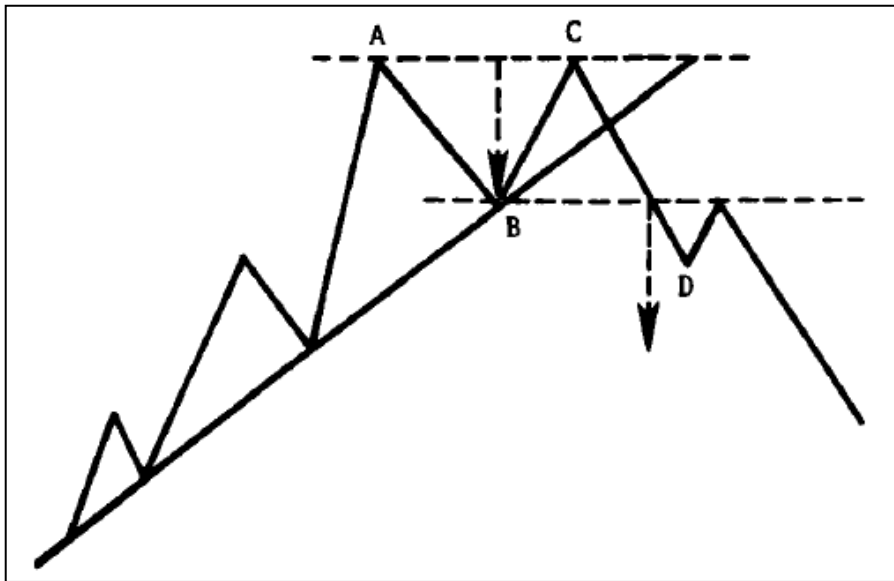
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Source: Murphy (1999: 118)
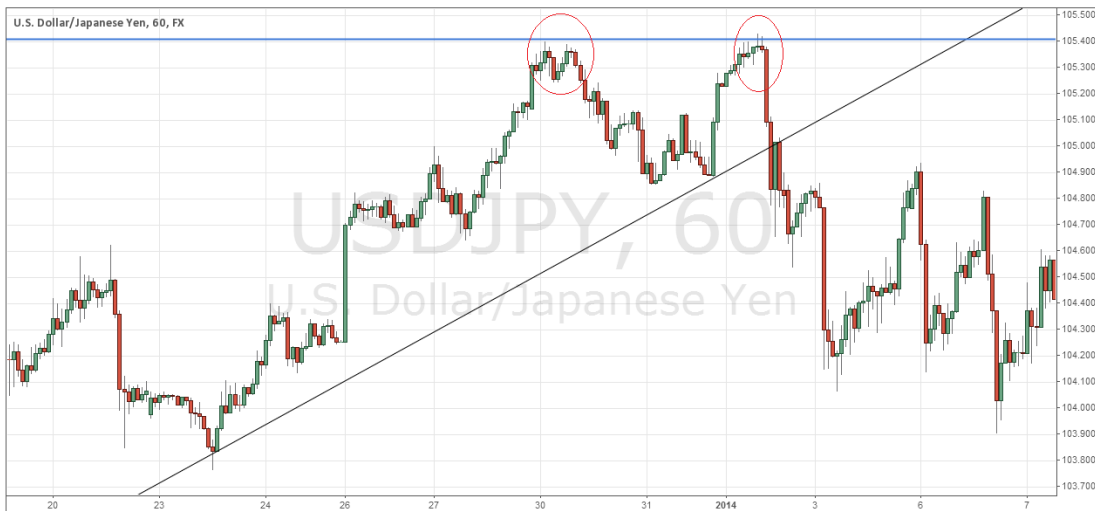
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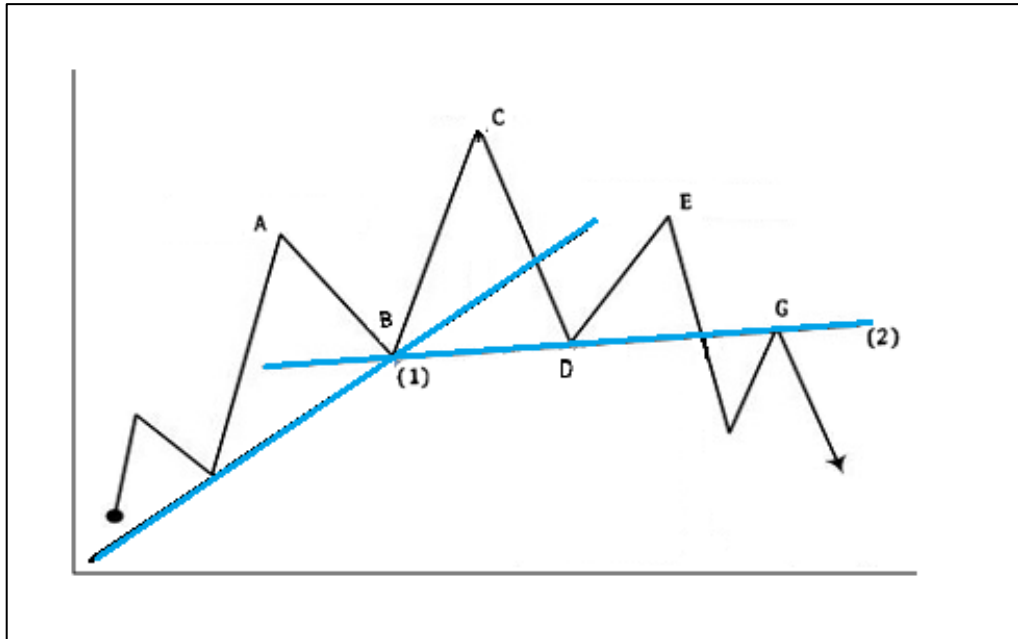
Fig 7.6.2.1.2.1 Head and Shoulders

Source: Adapted from http://econintersect.com/b2evolution/blog3.php/2013/09/14/apple-has-a-neckline-problem

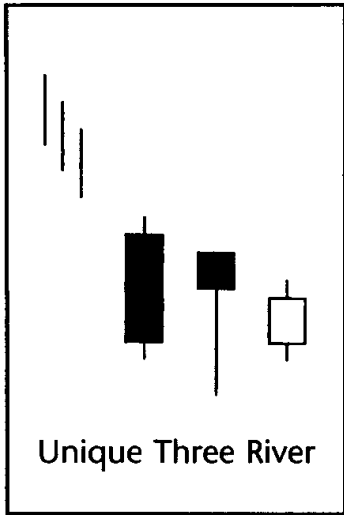**Fig 7.6.2.1.2.2** Head and Shoulders

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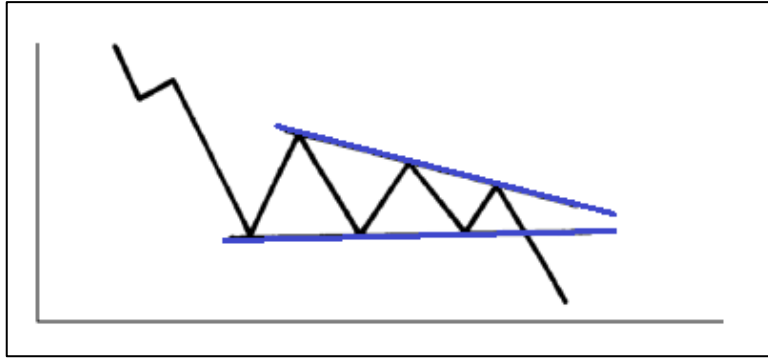
Fig 7.6.2.2.1.1 Symmetrical Triangle

Source: Adapted from Murphy (1999: 132)

Fig 7.6.2.2.1.2 Symmetrical Triangle

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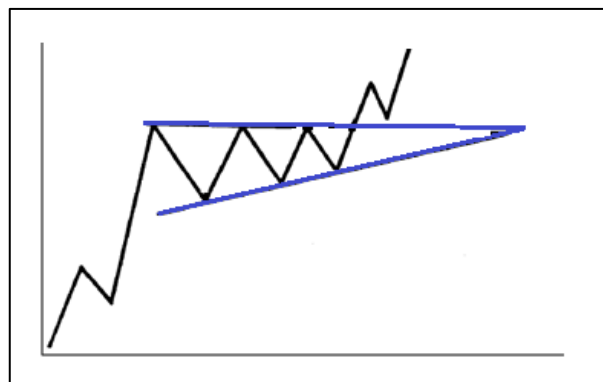
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Source: Adapted from Murphy (1999: 136)
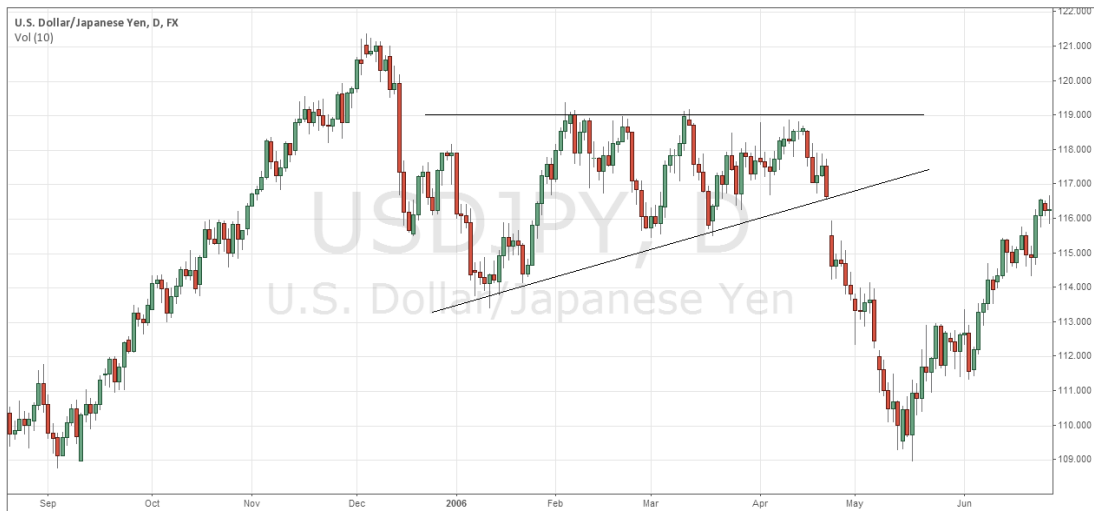
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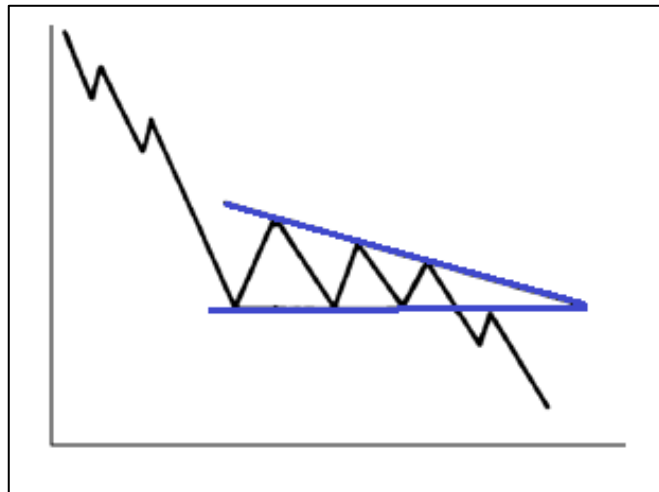
Fig 7.6.2.2.1.5 Descending Triangle

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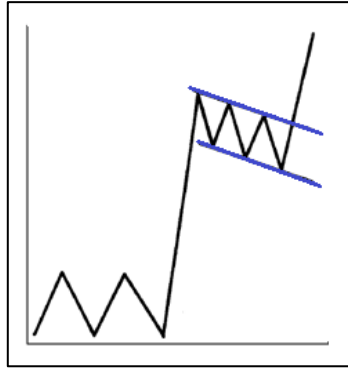
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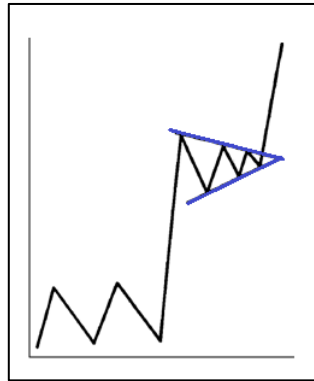
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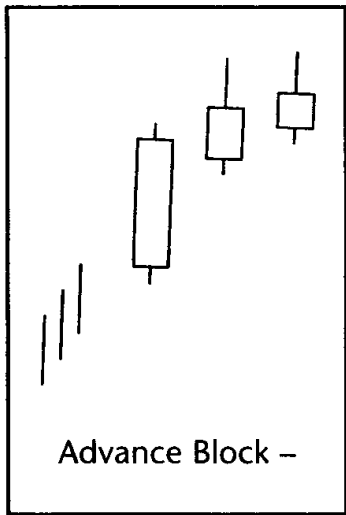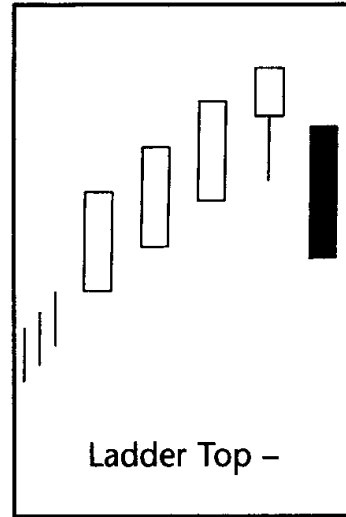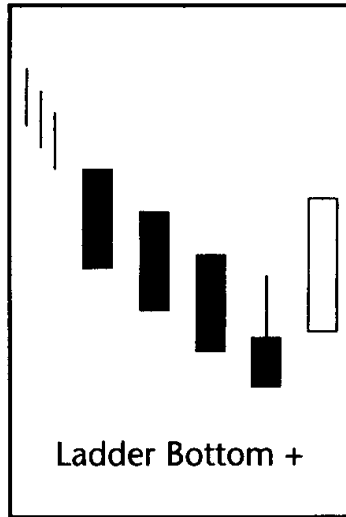**Source:** Adapted from Murphy (1999: 143)

Fig 8.1.1.1 20 Periods Simple Moving Average – EUR/USD

Source: www.tradingview.com

Fig 8.1.2.1 20 Periods Exponential Moving Average – EUR/USD

Source: www.tradingview.com
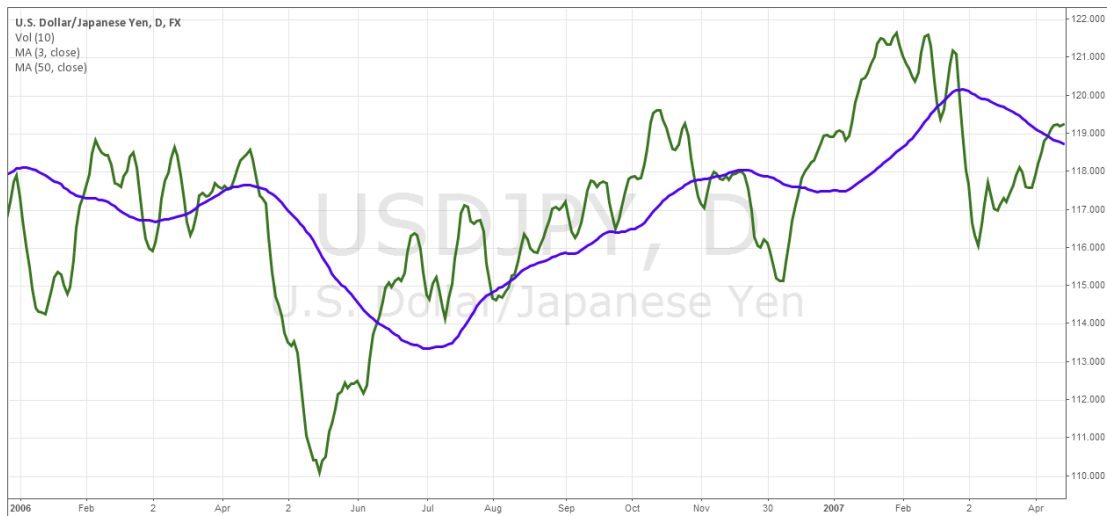
Fig 8.1.2.2 Moving Average Crossover System

Source: www.tradingview.com

Fig 8.1.3.1 Bollinger Bands

Source: www.tradingview.com
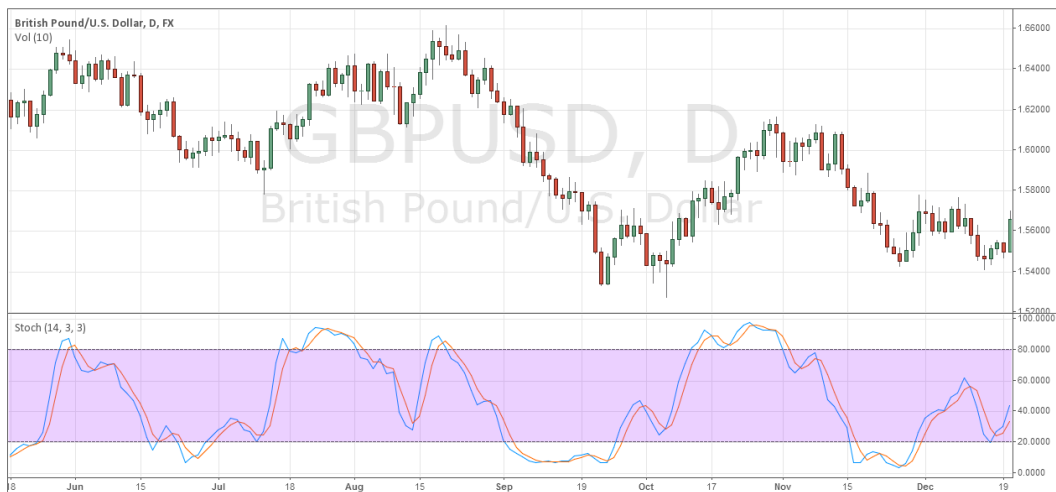
Fig 8.2.1.1 Stochastics

Source: www.tradingview.com
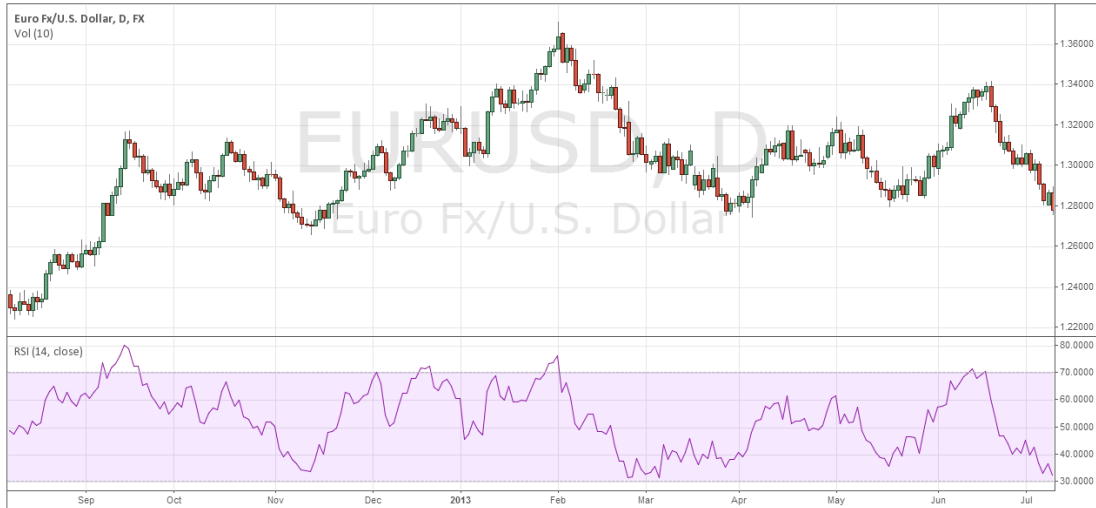
Fig 8.2.2.1 Relative Strength Index

Source: www.tradingview.com

Fig 8.2.3.1 Commodity Channel Index

Source: www.tradingview.com
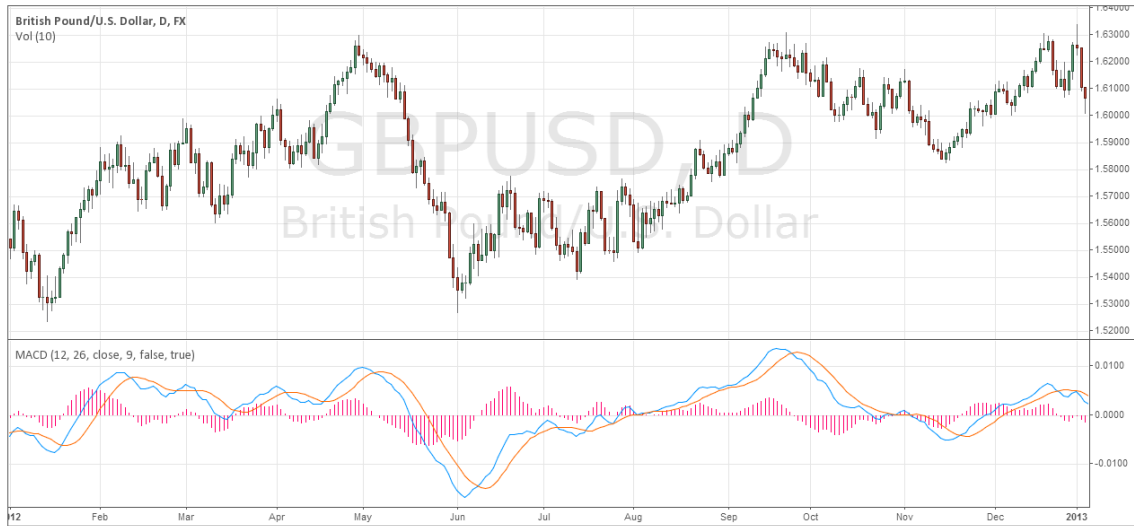
Fig 8.2.4.1 MACD

Source: www.tradingview.com

Appendix 2 – Candlestick Patterns

Hammer +

Hanging Man –

Inverted Hammer +

Shooting Star –

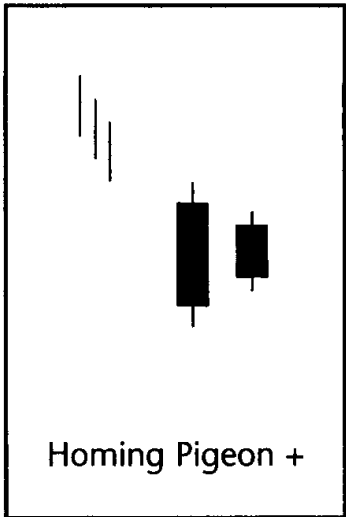**Belt Hold +**

Belt Hold –

Engulfing +

Engulfing –

Harami +

Source: Adapted from Murphy (1999: 310)

Harami –

Harami Cross +

Harami Cross –

Piercing Line +

Dark Cloud Cover –

Doji Star +

Doji Star –

Meeting Line +

Meeting Line –

Source: Adapted from Murphy (1999: 311)

125

Three White Soldier +	Three Black Crows –	Morning Star +
Evening Star –	Morning Doji Star +	Evening Doji Star –
Abandoned Baby +	Abandoned Baby –	Tri-Star +

Source: Adapted from Murphy (1999: 312)

Tri-Star –

Breakaway +

Breakaway –

Three Inside Up +

Three Inside Down –

Three Outside Up +

Three Outside Down

Kicking +

Kicking –

Source: Adapted from Murphy (1999: 313)

Unique Three River

Three Stars in the South +

Concealing Baby Swallow +

Stick Sandwich +

Identical Three Crows –

Deliberation –

Matching Low +

Matching High –

Upside Gap Two Crows–

Source: Adapted from Murphy (1999: 314)

128

Homing Pigeon +	Ladder Bottom +	Ladder Top –
Advance Block –	Two Crows –	Separating Lines +
Separating Lines –	Rising Three Methods +	Falling Three Methods –

Source: Adapted from Murphy (1999: 314)

129

Upside Tasuki Gap +

Downside Tasuki Gap −

Side by Side White Lines +

Side by Side White Lines −

Three Line Strike +

Three Line Strike −

Upside Gap Three Methods +

Downside Gap Three Methods +

On Neck Line +

Source: Adapted from Murphy (1999: 315)