The Suspension of Disbelief
The Myth of Market Memories

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Declaration

I declare that all work within this thesis is my own work and that none of it has been copied or taken from any copyrighted source other than where specified within content of research.

Dedication

I dedicate my thesis to my parents for their continuously support throughout the duration of all my studies. Their love, faith, encouragement, and financial support have helped me to complete this thesis despite any difficulties.

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Table of Content

Chapter Three Literature Review
Modern investment theories and the analysis of stock markets **29**

Chapter Four Literature Review
The magic of candlestick charting **63**

Chapter Five Research Methodology **93**

List of Figures

Figures **Page Number**

List of tables

List of Appendices

Abstract

Although the Efficient Market Hypothesis dismisses the idea that markets have a memory, technical chartists continue to believe that markets can react in similar ways to similar past events. One of the methods of technical analysis commonly used is candlestick charting.

The objective of this thesis is to investigate whether or not candlestick charting can be used to predict stock market price movements. This research is in both a quantitative and qualitative form and seeks to establish whether the signals released by candlestick charting could have helped investors to earn abnormal returns over the 25 year period from 1984 to 2008. The FTSE100 index has been chosen to represent the UK stock market as a whole. The month of May has been chosen because in this month the stock market exhibits a high volatility. The quantitative analysis is based on the use of a statistical correlation analysis which is applied both to particular candlesticks and to candlestick patterns. Interviews have also been conducted with financial professionals to gain a qualitative insight into their attitudes towards candlestick charting.

A literature review is included to provide a comprehensive overview of the relevant literature in order to develop an understanding of previous work in the field of stock market performance prediction theories.

The research suggests that candlesticks and candlestick patterns are not correlated with the movements of share prices, and therefore cannot be used to earn abnormal returns. Candlestick charting can only show stock market reversals and can provide early turning signals. Candlesticks appear to be popular as a result of their "magical" properties in helping investors overcome their fears of the market.

This research adds significantly to the understanding of the limitations of technical market analysis and also lends support to the Efficient Market Hypothesis.

Chapter 1 Introduction

1.0 Objectives of the thesis

The objective of this thesis is to perform a comprehensive examination of the reaction of stock markets to information signals. In particular, an investigation has been carried out into the well-known method of "*candlestick charting*" to determine whether or not candlesticks can be used to predict stock market changes. This study is based on the data derived from the last 25 years of stock market performance during the month of May. This research seeks to show whether or not candlestick charting is a reliable guide to predicting future prices or whether its use has evolved into a form of financial magic.

The specific research objectives are:

(1) To evaluate various signaling effects on changes in stock market prices in the period from 1984 to 2008.

(2) To interpret the signals released by candlestick charting against the performance of stock market prices in the given period.

(3) To analyse the relationship between candlesticks and (the events of) major stock market price movements.

(4) To attempt to provide extended quantitative evidence of the reliability of candlestick charting in terms of predicting the movements of stock prices.

(5) To try to explain the popularity within the financial community of candlestick Charting.

(6) To draw some conclusions and add further support to the theory of market efficiency in finance.

This study has been motivated by an interest in re-examining a hitherto dominant paradigm----the Efficient Market Hypothesis (EMH). Many researchers have argued that initial confidence in the Efficient Market Hypothesis might have been misplaced and there is growing dissatisfaction among academic researchers with the body of literature based upon assumptions of market efficiency.

Various anomalies and inconsistent results have been identified which call for a refinement of the existing paradigm. Researchers have repeatedly challenged the studies based on EMH by raising critical questions such as: "Can the movement in prices be fully attributed to the announcement of events?" Roll (1988) argues that most price movements of individual stocks cannot be traced to public announcements. Cutler, Poterba and Summers (1989) reach similar conclusions. More recently, Haugen and Baker (1996) suggest that "none of the factors related to sensitivities to macroeconomic variables seem to be important determinants of expected stock returns." The current debate(s) between proponents of EMH and critics of EMH provide different explanations for market behaviour. Fama and French (1995) insist that predictability results from a time-varying equilibrium and that the expected returns generated by rational pricing in an efficient market (that) compensate for the level of risk undertaken. La Porta (1996), Lakonishok, Shliefer, and Vishny (1994) argue that the predictability of stock returns reflects psychological factors, social movement, noise trading, and fashions or "fads" of irrational investors in a speculative market. Their studies and tests suggest that movements in stock prices cannot be attributed merely to the rational expectations of investors, but also involve an irrational component.

More recent research has attempted to demonstrate the persistence of anomalies on the basis of a psychological perspective. Research into investor behaviour in the stock markets is expanding rapidly with very surprising results and evidence. Hirshleifer and Shumway (2001) demonstrate that distance, language, and culture influence investor behaviour. Huberman and Regev (2001) present an example of *how* and not *when* information is released, can cause stock price reactions.

The Efficient Market Hypothesis states that all publicly available information must be reflected in stock prices. Much finance literature relies on the assumption of market efficiency because, in its absence, investors could earn abnormal profits while assuming little or no risk, a state that cannot sustain equilibrium. But in real market practice, investing institutes and individual investors use technical analysis as a means of capitalizing on identifiable price patterns that stem from investors' repetitive behaviour. Academics historically have dismissed technical analysis because it is inconsistent with one of the most fundamental theories in traditional finance – the theory of market efficiency. If markets are indeed efficient then technical analysis, which relies heavily on publicly available past price, volume data, and other data, such as accounting data about companies' financial performance, cannot predict future prices. But if investors' use of technical analysis is well-founded, then QED markets must be inefficient. Alternatively, if markets are efficient, then it seems that the investment community wastes an enormous amount of resources on gathering information signals for technical analysis.

Based on the above arguments, this research examines the claim that the use of signaling effect analysis can help investors identify the future movements of stock prices. The study focuses on examining the reliability of candlestick charting which is a commonly used in practice. An analysis of the relationship between candlesticks (including candlestick patterns and the movements of share prices) can be expected to provide evidence to support the theory of market efficiency.

This research is presented in the form of both quantitative and qualitative investigations. It looks at whether major past falls of stock prices, in the month of May in the given period, have performed similarly and could an evaluation of the effectiveness of information signals released by candlestick charting have helped investors to earn abnormal returns, simply by assuming that events repeat themselves. The FTSE 100 Index represents the performance of share prices of the 100 UK top companies listed on the London Stock Exchange. The data collected for this research was the historical daily prices of the FTSE 100 Index through the period from 1984 to

2008. This is secondary data obtained from the Yahoo Finance website. A case study including event studies and secondary analysis has been carried out to achieve the research objectives and findings. In addition, a number of interviews have been carried out with financial professionals, employed in a corporate treasury function and fund manager roles, to ascertain the applicability of candlestick charting.

1.1 The hypothesis and research questions of the study

Although the efficient market hypothesis dismisses the idea that markets have memories, *chartists* continue to believe that markets can react in predictable ways. Stock market investors attach a great deal of importance to information, particularly share prices and economic data, which are freely available or can be purchased at a reasonable cost. The key question is whether these information signals have already been incorporated into stock prices or can they act as a signal for investors? More importantly: How do they affect stock prices?

Three hypotheses are posited at the start of the study:

H1: *There is no relationship between candlesticks and major falls in stock prices.* This is the null hypothesis indicating that candlestick charting appears to be unreliable in terms of predicting the future movements of stock prices.

H2: Conversely this research hypothesis posits that *there is a significant relationship between candlestick indicators and major falls in stock prices.* This means that signaling does give clues to investors to identify the movements of stock prices.

H3: *Studying the movements of past stock prices will not help investors predict the future movements of stock prices (and earn abnormal returns) because the market is relatively efficient and therefore that information is already contained in the share price.* It is therefore very difficult to use signaling as a means of seeking to identify the optimum time to invest. Then an explanation is sought as to why the method of charting is so widespread within the financial community.

A case study will be presented of a sample of stock indices, employing the techniques and data used for technical analysis, specifically in terms of candlestick charting such as the movements of index prices, patterns, trend lines for a predetermined time period, namely the month of May, in the years from 1984 to 2008. The performance of the FTSE 100 Index in the given period will be presented as twenty-five samples to reflect the UK stock market as a whole. The samples selected and used in this study were the relevant daily prices of the FTSE 100 Index and major fall events of stock markets, in the given period, will be investigated to determine whether the candlestick charts correlate with trends in stock market prices and could have helped investors to identify the major falls or crashes in the month of May. Then the key question is 'do markets behave as if they have a memory'? In other words, do events repeat themselves? Secondary data analysis was used to support the case studies, by evaluating the UK key economic indicators and prices movements of the FTSE 100 Index in the given period.

The three hypotheses of the research were tested. The graphical method was applied to display the data used to create candlestick charts and summary statistics of analysis. The data analysis was carried out using SPSS 16. The candlestick charts and normal bar and line charts presented in this thesis were generated using the Microsoft Excel for Windows.

1.2 Contributions to knowledge

The originality of this study derives from what happened after "September 11th" in the United States in 2001. Many researchers carried out studies of stock markets' reactions to war events. They suggest that historical events are relevant to current events. These studies are simply based on an analysis of the performance of a share price index. For example, studies of the performance of the Dow Jones Industrial Average over the last half century show that events affect stock markets only for a short period, usually around the beginning of the event leading to an initial fallback or crash.

Before March 2003, with tensions running high about war in Iraq, many analysts and investors were concerned about the negative influence of these events on stock markets. At that time, this researcher was undertaking her Masters Degree and asked the following questions:

1) During the period of these war events, what happened to individual share price?
2) Did all stock prices fall very low following the market crash?
3) Could an investor earn abnormal returns in a war situation as stock markets show similar reactions to war events?

To pursue these questions she carried out a study of stock market reactions to war events since 1945 with a specific interest in abnormal returns. Initial findings showed:

1) Past events do seem to have some relevance to the current events. Similar rallies are seen during previous wars, as in current wars. However these events affected stock markets only for a short period.
2) Markets do not have a memory. This means that it will not always be the same case in the future. How much a stock market reacts to events will depend on the degree of uncertainty.
3) It is possible to earn abnormal returns during a war by investing in a speculative way and selling *as soon as* the market begins to rally.

Since finishing that Master's degree the researcher has continued to pay attention to stock market price performance. It was a big surprise to discover that some companies with good results, according to accounting data, had a low share price. On the other hand, some companies with weak accounting data had a strong share price. This suggested a way the research could be taken further. What types of information affect investors' decisions? Are there any signals that might indicate the movements of the stock market prices? Can abnormal returns be earned during the period of major falls or crashes of stock markets?

Some recent studies have been carried out to examine specific industry stock indices reactions to war events. Schneider and Troger (2004) examine how the ups and downs of three conflicts, of Iraq, Israel-Palestine, Yugoslavia, affected sub-indices of three major Western stock markets (CAC, Dow Jones, FTSE) through the 1990s. Books and software application packages regarding candlestick charting techniques are available on the market. In practice, investors and financial professionals apply the candlestick trading rules to try to beat the markets. But there is lack of research into the effectiveness of information signalling on the stock markets, especially signals released by candlestick charting. Only three such research papers were identified. These works focused on the profitability of applying candlestick charting techniques to stock markets.

What appears not to exist is an intensive investigation into the movements of share prices in relation to information signalling, especially the signals released by candlestick charting. The research presented in this thesis is based on an intensive investigation of the effectiveness and utility of candlestick charting as a means of stock market prediction. This study will not only concern the particular technique of candlesticks but will also be relevant to the general field of stock market prediction. Furthermore it will be directly relevant to a key field of stock market research, namely the Efficient Market Hypothesis.

What also emerges from this research is the importance of non-rational behaviour in investment decisions. In this way this research ties together several key areas of study in the field of investor behaviour and stock market analysis.

1.3 Structure of the thesis and key findings

The thesis consists of nine chapters. Chapter 1 presents an introduction to the background of the thesis. Chapter 2 offers the institutional background of this study. Chapter 3 and 4 provide a comprehensive review of relevant literature, in order to develop an understanding of previous work in the field of stock market performance prediction theories and also an explanation of the magic of candlestick charting. Chapter 5 is devoted to an explanation of the research methodology of the thesis. Chapters 6, 7 and 8 present the main analysis of this thesis including the tests of hypotheses. Finally, Chapter 9 concludes the research findings and points out the limitation of the study. The possibility of further research is also discussed.

This research suggests that candlestick charting only shows reversals and can provide early turning signals but cannot be used as a system to predict future price movements. However, despite the fact that it can, at best, only offer a very low probability of being correct, this method is widely used in nearly every area of finance. This research seeks to appraise the method of candlestick charting whist offering an explanation as to why it is so popular.

Chapter 2 Institutional Background

The stock market, risk and return under uncertainty, and rationality

2.0 Introduction

This chapter is intended to provide an overview of the stock market in the areas related to the study. This will serve as background for the subsequent analytical and empirical work. To achieve this goal the remainder of the chapter will be presented in the following order: section 2.1 summarises the character of stock markets. Section 2.2 states how stock prices change over time and the fundamental theory of the stock market, the Random Walk Theory. Section 2.3 identifies the relationship between risk and return. In section 2.4, the impact of time and uncertainty on the stock market is discussed. Section 2.5 evaluates market efficiency. Section 2.6 points out views of market rationality. Finally, Section 2.7 summaries the chapter and draws conclusion.

2.1 Characteristics of stock markets

Stock markets are classified as primary and secondary. Primary markets are stock markets where new issues of stocks are sold. Secondary markets are stock markets where stocks are resold. For a stock to be traded on a stock exchange it must be listed on that exchange.

Stock markets have a number of characteristics. The main characteristics are: Firstly, investors buy and sell stocks based on market information. Secondly, risk and return associated with investment in the stock market differ from a real assets market. Thirdly, stock prices are changing over time. Finally, markets have a rational as well as an irrational aspect.

2.2 Stock prices change over time

According to finance theory, stock prices are determined by the intersection of the supply and demand curves. There is equilibrium for an investor to make the decision of buying or selling stocks. It is suggested that prices of securities are determined by the conditions of equilibrium in competitive markets, populated by self-interested rational agents. Individual investors take positions in assets in response to the information available to them and according to their personal financial situations. The market aggregates this information and reflects the available information. Investors have their strategies to identify the movements of stock prices and make their investment decisions. There are two main strategies which investors use to make investment decisions. They are *fundamental analysis* and *technical analysis*. Investors make their investment strategies of buying and selling shares by using these two methods of analysis. All of this derives from an earlier theory known as Random Walk Theory.

Random Walk Theory

Random Walk Theory is the predecessor of the efficient market hypothesis. The term 'random walk' is disturbing, with its connotations of share prices being determined by change. Bachelier (1900) was the first person to realize that security prices in an organised market might follow a *random walk* for commodities traded on the French commodities markets. He defined the term 'random walk' to refer to successive price changes which were independent of each other. In other words, it is understood that tomorrow's price change cannot be predicted by looking at today's price change. $P_{t+1} - P_t$ is independent of $P_t - P_{t-1}$. As a result, there are no trends in price changes.

Working (1934) argues that 'random walks' significantly develop patterns that look like those commonly ascribed by market analysis to stock prices. The question was asked: "Was it possible that a model which provided the best description of time evaluation of any particular stock, predicted that the future price would be equal to the price of that same security in the immediately preceding period, plus some totally random increment?" Kendall (1953) and Granger and Morgenstern (1963) work on this question and support the random walk theory and its hypothesis. However Leroy (1989) points out that such empirical evidence did not support fundamental analysis.

2.3 Risk and return associated with investing in stock markets

Risk and return are the most important attributes of stock markets. "Risk" is defined as the potential exposure associated with an outcome whose value falls short of some minimum expectation. The term "return" is suggested to be the profit that investors earn from the investment. In particular, the term risk in investment means that future returns are unpredictable.

2.3.1 Relationship between risk and return

It is understood that when considering any security, the investor is always concerned with the return expected on the investment and the risk of that investment. Rutterford (1983) points out that if the return would always be exactly as expected, there would be no risk. However, the existence of uncertainty means that returns on investments are not always as expected. All securities are subject to risk and there is a great debate in finance as to whether or not a risk has its basis in events. Different types of securities have different types of risk attached to them. Rutterford also states that the effect of all different types of risk is the same - the actual returns achieved will be different from those expected by the investor. The riskier the security the more likely it is that hoped-for returns will not be achieved, or the greater the likely shortfall from the expected return. As a result, it is easily understood that the investors' need to be able to quantify both uncertain return and the level of that uncertainty, for each security, before they can make investment decisions. Depending on their attitude towards risk and return, they will be able to choose the securities which offer them the combination of risk and return which best suits them.

It is very important to measure the return on the investment. The standard measure of return is known as the "holding period return", which is all the investor needs to be able to make investment decisions with some certainty. When investors decide on choosing the securities they wish to hold in their portfolio, they should be able to compare them directly, each characterised by a market price, the cost of the security, and a pattern of cash flows. Calculating the percentage of holding period return for each security avoids the problem of comparing different sizes of investments. This return is simply the gain during the period held (money received less cost) divided by the cost. Thus, we have:

$$R = (D_1 + P_1 - P_0) / P_0$$

Where R is return of the investment at the end of the holding period, P_0 is the cost, P_1 is the value of the investment at the end of the holding period, and D_1 is any interest or dividend payments made during the period.

Historical studies indicate a great deal about the risk and return. Brealey and Myers (2000) point out that the University of Chicago's Center for Research in Security Prices has developed a file of prices and dividends for each month since 1926, for every stock that has been listed on the New York Stock Exchange. Other files give data for stocks that are traded on the American Stock Exchange and the over-the-counter market. Ibbotson Associates measures the historical performance of five portfolios of securities: (1) A portfolio of Treasury bills; (2) A portfolio of long-term United government bonds; (3) A portfolio of long-term corporate bonds; (4) Standard and Poor's Composite Index (S&P 500); (5) A portfolio of the common stocks of small firms. These investments offer different degrees of risk. Ibbotson Associates also calculated the rate of return from these portfolios for each year from 1926 to 1997. The study demonstrates that annual rates of return for common stocks fluctuate so much that averages taken over short periods are meaningless. The only hope of gaining insights from historical rates of return is to look at a very long period.

2.3.2 Types of risks in stock markets

Before we start, we need to recognise the difference between risk and uncertainty. In the literature risk and uncertainty are different concepts.

There is a great range of literature on risk and uncertainty. Knight (1921) initially draws a distinction between risk and uncertainty. He argues that risk is something that can be calculated, for example, the probability of someone losing at roulette. But he adds uncertainty when the odds of success or failure are incalculable - the probability of someone deciding to play roulette in the first place, and being pick-pocketed on the way out of the casino.

Risk and uncertainty as terms have been discussed in the economics literature. Keynes (1937) states that the analysis of an investment decision must take into account the nature of uncertainty. Keynes argues that uncertainty corresponds to a situation in which probabilities are not determinate or even comparable. According to Keynes (1937), taking account of uncertainty is associated with the absence of knowledge of probabilities. Furthermore the danger for investors is that stock markets can remain irrational longer than the investor can remain solvent.

Runge (2000) marks the concept of uncertainty very clearly. In his view uncertainty refers to some outcome whose value in not definitely known or cannot be determined in advance. He also states that uncertainty may arise on economic grounds because information is not free. Uncertainty may be an inherent characteristic, unable to be resolved by known technology or additional expenditure, for example the weather. Moreover, uncertainty may not be assessable in some actuarial manner. Furthermore, since value is a subjective concept, outcomes with no uncertainty can yield uncertain value, where an investor is himself unsure how the choice would translate into utility. Runge also notices that uncertainty is identified by some distribution of potential values, rather than one unique value.

Understanding the term uncertainty is very important when analysing and weighing the consequences of world wars or disasters, because we are dealing with uncertainty, not just risk.

It is suggested that Investors must not simply look at return alone when making investment decisions, they must also consider risk. By considering both risk and return, investors should understand the types of risk which can lead to variability in return on security. These different types of risk are identified as uncertainty of income, default risk, interest rate risk, and inflation risk.

Uncertainty of income is the risk to which all ordinary shareholders are subject. This can be seen by looking at the holding period return on an ordinary share, as noted above.

Default risk means that if a company does badly, it may be unable to pay the interest on a fixed interest security, or to repay the principal on maturity. Only government bonds, fixed interest securities issued or guaranteed by a government, are not subject to default risk, governments are the only borrowers which can always avoid default, in the last resort by printing more money.

Other risks may be defined as yield on gilts, such as interest risk and inflation risk. Interest risk is a change in interest rates which has had a impact on the investors' return on their supposedly risk-free gilt. Only when interest rates are stable can a gilt be truly considered risk-free. Thus, investors in an undated stock run the interest risk that, when they wish to dispose of the stock, interest rates will have risen and the value of the gilt has fallen.

Brealey and Myers (2000) state that inflation risk is the second type of risk attached to gilts, and in fact all other fixed interest securities. Inflation risk, in the sense that the actual real returns achieved on investments could be less than the expected real returns, is a risk for all types of fixed interest securities.

Except for the above risk, history indicates that future uncertainty about political risks, such as wars and disasters, should be identified. These risks and their uncertainties can bring about crashes in stock market prices and investors need to consider this in their investment decisions.

2.3.3 Measurement of risk and return

Measuring risk and return is an important process for investors seeking to compare their investments. Risk and return are measured by examining the probabilities which derive from inspecting past performance. These are known as 'objective' probabilities. Objective probabilities can be calculated by looking at the frequency distribution of returns the security has achieved in the past. If a particular share has provided variable returns in the past and if it has not fundamentally changed its business, it is likely to be equally volatile in the future. Frequency distributions therefore will provide a good picture of what may happen in the future. Alternatively, data on past performance may not be available or factors affecting the security's return may have altered.

A measure of total dispersion, the standard deviation, is the most common measure of risk used in the theory of investment (Brealey and Myers, 2000). This is for three major reasons: (1) if security return distributions are normal, then the expected return and standard deviation are the only two measures needed to describe fully the probability distribution of any security. (2) Most frequency distributions of past security returns do appear to conform more to normal than to skewed distributions. (3) The standard deviation is a particularly easy measure to handle. It is assumed that the standard deviation adequately quantifies the total risk of investing in security- the uncertainty surrounding the actual returns which will be achieved. The greater the uncertainty, the greater the standard deviation, and vice versa. If there is no uncertainty the return is known for certain the dispersion, and hence the standard deviation, will be zero.

The theories discussed assume the investor is averse to taking risk. In other words, the investor requires more expected return before he will take on more risk. All investors are presumed to be risk averse. Every investor will make different trade-off decisions between risk and return. This trade-off will be affected by such factors as the unwillingness to bear risk which will be reflected in how much risk to accept. Another factor will be how much the investment could affect the investor's total wealth.

The concept of utility means that investors can combine their attitudes to risk and return at different levels of wealth into one measure – the utility of wealth. Utility in this case can be considered as the satisfaction the individual gets from different amounts of wealth. The different probable outcomes of any investment will lead to different probable levels of wealth. If investors know how much utility they will get from each investment, they can choose securities which increase their expected utility or increase it to the maximum. Individual investors will have a different utility function which will lead to different investment preferences.

So it is the existence of uncertainty, especially war, the desire for war, and political uncertainty, which mean that investors forsake financial securities as too risky and choose to hold cash, or gold or other tangible assets, such as property. This inevitably leads to stock market crises. Moreover, the utility which the investors face is uncertain return. When the return is uncertain, investors prefer to sell shares so that they can transfer their money into safe investment. This helps us to understand how a state of uncertainty affects the movements of stock market prices. This also helps us to understand how stock markets react to wars and disasters.

2.4 Time and uncertainty – movements of share prices

Time and uncertainty are very important factors which affect stock price adjustment and investors' behaviour. For companies as well as investors, investment plays a pivotal role in explaining the process of economic growth.

Stock prices are conditional expected values. The price at each point reflects all publicly available information. Thus, understanding how prices adjust to new information over time is very necessary. Moreover, understanding how the price change process behaves can provide an insight into how markets should be regulated. When examining the process of price adjustment, I propose to focus on how prices change across time.

Time can be correlated with any factor related to the stock price. O'Hara (1997) argued that this correlation could arise from characteristics particular to the trading mechanism or could reflect properties of the underlying information process. It is understood that if investors can learn from watching the timing of trades, then the adjustment of prices to information will also depend on time.

There is plenty of debate on the matter of timing. Diamond and Verrecchia (1987) consider the notion of time as a signal. Easley and O'Hara (1992) have developed this argument. Diamond and Verrecchia noticed that market short sale constraints affect the propensity to trade. They introduce asymmetries into the speed of price adjustment to good and bad news. Easley and O'Hara developed the idea that the timing of trades is related to the existence of new information. Their analyses focus on what market participants can learn from timing and sequences of trades.

Trader behaviour is a very important issue. How do traders use information about price to determine their investment demands? When traders are watching the market, they can compute the probability of any no-trade interval as a signal of bad news.

Therefore, they can adjust their beliefs accordingly. The change in beliefs means that the movement of stock prices across time will be affected by the no-trade outcome. In effect, traders can follow or "chart" the pattern of prices to gain underlying information.

Empirical studies have placed great importance on the role of time in affecting price behaviour. Hasbrouk(1991), Huausman, Lo, and Mackinley (1992) worked on the analysis of timing in affecting price behaviour. Their research results suggest that time may matter, but it is not clear how much.

Uncertainty is another important factor that affects the movement of stock price and investor behaviour. Keynes (1936) first pointed out that convention is a basis for making valuations of existing investments. According to Keynes, the application of conventions can cause highly unstable and arbitrary states, in particular, the existing market evaluation cannot be uniquely correct, given limitations of knowledge. Keynes tied his discussion of convention to his analysis of uncertainty, emphasising that uncertainty could not be reduced via the calculus of probability. He gave his view as follows:

"By uncertain knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense to uncertainty; nor is the prospect of a Victory bond being drawn. Or again, the expectation of life if only slightly uncertain...The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention or the position of private wealth owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know." (p.108)

Keynes's account of uncertainty is associated with the absence of probabilistic knowledge. Keynes's discussion showed the role of uncertainty in affecting investing behaviour. He stated that the analysis of an investment decision must take into account the nature of uncertainty. Given the nature of the uncertainty investors face, the identification of rationality makes them carry out valuations of existing investments. Keynes asserts that when the information that is sought after is unavailable, it is rational to fall back on any relevant knowledge that is available. Keynes states:

"It would be foolish, in forming our expectations to attach great weight to matters which are very uncertain, It is reasonable, therefore, to be guided to a considerable degree by the facts, about which we feel somewhat confident, even though they may be less decisively relevant to the issue than other facts about which our knowledge is vague and scanty. For this reason the facts of the existing situation enter, in a sense disproportionately, into the formation of our long term expectations; our usual practice being to track the existing situation and to project it into the future, modified only to the extent that we have more or less definite reasons for expecting a change". (Keynes 1936, p.148)

Keynes's empirical studies on investment show the importance of the uncertainty which investors face. When future economic circumstances are not clear, most investors prefer to hold their money rather than to make any investment. Uncertainty may change investment states and cause stock market prices to fallback or crash.

2.5 Market efficiency

The behaviour of changing prices in stock markets is significant. There are some effects which can be identified as follows:

(1) The January effect. This is defined as an unusual market activity at the end of the year. It means every year in January, there is an upward pressure on the prices of the stocks. Empirical studies by Haugen and Jorion (1996) have demonstrated that January effect could be seen clearly by looking at the average difference between the rates of return of small and large stocks.

(2) The lunchtime effect. This means that in every trading day, lunch time is a very important trading interval. Investors from different areas have a working break and may get together for stock trading communications. This has an effect on trading volume and price behaviour (Perenne 2004).

(3) The Weekend effect. This is also called "the day-of –the-week effect". This means that the expected percentage change on Mondays appears to be negative, and the expected percentage change on Wednesdays and Fridays appears to be larger than on Tuesday and Thursdays. Fridays are considered to be the end of the trading week and the prices have unusual behaviour. Those investors who consider the weekend effect, in timing their purchases and sales, buy some stocks at the beginning of the week and then sell them near the end of trading every Friday. French (1980), Gibbons and Hess (1981), Wang, Li, and Erickson (1997) have provided the evidence to support the weekend effect.

(4) The weather effect. This means that weather could be a factor influencing the performance of stock markets. For example, if the weather is good, the Stock Exchange may be crowded; if the weather is bad or very bad, some or most investors are not going in for trading. The population of trading investors is less than usual. The absence of investors will affect the trading volume and the movement of stock prices (Hirshleifer and Shunway 2003).

(5) The size effect. This means the size of a listed company can affect its stock price. Keim, and Gultekin (1983) determined the total annual difference between the returns of small and large firms. Haugen and Jorion (1996) studied U.S. stocks and discovered that small stocks have a strong propensity to outperform large stocks in the first month of the year over all periods shown.

(6) The low price to earnings effect. This means stocks which have a low price to earnings will not be considered favourably by investors. This has an effect on

their trading volume. This also influences the stock price behaviour. But some investors who have a very good knowledge of these stocks, will be willing to make their trading decisions on buying stocks.

Uncertainty is a key factor which very much affects stock price behaviour in particular when shocking world events occur. From a literature review on uncertainty, it is understood that uncertainty plays a very important role in influencing investors' behaviour (Runge, 2000). Jiang (2003) studied six war events and provided consistent evidence: The changes of stock prices show a similar pattern. Before the start of each war, when victory and the future global economy is unclear, investors change their strategies. Uncertainty makes sense and leads to the initial fall of stock markets or a crash. Timing is another factor which influences investor's behaviour and we cannot ignore it.

According to Rational Choice Theory (Sen 1987 and Scott 2000) peoples' behaviour normally is considered rational, but could also be irrational (Becker 1976). Shackle (1972) states that expectation time itself is devoid of reason except in the world of pure mathematics where time is a perfect variable and not the enigmatic unarguable reality. When investing in stock markets, timing is everything. Ideally investors should be rational decision- makers. Timing is vital when investors make a decision. When economic circumstances in the future are unclear, some investors are risk averse and sell stocks, their behaviour is irrational. Other investors hold stocks or make a purchase decision, they are risk seekers but their behaviour is rational.

2.6. Market rationality - Markets do not always behave rationally

There are many security exchanges in the world and millions of shares are being traded every day on stock exchanges. When buying and selling shares on the stock markets all investor face the same difficult question - What is the stock worth? It is understood that the market price of a share is the cost (without consideration of transaction cost) an investor has to pay for its ownership. The value of the total shares of a company, at market share price, is also the firm's market value. As a result, changes in share prices means changes in the company's market value. The movements of share prices indicate an increase or decrease in investors' economic benefits. In which ways do stock markets behave and what underpins the market price of shares?

2.6.1 Stock market is a rational market

The theoretical economic literature has provided us with a traditional view of market rationality, the basis of which is the assumption that stock markets behave rationally. This rational view was developed in early the 1990s. It is believed that the function of the stock market is to encourage the accumulation of capital to finance businesses over a lomg-term. The market price of listed companies reflects fully the market values of corporations.

Early contributions to rational market theory were made by Walras (1874), Marshall and Wicksteed (1933). They explain that stock markets are real examples of competitive markets in which equilibrium market prices are established. According to Walras the stock exchange is the market for new capital goods, where the prices of these goods rise (or fall) through a fall (or rise) in the rate of net income, according to whether or not the demand for new capital is more or less than the supply.

Stock markets were considered to behave in accordance with the economic principle of supply and demand leading to price equilibrium; Marshall and Wicksteed (1933) suggested that issues of ordinary shares or common shares are claims for a fixed fractional share in a sum of undetermined amount that is dependent upon the success of the corporation and the judgement of the directors. But once issued, the shares will then sell in the market for what they are worth.

Barksy and Delong (1989) believe that the stock market serves as a social calculating machine which reports to firms what market thinks of their future prospects and governs the allocation of investment. They point out clearly that this is the central reason to have a stock market.

In the rational view of stock markets, the prices of corporate shares are considered as rational valuations providing both information and incentives to induce investors to make efficient use of capital.

The latest development of the rational market view has been the Efficient Market Hypothesis (EMH). The general implication of the EMH is that stock prices are affected and adjusted by the new information about all factors. Because of the existence of adjustment, market participants are not able to realise above-average trading profits by trading on that information. A detailed discussion about the EMH as a modern theory explaining the movements of share prices will be provided in the following chapter.

2.6.2 Stock market is an irrational market

This is a quite different belief about the behaviour of stock markets, opposed to the rational market view. Recent research shows growing evidence to suggest that stock markets do not always behave rationally and in fact stock markets are irrational. And the history of stock markets shows that markets have crashed suddenly, in different ways at different times. Taking the 1987 world stock market crashes as an example, the Dow Jones Index fell by over 30% in six days and such a dramatic fall in the share prices could not be explained as a reaction to changes in the major fundamentals of the companies.

Early researchers who challenged the rational market view were Veblen and Keynes in the 1930s and Galbraith in the 1950s. Their views can be classified as two different speculative market views: speculative expectation and psychological phenomenon. Speculative expectation means that increase or decrease in stock prices may be a derivative of speculative expectations about company's earning-capacities. Psychological phenomena show that market participants buy stock based on expectations of the behaviour of other market participants. Veblen (1935) explains that speculative stock prices involve two forms in the theory of business enterprise. He points out that a period of speculative inflation emerges from a period of business prosperity that is initiated by some traceable favourable disturbance of the course of business. Keynes (1936) states that the value of a security is determined not by the terms on which one could expect to purchase the whole block of the outstanding interest, but by the small fringe which is largely dealt by speculators who have no intention of holding the securities long enough for the influence of distant events to have an effect. Their object is to re-sell to the mob after a few weeks or at most a few months. In his latter work Keynes (1937) argues that stock prices tend to be dominated by short-term expectations. He believes that business is the activity of forecasting the prospective yield of assets over their whole life and speculation as the activity of forecasting the psychology of the market.

Galbraith (1961) analyses the speculation and psychological phenomena of market behaviour throughout stock market booms and crashes. He generated a model to define speculation. Raines and Leathers (2000) pointed out that the key theme of Galbraith's model is the dynamics of speculation that the driving force behind all speculative manias is the mass psychology of speculative euphoria. They also pointed out that Galbraith had stated this before both the 1929 and 1987 world stock market crashes.

Moreover, it is believed that stock market volatility is significant. This is the development of the speculative market view. Shiller (1981) analysed the relationship between share prices and dividends payables. He presented evidence to support speculative market view. He found that stock prices were too volatile to be consistent with movements in future dividends. He stated that the movements of stock indexes were not contributions to any objective new information. In his later work Shiller

(1981) investigated the popular models of investor behaviour to explain stock volatility. He concluded that the movements of share prices could be due to changes in opinion and psychology. Shleifer and Summers (1990) argue that investors are not fully rational and their demand for risky assets is affected by their beliefs or sentiments that are not entirely justified by fundamental news. They also argue that arbitrage is risky and limited. They suggest that psychological and behavioural elements are part of the determination of stock prices.

Furthermore, a new concept of the 'rational bubble' was created from efforts to explain deviations of stock market prices from fundamentals within the efficient market hypothesis. Blanchard and Watson (1982) introduce rational deviations as rational bubbles. They argue that rationality, both of behaviour and also of expectations, often does not imply that the price of an asset be equal to its fundamental value. In other words, there can be rational deviations from this value. In the field of behaviour finance, Stiglitz (1982) suggests that a bubble exists if the reason that price is high today only because investors believe that selling price will be high tomorrow – when fundamental factors do not justify such a price. It is understood that the notion of rational bubbles explains the movements of share prices as a reflection of both rational considerations of fundamentals and bubbles. The rational bubble is considered as the alternative explanation of changes in stock prices. This also can be seen as a concession to the irrational market view.

2.6.3 Risk seeker and speculator – Investors' rationality and irrationality

It is understood that the study of economics is underpinned by the assumption that humans act in a rational manner. Runge (2000) defined rational behaviour to mean behaviour held to be consistent according to some simple axioms and directed towards some ordering of alternatives in term of relative desirability. Decision-makers are typically considered to behave rationally when behaviour confirms, or can be interpreted to confirm, the neoclassical rational choice paradigm.

The existence of uncertainty means that returns on investment are not always as expected. All securities are subject to risk. In other words, different types of security will have different kinds of risk attached to them. Therefore, the actual returns achieved will be different from those expected by the investor. Runge (2000) argue that the riskier the security the more likely it is that the hope-for return will not be achieved or the greater the likely shortfall from the expected return. As a result, investors need to be able to quantify both the uncertain return and the level of that uncertainty for each security before they can make their investment decisions. Runge (2000) argues that the investors then can decide, according to the level of return they wish to achieve and amount of risk they are willing to bear, which securities they prefer. If they are averse to taking on risk, they will prefer the securities that offer the least risk for any given return or the most return for any given level of risk.

Overall, on stock markets, investors are considered to be either risk seekers, risk averse, or speculators. The risk seeker always makes investment decisions when market situation is risky, so as to earn abnormal returns. Investors who always avoid the risky investment are considered risk averse. Speculators seek investing opportunities according to timing and price movements to make investment decisions to make profit. They may always decide their investments according to timing, for instance, buy stocks on Monday low and sell them on Friday high. All together, it is assumed that the average investor on the stock market is "risk averse".

The investor's behaviour can be classified as rational or irrational according to their decision making processes. According to Linstone (1984), organisational scientists view rational decisions as those that maximise the attainment of objectives. Simon (1986) pointed out that individual investors make consistent, value-maximising decisions within specified constraints. Mckenzie_Mohr and Smith (1999) makes three assumptions under the notion of rational behaviour: An individual has a preference and can identify what he or she wants; an individual is capable of ordering his or her wants consistently with preference; an individual can choose consistently from these ordered preferences to maximise his or her satisfaction. As a result, rational behaviour is considered as a consistent behaviour that maximises an individual's satisfaction.

It is assumed that investors' behaviour can be classified as either perfectly rational or bounded rational. In a world of perfect rationality, investors must have complete and perfect information. This means that all problems can be clearly defined, all information and alternatives are known, and the consequences of implementing each alternative are certain. A list of human behaviour is assumed and as pointed out by Bloisi, Cook and Hunsaker (2003) represents perfect rationality.

However, in the real world, there is no description of how decision-makers actually behave in most circumstances. In 1979 Herbert Simon challenged the idea of perfect rationality and argued that administrators exhibit bounded rationality to reach satisfactory rather than perfect decisions. Bloisi (2003) states that bounded rationality implies decisions are made under constraints of no perfect information about problems, no awareness of all feasible solutions, and no capacity to understand and remember all available information.

An understanding is that in real practice, there is no investment which can be considered totally rational or irrational. Every investor has his own level of risk and expected return. General speaking, rational behaviour is to buy stocks when they are cheap and sell them when they get worse. In a crashed market, when stock prices hit the bottom, even though facing uncertainty, some investors are still buying stocks and bearing risks. This is rational behaviour and this kind of investor is a risk seeker. They believe that following a downside reaction, there must be a rebound.

2.7 Summary

This chapter has presented an overall institutional background to the stock market. The characteristics of the stock market, risk and return under uncertainty, market rationality have been discussed in detail. Based on this review of the institutional background of stock market, I will present the current issues – modern investment theories and the analysis of stock markets in the next chapter.

Chapter 3 Literature Review

Modern investment theories and the analysis of stock markets

3.0 Introduction

Modern investment theories provide grounds for academics and investors to analyse the performance of stock markets. The relevant theories regarding stock market investment analysis are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). The analysis of stock markets includes the Efficient Market Hypothesis (EMH), fundamental analysis, and technical analysis.

Both fundamental analysis and technical analysis have long histories of using published financial data to generate variables to predict future movements of share prices and returns. However, the Efficient Market Hypothesis plays a very important role in explaining the movements of share prices and it is the current paradigm, having been the central proposition of finance for the last thirty years. In the literature, empirical studies have been carried out to provide evidence that have strongly supported the terms of market efficiency. But on the other hand, some researchers have repeatedly challenged the studies based on the EMH by raising critical questions. Their studies and tests suggest that movements in stock prices cannot be attributed merely to the rational expectations of investors, but also involve an irrational component.

More recent research has attempted to demonstrate the persistence of anomalies on the basis of a psychological perspective. Research into investor behavior in the stock market is rapidly expanding, with very surprising results. It has been demonstrated that distance, language, and culture influence investors' decision making. Moreover, chartists continually claim that with the development of technology, technical analysis has been helping investors to beat the market and make abnormal returns.

This chapter presents a comprehensive review of the major investment theories, the analysis of stock markets, and previous studies seeking answers to the following questions: Why do people invest in stock markets? Why do share prices change over time? What influences real investors' behaviour? How do investors value shares and make decisions on the formation of the investing portfolio? Does change in the development of technology provide investors with an effective trading system? The development and limitations of these theories will also be discussed.

3.1 Modern investment theories – Why people invest?

Modern investment theories provide grounds for academics and investors to analyse the performance of stock markets. The theories which are concerned with why people invest in stock markets are the Capital Asset Pricing Model (CAPM), and the Arbitrage Pricing Theory (APT), and the Theory of Modigliani and Miller (MM). These theories consider that people invest in stock markets to earn returns to increase their wealth.

Investing in a financial market is different from investing in the real estate market. For example, stock markets differ from real markets for three main reasons. Firstly, real assets are not homogenous where as financial assets are. Nobody ever complains that if they buy 5,000 shares in a company that they are not the same as the ones they previously sold. Secondly, the transaction costs with financial assets are very small unlike the case of a real asset where transaction costs can be a fairly large percentage of the total price. Finally, real assets are not divisible and so one can not buy part of a house but one can buy part of a company's shares.

Carsberg (1974) points out the three main questions which investors are facing when they are making investment decisions. These questions are:

- How much should be invested

- In what activities should money be invested?
- How should finance be obtained for the investments?

All investors have one thing in common: they do not wish to lose money and they hope to invest to increase their wealth. Investors know that information is the key to wealth and that the more information they have the better informed they are, and the more likely they are to make a sound investment. As a result, an understanding of investment theories will help investors to achieve their needs. All of this is explained by the Capital Asset Pricing Model (CAPM), and the Arbitrage Pricing Theory (APT).

3.1.1 Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is one of the most popular standard tools for financial market analysis. Markowitz (1952) initially argued that investors would optimally hold a portfolio with the highest expected return for a given risk. Based on this so-called mean-variance efficient portfolio, Lintner (1965), Mossin (1966), and Sharpe (1964) independently produced the well-known Sharpe and Lintner version of the CAPM. They agreed with the existence of a positive correlation between the expected returns and the market risk. Sharpe (1964) determined that the capital asset prices have adjusted in equilibrium so that an investor who follows rational procedures is able to attain any desired point along a capital market line. Litner (1965) developed the CAPM and produced an equation $R = Rf + \beta(Rm - Rf)$ that defines the expected returns on any assets, under the condition of idealised uncertainty, in purely competitive markets with risk-averse investors. Here R is the required rate of return on asset, β is the beta coefficient for the asset, Rm is the expected rate of return on market portfolio, Rf is the risk-free rate of return. We can express this equation as $R - Rf = \beta(Rm - Rf)$. Here $R - Rf$ is the expected risk premium on the asset. Litner also applied this model for capital budgeting and portfolio selecting and showed the required return is the minimum expected rate of return on the asset that is required by the investor to encourage investing in that asset.

The CAPM is a theory about the way assets are priced in relation to their risk. The theory is based on three assumptions. Firstly, investors can choose between portfolios on the basis of expected return and variance; secondly, all investors are in agreement regarding the planning horizon and the distribution of security returns; and thirdly, there is no friction in the capital markets.

The first assumption shows that investors can choose on the basis of expected returns and variance, if either of two conditions holds. One is that the probability distributions for portfolio returns are all normally distributed. The other is that there is a relationship between the utility and the value of the portfolio. The portfolios to be chosen are those which maximize the expected wellbeing or utility.

The second assumption gives a single period of time to all investors to purchase their stocks in the market, whilst the third assumption ensures that there is no friction to impede the free flow of capital and information throughout the capital market. Haugen (2001) explained that these assumptions were made so that a definitive picture of the relationship between risk and expected return could be obtained in the market.

The CAPM presents the capital market line to all investors to take portfolio positions on this line by borrowing and lending. In the CAPM, measuring the risk of an individual asset is based on its contribution to the variance of the market. Thus, the risk of an investor's portfolio is measured in terms of its variance and the risk of an individual asset in terms of its beta. The CAPM also presents a security market line and states that the expected risk premium on each investment is proportional to its beta. This means that each investment should lie on the sloping security market connecting Treasury bill and the market portfolio. Bodie, Kane, and Marcus (2008) suggest that under assumptions of CAPM investors, who are willing to expend resources to construct a superior portfolio, must take the following actions: (1) identify a practical index to work with; (2) deploy macro analysis to obtain good forecasts for the index and stock analysis to identify mispriced stocks.

Development and empirical tests of the CAPM have been carried out since the late 1960s. Evidence offered by researchers shows the limitations and failures of the model. Apart from the continuing studies carried out by Lintner (1965), Mossin (1966), and Sharpe (1964), Black, Jensen, and Scholes (1974) completed the definition of CAPM and agreed with the proposition that the expected return on any risky assets is a linear function of its beta. Black, Jensen, and Scholes (1974) tested the security market line by restricting their samples to all stocks traded on the New York Stock Exchange during the period 1926 through 1965, to see if the market portfolio is efficient. Their findings appeared strongly to support the CAPM. They demonstrated that beta should be the only determinant of differences in expected rates of return. Fama and MacBeth (1973) carried out a study similar to that of Black, Jensen, and Scholes (1972) and discovered some 'stochastic non linearity from period to period' in the CAPM relation to the risks and returns. They provided further support for the CAPM. However Roll (1977) criticizes the empirical tests of the CAPM, the use of the beta as a risk measure, and the measure of portfolio performance employing the security line as a benchmark. He claimed that results of tests like Black, Jensen, Scholes (1972) and Fama and MacBeth (1973) were tautological. He remarked that the CAPM could never have been tested.

Since 1980 the tests of the CAPM have focused on its central prediction 'the market portfolio is on the global mean-variance efficient set'. Shanken (1987) offers an intelligent approach to a potential empirical test of the model. He claimed and demonstrated that the CAPM could be rejected with 95 percent confidence. Fama and French (1992) extended Fama and MacBeth's 1974 study and discovered that over the last 40 years it has not been true that the stocks that made a larger contributions to the volatility of the capitalisation-weighted NYSE index could be expected to produce higher rates of return to investors.

More recently, based on their empirical results regarding the relation between market Beta and average return, Fama and French (1996) have concluded that CAPM is finished as an empirical tool for the analysis of the trade-off relations between risk and returns on stocks.

In order to improve the empirical performance of the CAPM, some researchers provided modifications to the model and these are also considered in the literature. For example, Banz (1981), Fama and French (1992) performed the modifications by using some firm specific variables such as *firm-size* and *book-to-market ratio*. On the other hand, Jagannathan and Wang's (1996) modifications are based on another probability principle, such as the time-varying market Beta. Furthermore, Guo and Whitelaw (2006) considered a structural asset-pricing model in the context of time series, and discovered a significant positive relationship between return and risk.

Reviewing the literature of the CAPM develops a better understanding of the theory. It has been identified that evidence of the poor empirical performance of the conventional CAPM has accumulated in the literature. Despite that, as one of the modern investment theories, the CAPM is intuitively clear and its empirical implication is plausible, since risky assets will usually yield higher returns than an investment free of risk.

Despite numerous theoretical and empirical criticisms, the CAPM has been and is still one of the most popular standard tools for financial researchers and practitioners to quantify the trade-off between risk and expected return in financial markets. Companies use the CAPM to make budgeting and other decisions. Some regulatory authorities use the CAPM to regulate utility rates. Rating agencies use the CAPM to measure the performance of investment managers.

As far as it is concerned a deeper understanding of the CAPM, especially for a market portfolio, is vital for researchers to analyse the stock markets. One significant fact is that beta should be the only determinant of differences in expected rates of return.

3.1.2 Arbitrage Pricing Theory

The Arbitrage Pricing Theory (APT) is an alternative model of asset pricing that captures the appeal of the CAPM. It was introduced by Stephen Ross in 1976. It is commonly understood that Arbitrage refers to the notion that the same goods or assets have to have the same price in each period, in the absence of any restrictions. This means that investors can buy and sell the same assets at different prices to earn a risk free profit. The APT starts by analysing how investors construct efficient portfolios. The model assumes that the return on each stock depends partly on pervasive macroeconomic influences, such as factors or noise or events that are unique to that related company. The model shows a simple relationship as follows (Brealey and Myers 2000, p205):

$$\text{Return} = a + b_1(r_{\text{factor1}}) + b_2(r_{\text{factor2}}) + b_3(r_{\text{factor3}}) + \ldots + \text{noise}$$

The model does not indicate what the factors are. They could be interest rates, exchange rates, real gross national product (GNP), oil price, the level of industrial activity, and so on. The APT states that the expected risk premium on a stock should depend on the expected risk premium associated with each factor and the stock's sensitivity to each of the factors. This theory provides a good handle on expected return if the investor can identify a list of factors and measure the sensitivity of each stock to these factors. This is different from the CAPM which condenses all risks into a well-defined single factor---the return on the market portfolio.

An empirical test of APT was carried out by Roll and Ross (1980). They applied a similar methodology to that used by Black, Jensen, and Scholes in testing the CAPM. Chen, Roll, and Ross (1986) employed an alternative method, 'factor analysis', to test the APT. Their research was based on unanticipated changes in four specified factors. for instance the difference between the yields on long-term and short-term treasury bonds, the inflation rate, the difference between the yields on BB-rated corporate bonds and treasury bonds, and the growth rate of industrial production. Their findings regarding relative returns between stocks supported the APT model. Haugen (2001) tested the predictive power of the APT with more factors including relative companies' financial data such as dividend-to-price ratio. Megginson, Smart, and Gitman (2007) point out that interpreting these risk factors can be very tricky because the model does not state but rather leaves these factors as an empirical matter for researchers to sort out.

The APT helps us to understand what would determine the differences in expected stock returns in the market, in which prices are rationally determined.

3.2 Investment, capital market imperfections and uncertainty

Traditionally, studying corporate finance offers theories which cover two separate fields: investment and financial imperfection and investment under uncertainty. These theories are Fisher's Theory of Interest, the Theory of Modigliani and Miller, and Orthodox Models.

3.2.1 Fisher's Theory of Interest

Fisher (1930) presents a model of sequence economy without uncertainty over a finite number of periods. Fisher's Theory of Interest gives the first classical results on finance and production in a one-good economy. Fisher points out that there is a short term bond in each period which enables agents to redistribute their income across time. Each agent is both a consumer and an entrepreneur and has access to a production set. Fisher's main result is known as the "Fisher Separation Theorem". This theorem states that a firm should determine its production plan so as to maximize the present discount value of its profit, which implies that the firm's objective function is independent of the preferences of the owner. The theorem also implies that the production decision is independent of the financing decision.

3.2.2 The Theory of Modigliani and Miller (MM)

The Theory of Modigliani and Miller (MM) is known as the first extension of Fisher's separation theorem, to a setting of uncertainty, and was proposed by Modigliani and Miller in 1958. The theory of MM refers to the invariance of the value of the firm for its capital structure. The theoretical underpinning of the literature argues that financial structure does not affect the investment decision. In their article, Modigliani and Miller state that internal funds and external funds are perfect substitutes to a company. The assumptions made underlying the MM invariance theory, as well as the separation of the finance and investment decision, are perfect and asymmetric information. They argue that in the case where information is no longer fully and perfectly available for market participants, the capital structure affects the market value of the firm, so that financial variables may become important determinants of investment.

It is understood that in the modern neoclassical theory of finance, arbitrage, optimality, and equilibrium are three crucial pillars. Lensink, Bo and Sterken (2001) explain: Arbitrage refers to the notion that the same goods or assets have to have the same price in each period in absence of any restrictions. This means buying and selling the same assets at different prices allows investors to earn risk free profit. Optimality means that rational investors strive for optimal returns. Equilibrium relates to the neoclassical idea that markets are cleared by price adjustment at each moment in time. They suggest that the Arrow-Debreu (Geanakoplos, 1987) economy, which is usually seen as the ideal classical world, is based on the paradigm of complete markets, implying that there are no restrictions on the amount of contracts investors can enter into, and hence any type of risk can be insured. Each possible future state is covered by a so-called Arrow-Debreu security (or state security, state contingent claim).

In the case of markets that are complete, present value prices of investment projects are well defined. In such a setting all shareholders are unanimous and agree that the firm should take the investment decision that maximizes the value of the firm.

However, if markets are not complete, present value prices of investment projects are not unique: the market alone does not provide a well defined signal for the value of the investment.

Modigliani and Miller argue that a firm's financial policy is irrelevant. More precisely, they propose that the market value of a firm depends only on its profit stream and is invariant to its capital structure. Their basic argument is that arbitrage precludes that the market value of a firm can be altered by a change in a firm's financial policy, when profit flow is given. In the case where investors have the same financial opportunities as firms, investors can always undo the actions of firms on the financial markets.

According to Lensink, Bo and Sterken (2001), Modigliani and Miller (1958) provide the following example to explain the propositions of their theory:

Assume that there are two companies. Company 1 finances its capital expenditures only by common stock and it is an unleveraged firm. Company 2, on the other hand, finances its capital expenditures by both common stock and debt. An investor, holding a fraction α of the total outstanding stock of shares (S_2) of company 2, receives a return of:

$$Y_2 = \alpha\,(X - rD_2)$$

Where: Y_2 = the return from the portfolio

X = the expected return on the assets owned by the company

r = the interest rate on debt, and

D = the market value of debt of company 2. (Lensink, Bo and Sterken 2001, p 9)

Assume now that the investor sells his shares in company 2, borrows an amount of money on his own account and buys from the proceeds shares of company 1. If the investor borrows an amount equal to αD_2, money available for company 1 share equals:

$$S_1 = \alpha(S_2 + D_2)$$

The return from this portfolio Y_1 is:

$$Y_1 = \frac{\acute{a}(S2 + D2)}{S1} \times x - r\alpha D_2$$

$$= \alpha \frac{V_2}{V_1} X - r\alpha D_2$$

Where S_1 = the outstanding stock of company 1

$V_1 = S_1$ is the market value of company 1

$V_2 = S_2 + D_2$ is the market value of company 2

X = the expected returns assumed to be equal for both companies. (Lensink, Bo and Sterken 2001, p10)

By comparing the above two equations for Y_1 and Y_2 it is obvious that Y_1 only exceeds Y_2 when $V_2 > V_1$. In this case , the investor makes a profit by selling shares of company 2 and buying shares of company 1, which would result in a decrease in S_2 and hence an increase in S_1 and V_1. Arbitrage will thus lead to $V_1 = V_2$. More generally, this implies for any firm j in class k:

$$V_j = (S_j + D_j) = \frac{\overline{X}_j}{P_k}$$

This is the famous proposition I of Modigliani and Miller. It states that "the market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate P_k appropriate to its class" (Modigliani and Miller 1958, p.268). Sometimes this proposition is stated in terms of the average cost of capital, i.e. the ratio of expected return to the market value of its securities. It then reads:

$$\frac{\overline{X}_j}{S_j + D_j} = \frac{\overline{X}_j}{V_j} = P_k$$

This represents that the average cost of capital equals the capitalization rate and does not depend on capital structure.

By defining the expected yield of a share in class $j(i_j)$ as:

$$i_j = \frac{\overline{X}_j - rD_j}{S_j}$$

And by using the equation for proposition I, it can easily be derived that:

$$i_j = P_k + (P_k - r)\frac{D_j}{S_j}$$

This is proposition II of Modigliani and Miller. It shows that the expected return on equity (yield of a share) equals the capitalization rate (and so the average cost capital) plus a premium on the interest rate on bonds related to financial risk. Alternatively, the proposition shows that the average cost of capital, which equals the weighted average of the interest rate on bonds and the expected returns on equity, is not affected by an increase in the leverage rate. The decline in the average cost of capital by means of an increase in the leverage rate is exactly offset by the increase in the expected return on equity. Hence, if a firm substitutes cheaper debt for equity, the gains from cheaper debt will be exactly offset by an increase in the cost of equity which has become riskier as a result of the increase in a firm's leverage. It is for this reason that equity holders ask a premium when the leverage rate increases.

The MM invariance proposition has been of great importance in the literature on corporate investment. Using MM theory as a theoretical underpinning, neoclassical investment theory, mainly associated with scholars like Jorgenson (1963, 1971), argues that financial variables, like cash flow, profit etc., should not be included in investment equations. According MM theory, firms derive investment decisions by maximizing market value or equivalently optimizing profits, in a tax-free certain world with perfect capital markets. In this setting, the desired share capital and investment of firms depends only on factor prices and technology. Lensink, Bo and Sterken (2001) state that "the reason is simple: if financial policy does not affect market value, this implies that if firms want to maximize their market value financial variables do not matter. The real activity of the firm is then independent of its financial choice." (p.11)

The discussion on the MM propositions can be centered around four issues:

1) firms can be grouped in risk classes;
2) bankruptcy is ignored;
3) there are incomplete markets and imperfection, and
4) there are no taxes.

3.2.3 Economics of imperfection

In a neoclassical world it is assumed that agents have full information on the characteristics of goods and services. However, in practice there will often be a situation of asymmetric information. Asymmetric information refers to a situation in which one agent has better information than another agent. The problem of asymmetric information can arise in all kinds of markets. It is especially important to credit relationships. For example, a manager of a firm often has more information on the characteristics of a project than a bank does.

Asymmetric information can lead to two problems. The first one is "adverse selection", which refers to a situation where one agent has prior information on the quality of a good, whereas a second agent at best knows the probability distribution function.

The second problem related to asymmetric information is "moral hazard", according to Hellmann, Murdock and Stiglitz (2000). It is also known as "adverse incentive". Moral hazard refers to a situation where two parties agree on a contract, but one party afterwards takes an action that is not observed by the other agent. The "hidden action" is meant to increase the welfare of the informed agent at the expense of uninformed agent.

Information asymmetries between buyers and sellers may lead to so-called "equilibrium rationing". Equilibrium credit rationing refers to the situation where a borrower's demand for credit is turned down, even if this borrower is willing to pay all the prices and non-price elements of the loan contract. This assumes that the price mechanism works. Rationing occurs after full adjustment of the price.

Modern finance and investment theories explain the reasons why people invest in stock markets and how a company's share is valued. The existence of capital market imperfections and the uncertainty of a company's future performance cause problems to investors regarding investment decisions. As a result there is a need for market participants, or investors, to analyse the movements of the firm's share prices when making investment decisions.

3.3 The analysis of stock markets - How do we think stock market prices move?

An analysis of the performance of stock markets helps investors make their investment decisions. As pointed out earlier there are three main reasons why financial markets differ from real markets. However, another big difference is that for most real assets information is not freely available and so one does not know if one is paying the correct price. Even in the case of a small farmers market, different stalls could be selling similar merchandise but at different prices. The only explanation for this is that buyers are unaware of all of the prices in the market and so inefficiencies allow traders to earn higher profits. In the case of a stock market, the price at which buyers and sellers are willing to do business is constantly displayed and so the market prices are deemed to be correct at the time the transaction takes place. In such a market, pricing is deemed to be efficient and hence correct but there is still the problem of explaining why they may change so suddenly.

The Efficient Market Hypothesis, Fundamental Analysis, and Technical Analysis are techniques used by investors to analyse the movements of share prices.

3.3.1 The efficient market hypothesis

The Efficient Market Hypothesis (EMH) was first posited in the 1960s and has been the central proposition of finance for the last thirty years. The Efficient Market Hypothesis is a theory of competitive equilibrium applied to stock markets. It is a framework that holds that the stock market is efficient if it utilises all the available information in setting the prices of assets. The term efficiency suggests that the market establishes stock prices that reflect the worth of the stocks. Fama (1970) defined an efficient financial market as one in which security prices always fully reflect the available information. He defined different markets in terms of their levels of efficiency, where the level reflects the type or scope of information that is quickly and fully reflected in the prices. According to this definition, there are three levels of efficiency, each level designed to correspond to the different types of 'picking winners' or investment strategies, which have been used in practice to try to achieve excess returns. These three levels of efficiency are well known as the weak form---prices fully reflect past prices, semi-strong form---prices fully reflect all publicly available information, and strong form---prices fully reflect all information.

Levels of market efficiency

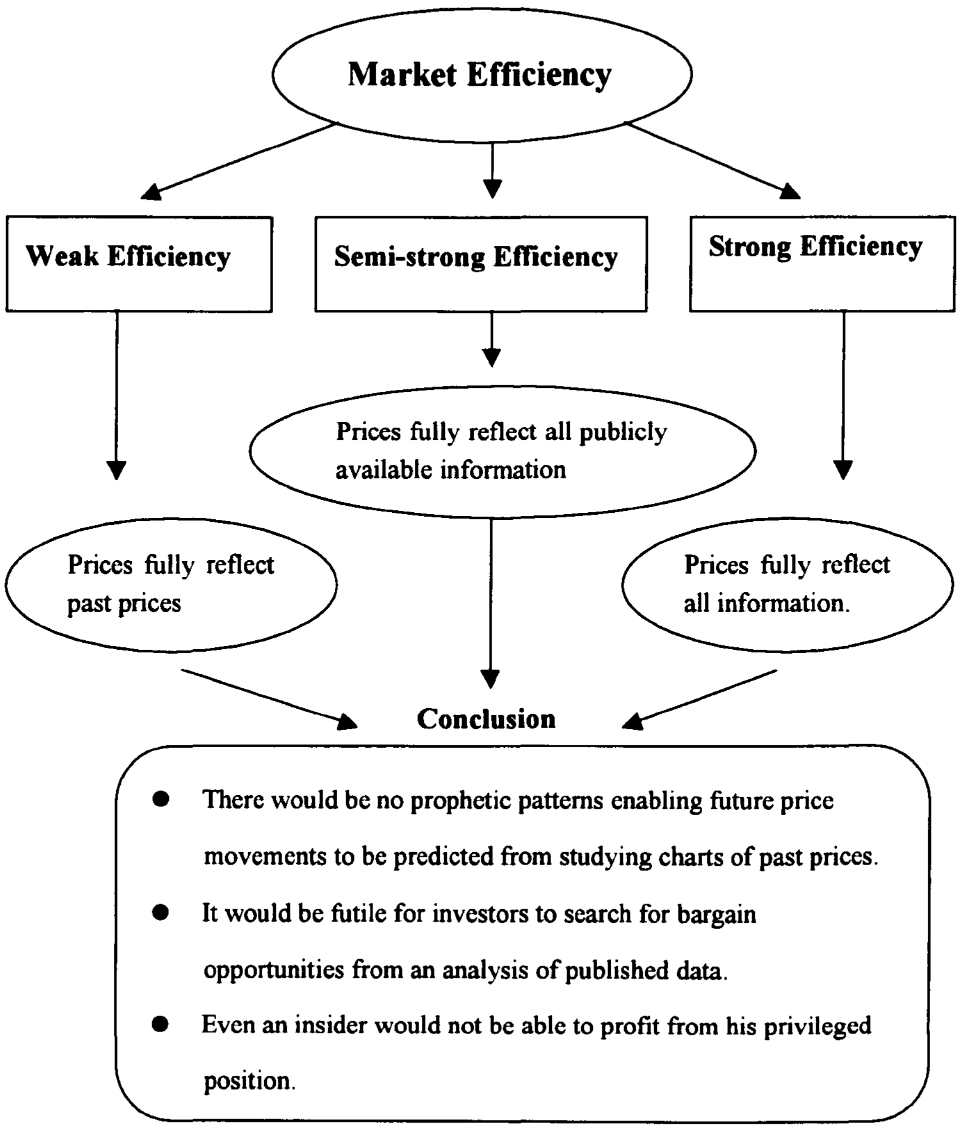
In the Efficient Market Hypothesis literature Keane (1980) clearly described three levels of market efficiency as follows:

(1.) Weak Efficiency: The market is efficient in the weak sense if share prices move independently of previous movements. Thus, in such a market there would be no prophetic patterns enabling future price movements to be predicted from studying charts of past prices. Nor would there be any effective "trading" rules which produce above-average returns. Prices would respond only to new information or to new economic events

(2.) Semi-strong Efficiency: The market is efficient in the semi-strong sense if share prices respond instantaneously and in an unbiased manner to new information. Thus, although the users of information might differ among themselves about the significance of new data, the implication is that the prices that are actually arrived at in such a market means it would be futile for investors to search for bargain opportunities from an analysis of published data.

(3.) Strong Efficiency: The market is efficient, in the strong sense, if share prices fully reflect not only published information but all relevant information including data not yet publicly available. If the market were strongly efficient, therefore, even an insider would not be able to profit from his privileged position. Strictly, this third level has little to do with the efficiency of stock market itself, but relates to the efficiency of the capital market in its broadest sense. Thus, semi-strong efficiency is concerned with how well the market processes the information disclosed to it, but strong efficiency is concerned primarily with the adequacy of the information disclosure process. (Keane 1980, pp.6-7)

The following diagram summarises Keane's distinction of three levels of market efficiency:



Rutterford (1983) pointed out that that earlier markets which are efficient in quickly reflecting new information, prevent investors from making excess profits from that information. As a result, in a weak-form efficient market, investors would be unable to pick winners by looking at charts of past security prices, or by devising trading rules based on stock price movement. In a semi-strong-form efficient market, with access only to publicly available information, investors would not be able consistently to make excess profits by buying stocks, because the new information would be available to all investors and the share prices concerned would quickly reflect that information. In the strong-form efficient market, no investor could make excess returns. In this level of efficiency, share prices would already reflect all the information relevant to the shares, whether publicly available or not.

From the above three levels of efficiency, it can be seen that the ability of investors to pick winners and generate excess profits, using new information, is directly related to the speed and efficiency of a market at absorbing that information. Fama (1970) states that the efficient market hypothesis "rules out the possibility of trading systems based only on currently available information that have expected profits or returns in excess of equilibrium expected profit and return" (p.383). In a word, investors who dedicate themselves to technical analysis are wasting their time, and the money they have spent, on the cost of acquiring information for their analysis. This means that future movements of share prices are determined entirely by unexpected information and therefore share prices are random.

The theoretical foundation of the efficient market hypothesis

The theoretical foundation of the efficient market hypothesis states that when investors are rational, they value each security for its fundamental value: the net present value of its future cash flows, discounted using their risk characteristics. When investors learn something about the fundamental value of a security they quickly respond to the new information by bidding up prices when the news is good and bidding the prices down when the news is bad. As a result, security prices incorporate all the available information almost immediately and prices adjust to new levels corresponding to the new net present value of cash flows.

Some empirical studies do not support fundamental analysis but suggested that stock prices might follow a random walk. Bachelier (1990) studied commodity prices on French commodity markets and was the first to state that prices might follow a random walk. It was suggested that neither buyers nor sellers could be expected to make profits because the prices were an unbiased estimate of their future prices. In the 1950s and 1960s researchers showed evidence that the common stock prices followed a random walk. This allowed academic attention to shift to an investigation of why share prices follow a random walk which led to the theory of market efficiency.

There are a number of researchers who have worked on testing the efficient market hypothesis and their studies were broadly supportive of the efficient market hypothesis. Samuelson (1965) and Mandelbrot (1966) present some of the first theories showing how returns are unpredictable in competitive markets with rational risk-neutral investors. They provided evidence that security values and prices follow random walks. Samuelson used a martingale model and constituted an economic model of asset price determination. Fama (1970) surveys the behaviour of stock market prices and provided some preliminary theoretical discussion which influenced the following studies regarding movements of stock market prices. He suggests that stock returns are entirely unpredictable under the assumption of risk neutrality. He provides evidence that investor rationality implied the impossibility of earning superior risk-adjusted returns.

The empirical evidence that appeared in the 1960s and 1970s was even more overwhelming. At the most general level, the empirical predictions of the efficient market hypothesis can be divided into two broad categories: Firstly, when news about the value of a security hits the market, its price should react and incorporate this news both quickly and correctly; secondly, since a price of a security must be equal to its value, prices should not move without any news about the value of a security. These suggested that there should neither be price trends nor price reversals following the initial impact of the news. Also, prices should not react to changes in demand or supply of a security that are not accompanied by news about its fundamental value. The quick and accurate reaction of security prices to information are the two broad predictions of the efficient market hypothesis. Fama (1970) points out that the principal hypothesis following from the quick and accurate reaction of prices to new information is that stale information is of no value in making money.

There have been a great number of studies on why prices change in the stock market. Shaw (1993) clearly summarises the development of these studies as follows: "Bachelier (1900) studied the distribution of returns on the Paris Bourse. Nearly sixty years later Osborne (1959), basing his arguments on the central limit theory, put forward the theory that the distribution of returns is approximately normal. Osborne's conclusions were supported by the empirical findings of Fama (1965). The evidence does not seem to support the view that the world's major stock markets are efficient. The problem is defining the degree of efficiency. The evidence is strongest for supporting the weak form of market efficiency. Fama and Blume (1966), and Ball and Brown (1968) argued that as the markets are efficient, albeit in a weak form, technical trading will not produce better results for an investor than a strategy of buy and hold.

According to empirical studies, the weight of evidence is not so strong for the semi-strong and strong forms of efficiency. Jensen (1969) carries out an investigation into the performance of mutual funds to support the view that the world major capital markets are strongly efficient. Jensen's findings show that out of 115 funds studied, there is no evidence that managers were able to achieve better results than those achieved by adopting a 'buy and hold' strategy. Main (1977) criticises Jensen's work and demonstrated that fund managers can earn higher returns than a buy and hold strategy before transaction and management costs. Cornell and Roll (1981) state that investors who have access to information earn higher returns than those who do not. Huberman and Kandel (1990) examine how investors' performances could be improved by subscribing to Value Line. Cooeland and Friedman (1991) describe how market traders form price expectations based upon market signals.

These empirical studies provide the evidence that markets can become more volatile with the arrival of new information. This is a very important point in support of the arguments that seek to explain why investors change their strategies and sell stocks when bad news is coming. This makes us able to evaluate the market condition, with an uncertainty in the future, especially when a world shaking event has occurred.

Tests of efficient market hypothesis

Tests of the efficient market hypothesis were carried out immediately after it was suggested in 1960s and onwards. There were two groups of tests. The first group of tests involved statistical tests of independence of changes in stock prices and the second group of tests entailed a comparison of results of risk-return derived from using certain specific trading rules.

Two statistical tests have been employed to investigate the randomness of stock prices. This was to test the 'weak form' of the efficient market hypothesis. The first statistical test was a serial correlation test to measure correlation relationships among price changes in different time periods, for example, the share price changes between day t and day t-1, or day t-2, or dayt-3. Fama (1965) observes the daily changes in the price of each of the 30 Dow Jones stocks and concluded that only a very small percentage of any successive price changes could be explained by prior changes. Later studies carried out by Kendall (1953), Roberts (1959), Alexander (1961), Granger and Morgenstern (1963) and come to the same conclusion, stating that price changes have been independent of prior movements. The second statistical test of independence of stock price changes was the "runs test" – two or more consecutive positive or negative price changes constitute one run. Reilly and Norton (1999) claim that the findings of the "runs test" showed the independence of stock price changes over time.

Using specific trading rules the second group of tests of the efficient market hypothesis were carried out by Alexander (1964), Fama (1970) and several others. They suggested that, in general, trading rules would not outperform the stock market after trading commissions were considered. Their results indicated that the market has been substantially efficient in a weak from.

Empirical studies have showed that the results of tests on the weak form of the efficient market hypothesis were consistent with market efficiency, but there was a lack of direct tests.

Thaler and De Bondt (1985) challenge the Efficient Market Hypothesis and provide evidence that investors can display irrational behaviour.

To sum up, the efficient market hypothesis states that it is impossible for investors to generate excess returns by studying past trends and information. If the markets are efficient, in the true sense, the stock price movements represent fair value, and investors cannot earn abnormal returns in the long term. Even if the markets are efficient they are likely be weak-form efficient. Therefore Charting cannot be ignored. Similarly, the market cannot be disrupted by events, and fundamental analysis can sometimes find under and overvalued stocks.

3.3.2 Fundamental Analysis

Fundamental Analysis is used as a method of valuing shares. It is a long established traditional technique which attempts to use published financial data to calculate financial ratios as predictors to forecast a company's future share price, or return, or direction of movement of future share prices. The predictor variables produced from fundamental analysis are referred as fundamental variables. This process of applying fundamental variables to make stock trading decisions starts with Benjamin Graham in 1928. Later, in 1934, Benjamin Graham published his first book entitled 'Security Analysis' which clearly explained what are the fundamental values of a security. Graham and Dodd (1951) present the idea that the 'intrinsic' or 'fundamental' value of any security equals the discounted cash flow which that security gives title to, and that actual prices fluctuate around these fundamental values. Thereafter a number of books were published by Benjamin Graham focussing on investment in stock markets. In his book entitled 'Intelligent Investor' which was first published in 1949, Graham made comments on the building of portfolios and selecting stocks. Graham suggested that the 'fundamental' value of an asset is the present value of the expected future returns from the asset. He defined three very important fundamental variables as, size of firm; capitalisation of firm; and price-earning ratio (P/E ratio), and urged investors to pay attention to these variables. In this book Graham provides detailed information about how to select companies using these variables.

Graham also provided a list of ten attributes of an undervalued stock. He suggested that investors could use these attributes to earn excess returns. These attributes were summarised by Lowe (1994) as bellows;

(1) Earnings-to price yield >= double the AAA bond yield

(2) P/E <= four-tenths highest average P/E in most recent 5 years

(3) Dividend yield >= two-thirds the AAA bond yield

(4) Price <= two-thirds tangible book value per share

(5) Price <= two-thirds net current asset value per share

(6) Total debt less than tangible asset book value

(7) Current ratio >= 2

(8) Total debt <= net quick liquidation value

(9) Earnings doubled in most recent 10 years, and

(10)No more that two declines in earnings of 5% or more in the past 10 years.

Following Graham's work, Cass and Shell (1983) consider the fundamentals to be the basic parameters defining an economy – such as endowments, preferences and production possibilities. They suggested that the problem of determining the fundamental value of an asset, which is to be held for an extended period of time, consists of three parts: first, estimating the income to be received over time; second, estimating the terminal value the asset will have at the end of the period; and third, deciding upon a discount rate to be used for translating future returns into current value. Then they argued that according to this, financial analysts should be instructed to recommend buying or selling securities that were priced below, or above, fundamental values, and to realise profits when the disparities were eliminated

Test of effectiveness of fundamental analysis

Many researchers carry out investigations to test the effectiveness of fundamental analysis. Over the period from April 1957 to March 1971, Basu (1977) investigated whether or not investing in stocks with low P/E ratios could earn excess returns when compared to investing in stock with higher P/E ratios. He found that portfolios made up from companies which had low P/E ratios earned higher returns than those portfolios built from higher P/E ratios. Basu's study concluded that the published information about companies P/E ratios could offer opportunities to investors and this was inconsistent with semi-strong form of EMH. Oppenheimer and Schlarbaum (1981) extracted the rules provided by Graham in each of the four editions of The Intelligent Investor, and used published information of companies' financial data to test Graham's approach to determine its effectiveness. They found that positive risk-adjusted rates of return were delivered to investors who followed that approach between 1956 and 1975. They discovered that in a frictionless market, rates of return were 3-3.5% higher than a naive buy-and -hold strategy. They also concluded that their evidence contradicts the semi-strong form of the efficient market hypothesis.

Some researchers' studies focused on the "size effect". Banz (1981) states the size of a company is connected with its capitalisation and return. He reports that stocks of small firms had higher returns than the common stock of large firms, over the period from 1936 to 1975. Banz believes that the size effect may be considered as a proxy for one or more other factors which are correlated with size of a company. Also, Reinganum (1981) shows that data on the size of companies can be used to select stocks and build investment portfolios based on CAPM. He studies small firms listed on the New York and American Stock Exchanges over the period from 1963 to 1977 and discovered that average rates of return for small firms were about 20% per annum greater than those of large firms.

Rosenberge, Reid, and Lanstein (1984) contribute two strategies to the application of fundamental analysis to increase returns. They are "book/price" strategy and "specific return reversal" strategy. The first one involves buying stock with a high ratio of book value to market price, and selling stock with the reverse. The second strategy is to compute specific returns per share, and relies on the observation that specific returns tend to reverse in the subsequent month. They selected 1400 of the largest companies listed on the New York Stock Exchange, over the period from 1980 to 1984, to carry out their investigation. Their findings provide quantitative evidence that both strategies can help investors earn abnormal returns, suggesting the share prices on the New York Stock Exchange were inefficient.

DeBondt and Thayler (1985) investigated investors' reaction to the movements of stock prices. Their results show evidence that investors tended to overreact when they were considering recent available financial data. They state that this overreaction led to a reversal effect on stock markets. This means that stocks that had been prior "losers" were likely to become "winners" in the future. They also examine the seasonal variation pattern of returns. They argue that the winner-loser effect is not primarily a size effect and the earnings of "winner" and "loser" firms present reversal patterns consistent with overreaction.

In 1992, detailed research carried out by Fama and French to investigate the above style of anomaly detection. They conclude that if asset-pricing is rational, the size and the ratio of book value of a stock to its market value must be proxies for risk, as opposed to reflecting market efficiency. Lakonishok, Shleifer, and Vishny (1994) also discovered that, based on the growth of sales, book-to-market value, cash flows, earnings, a wide range of value strategies have generated higher returns. Lakonishok et al (1994) carried out research in financial data taken from companies listed on NYSE and AMEX over the period from April 1963 to April 1990 April. They discovered that the markets appear to have consistently overestimated future growth rates for glamour stocks, relative to value stocks. They point out that the reward for fundamental risk does not explain the 10-11% higher average returns on value stock. However, Fama and French (1995) provide evidence against Lakonishok et al. Fama and French (1995) concentrated on studies of size, book-to-value, and created portfolios of stocks taken from NYSE, AMEX and NASDAQ over the period from 1963 to 1992. They demonstrate that both size and book-to value are related to profitability but found no evidence that returns respond to the book-to-market factor in earnings. They also suggest that there is a size factor in fundamentals that might lead to a size-related factor in returns.

Development of fundamental analysis

Fundamental analysis was developed to use a company's fundamental values to estimate future value of share prices. Rutterford (1993) noted that, in practice, fundamental analysis consisted of forming projections of future cash flow. This involved analysing the demand for products made by a firm, the possible future development of substitutes, changes in the regulatory environment and so on. To sum up, all information was relevant to future profitability. Frankel and Lee (1998) predict companies fundamental values (denotes by V) using I/B/E/S consensus forecasts and a residual income model. They discovered that V has a strong correlation relationship with share price and also the V/P ratio is a good predictor of long-term returns. They point out that this effect is not explained by a company's market beta (β), B/P ratio or size of the company (capitalisation). They argue that their evidence shows that a firm's value estimates could provide a better forecast ability than the simply using ratios. They state that prices converge to estimated values gradually over periods greater than 12 months.

The fundamental analyst studies corporate financial reports and other relevant available information to try to gain an insight into the "real worth" of the shares, in the hope of identifying ones that the market has over or undervalued.

However, some have argued against fundamental analysis. Alfred Cowles (1933) proves that the recommendations of main brokerage houses, presumably based on fundamental analysis, did not outperform the market. He stated that the implication was that investors who paid for the recommendations were wasting their money.

3.3.3 Technical analysis - charting

Technical analysis refers to a myriad of trading techniques. Brock et al (1992) explain that technical analysis attempts to predict share prices by studying past prices and related summary statistics. People who apply technical analysis to trading activities believe that shifts in supply and demand can be detected in charts of the movements of the market.

Technical analysis dates from the work of Charles Dow who produced an average of the daily closing prices of 11 important stocks as early as 1884. Later Dow published a series of articles in the Wall Street Journal documenting stock price patterns and movements he observed in the average in the period from 1900 to 1902. Dow's work represents the beginning of modern technical analysis in the western world. It is suggested that technical analysis existed in Japan centuries before Dow's early work in 1850, where the Japanese rice trader Munehisa Homma is claimed to have applied technical analysis, notably candlestick charting, to the first futures contracts. Japanese traders had been applying candlestick charting for so many decades and this was a secret unknown in western society until 1991, when Nison published his book entitled "Japanese Candlestick Charting Techniques" and introduced Candlestick charting the west.

Technical analysis can be classified as charting, indicators, and esoteric approaches. Charting is a major form of technical analysis. There is a large body of literature on technical analysis and using chart patterns. Gann (1940) initially defined the details of charts. His followers were Edwards and Magee (1948). They divide the charts into three types: reversal patterns, congestion patterns, and trend patterns. The charts are used to represent short-term trading periods on the assumption that patterns, over a very long time, were replicated in shorter time frames.

Rutterford (1983) describes how chartists specialise in analysing charts and graphs of share price information, spotting past trends and patterns and using these to forecast future price movements. He points out that the primary tool of technical analysis is the graph or chart. There are many charts available. For example, a line graph is a continuous line which connects the prices for each time interval, during the period covered by the chart. Other charts are bar charts, point and figure chart, and candlestick graphs.

Technical analysis seeks to analyse and interpret price movements. Choudhry (2001) defines the three basic principles of technical analysis behind charting. Firstly, market price discounts all information. This means that everything that is known about a market, at any given time, is reflected in its price. Secondly, history repeats itself. Technical analysts or chartists believe that markets are composed of people whose collective influence affects prices and direction. They believe that the future is a repetition of the past. Thirdly, market prices move in trends, which persist over a period of time. In this case, when a price moves in a particular direction, whether up or down, the trend will persist.

Pring (1999) suggests three basic principles of technical analysis:

1) Prices move in trends
2) Volume goes with the trend
3) A trend, once established tends to persist.

Choudhry (2001) points out that the starting point for charting is trend analysis. The purpose of analysis is to detect a trend in the price action. In a bull market, the price moves upward in a series of rises, while in a bear market, the price moves in a series of declining jagged lines. Peaks and troughs in the graph are discernible. When the peaks and troughs are within a defined price range, the market is said to be in a trading range. That means that an investor is able to make the decision to trade.

Trend analysis is very important in detecting the direction of price movements. By analysing trends of price movement, chartists are able to identify the trading range, generate breaking through trend lines and retracing lines, and price gaps. Chartists believe that it is possible to make investment decisions by following the trend analysis.

A significant view on trend analysis is reversal patterns. Choudhry (2001) describes reversal pattern as a reverse which is a current trend that occurs over a period of time, which can range from one day to several weeks, and this transition period is usually illustrated by a reversal pattern. He argues that investors try to recognise reversal patterns because they have predictive value and also argues that certain patterns are observed more frequently than others and therefore are more well known. He summarises the types of reversal patterns as head-and-shoulders (top and bottoms), rounded tops or bottoms, double tops and bottoms, triple tops and bottoms, broadening formations, and triangles tops and bottoms.

The head-and–shoulders reversal pattern is one of the best-known patterns used in charting analysis. Choudhry describes how it is comprised of the left shoulder, the head, the right shoulder, the neckline. From a head-and–shoulders reversal pattern, investors can identify the continuation of the trend in heavy trading volume, the trigger point at which the investor is likely enter the market.

Another famous pattern used in charting analysis is double tops and bottoms. Choudhry (2001) suggests that in this case, the markets appear with a new low price in a downward trend before moving back up to form a reaction high level. From this point, the market moves back down on lower level volume and near to or on the previous low. Choudhry points out that this is close to forming an inverted "W". He states that the top of "W" forms the base level, and a line is drawn across the top of "W" parallel to the two bottoms, and from there, any break of this base line is a signal to buy. The expected move is the price range from the top of the pattern to the bottom.

An equally famous pattern used in charting analysis is point and figure charting. Choudhry points out that this method of charting is merely a "book method". He suggests that the purpose of using point-and-figure charts is to determine where price activity is consolidating. According to the charts, once a consolidation area is observed, a valid forecast may be made of future price movements. In this pattern, the charts are constructed by using a series of noughts and crosses. The crosses represent rising prices and the noughts represent falling prices. As Choudhry (2001) points out, "the greater the frequency of price movements, the less the price congestion; the more compact the price movements, the greater the congestion area. Once a price moves away from the congestion area, again depending on where it came from, prices will either reverse or continue."

Technical analysis is commonly used in stock market trading. Taylor and Allen (1992) survey 213 traders in the London Foreign Exchange Market. Their findings showed 36% of respondents have been using chartist computer graphics packages while 65% of respondents reported using online commercial computer services. Cheung and Wong (2000) carried out a survey on the US markets and thirty percent of those questioned admitted they were technical traders.

In short, the Chartist seeks to predict future price movements by seeking to interpret past patterns, on the assumption that historical trends repeat themselves. They believe that future changes in stock market prices must repeat previous price movements. They believe that the market has a memory and that share prices changes will occur following the same trends as before.

The EMH states that successive prices changes in the stock markets are independent, identically distributed random variables. This implies that a series of price changes has no memory, meaning that study of past prices cannot provide a useful contribution to predicating future prices. The conclusion was made that technical analysis cannot work. This led to a loss of interest by academics.

However, in practice, a large number of investors use technical analysis as main method of stock selections, regardless of the EMH and the random walk theory. Taylor and Allen (1992) carried out a survey of Foreign Exchange dealers on behalf of the Bank of England, and discovered that above 90% of the respondents applied technical analysis to decision making.

3.4 Signalling Effect

Shaw (1998) defines signalling as taking action when information has been conveyed and communicated by a variety of means. He points out that the signalling principle is very important because the actions of individual buyers and sellers of financial securities in the capital markets convey a signal to the issuer of those securities as to the benefits of being a holder. He explains that the collective action of investors appraises companies' management and so changes in share prices act as a signal to managers, fund lenders and investors.

Signalling has its roots in the idea of the construct of asymmetric information, which is a deviation from perfect information. It is criticised in some economic transactions because inequalities in access to information upset the normal market in the exchange of goods and services. Earlier researchers realized that signalling has an effect on investment decision making. Spence (1973) provides an example to show how signals sent between two parties influence their actions. He suggests that two parties can get around the problem of asymmetric information by having one party send a signal that would reveal some piece of relevant information to the other party. That party would then interpret the signal and adjust their purchasing behaviour. A higher price would be offered if the party had not received the information signal. Using his findings from studies on market signalling, Herbig (1996) demonstrates that how a company can send signals effectively to its customers and competitors.

Types of signals

Stock markets are in fact capital markets where companies raise long-term finance. Signalling has a significant effect on changes in share prices and influences investors' decision making. Corporate business activities, such as mergers and acquisitions and the announcement of new share issues, financial results and investment prospects move these companies' share prices.

Signals sent by corporations' financing activities

In a detailed explanation Penman (2007) states that the effect of issuing shares at market value is different from the effect of announcing that a share issue will be made. Sometimes the announcement, in advance of the issue, carries information about the value of the firm, for example about investment prospects, and so the market price changes. But this effect, sometimes referred to as a signalling effect, is generated by new information, not by the issue itself. Bradfield (2007) argues that a company's choice of which security to issue credibly transmits the firm's private information to prospective buyers of new securities. He believes that a firm's choice of the kind of security to issue is an example of the general problem of signalling in economics. It is understood that in order to maximise the shareholders' wealth, managers must make optimal choices of which investment projects to undertake and how to finance them. Optimal choices of investment projects and the sources of finance of these projects, transmit private information to potential investors. Empirical studies of the ways in which a corporation might finance the company, debt finance or equity finance have shown that a company's choices of finance transmits signals to investors and these affect the company's share price. In finance, the apparent motivation for a new bond issue could be critical. An announcement of a new bond issue can signal to the market an unexpected shortage of cash flow from the assets of that issuing company and investors are then aware of this. Bond and share prices of the company may fall and its borrowing costs may rise.

Signals sent by corporations' performance improvement

An improvement in a corporations' performance such as a new investment in fixed assets or mergers and acquisition activities, can give signals to the market and drive its share price up. Investment in new plant and equipment, to increase production capacity, can signal to the market that future economic benefits are flowing in to the company, with an improved level of profitability. The announcement of mergers and acquisitions indicates the growth of the businesses and signals investors that their share prices are changing, as well the total equity of the companies.

Signals sent by corporations' changes in dividend policies

Companies can announce dividend payments to signal to investors the companies' ability to generate profits and indicates the benefits of future cash flow to investors. Arnold (2007) points out dividends appear to act as important conveyors of information about corporations.

A growth of dividends payable means the shareholders' returns are maintained, which shows the directors' view of the future prospects of the business. Investors take an optimal view about a company's future profitability if there is a large increase in the dividends payable. On the other hand, with a decline in dividends, investors consider it to be a bad sign.

Signals sent by insiders

Managers who are responsible for the operations of businesses have details of the companies' prospects and their actions and words to the public are often considered as information signals sent to the markets. Rose and Marquis (2006) suggest that a manager acts as an insider when he knows his company is in trouble and sells the company's shares His action of selling his company's stock sends a signal to the public that the company is in trouble. If other investors happen to see insiders selling out they may follow and begin to sell, driving the company's share price lower in the stock market.

Signals sent by chartists

In the field of technical analysis charting is a very important tool used to display information with meaningful graphs. The people who apply charting to analyse and predict the movements of stock prices are called chartists. They generate indicators for the purpose of forecasting share prices and the direction of movements. For example, chartists compute Centre Moving Average (CMA) of a stock, based on the stock's historical prices, to identify the moving trends and directions of the share price. Moreover, chartists produce charts or graphs to display the shapes or patterns of share price movements and give their meaning, to help investors identify buying and selling points. Furthermore, some charting graphs are used to help investors in making decisions. In this context these charting indicators can be thought of as "magical indicators" of future stock movements. For instance, candle lines, such as "Long White Candle" and "Hammer", and candle patterns such as "Dark Cloud Cover" and "Three Advanced Soldiers" on charts generated by candlestick charting, have the magical meaning to signal investors the up or down movements of share prices.

In the next chapter more detailed information on the magic of information signalling with the focus on the magic and reliability of candlestick charting will be discussed.

3.5 Summary

Investors invest in the stock market to earn a rate of return to increase their wealth or to satisfy their personal objectives. Investors select shares to make up a portfolio to reduce risk and maximise their wealth as they face the existence of risk and future uncertainty. The analysis of share price movements helps investors make investing decision on buying and selling and this causes share prices to change over time.

Chapter 4 Literature Review

The magic of candlestick charting

4.0 Introduction

The world of finance has always taken the view that investors are rational, seeking to maximise the utility which they enjoy from their investments. This kind of thinking underpins nearly every financial model. However, history teaches us that in reality investors are often anything but rational. For example, why do people suddenly decide that they must all purchase certain assets? The famous South Sea Bubble and the Tulip mania are known to everyone, yet more recently few people realised that a huge housing and property bubble was developing on the back of low interest rates. The recent commodity boom, when oil touched $150 a barrel, was explained both by speculators and the media, claiming that the commodity was precious and in short supply. Many commentators were talking about a $200 price instead of realising that in reality oil futures were being over bought.

The obvious question to ask is why do people suddenly decide that they must have certain assets. In the early 1960s Shaw (2005) noticed how school children valued certain cards contained in bubble gum, and that these values became akin to fixed exchange rates. The company which produced the cards was probably unaware that some cards, such as the one of the dead drummer boy, had a very high value placed upon them, whereas other cards could be simply exchanged for each other. However the interesting fact is that the playground value system also experienced bubbles where at one time a certain card had a great value only later to fall in value and become almost worthless.

Financial theory seems to be uncomfortable with asset bubbles and is unable to explain exactly how they come about. When prices crash everyone talks about overvalued assets but, up to that point, prices continue to rise and everyone appears to want a piece of the action. In order to understand this phenomenon one needs to look for an explanation outside of the financial literature and, strangely, the best explanation is found in literature relating to magic.

This chapter presents literature review of the magic related to investment in financial markets. The origins of this magic will be explained as well as its application to the stock market. The chapter focuses on the interpretation of magical meanings released by candlestick charting.

4.1 What is magic?

To most people magic refers to a form of entertainment where a performer, the *magician,* performs acts such as pulling a rabbit out of a hat, but in fact this is only one facet of magic. Magic can be thought of as something that happens in our society but we do not know why or how it happens.

4.1.1 Definitions of magic

So what is magic? The Oxford English Dictionary defines it in the following way: It is the "supposed art of influencing or controlling events supernaturally", or "witchcraft", or "conjuring tricks", or "inexplicable influence", or "enchanting quality or phenomenon" (p.675). Magic is sometimes known as sorcery, is the practice of consciousness manipulation or autosuggestion to achieve a desired result by empirical techniques described in various conceptual systems. The practice of magic is often influenced by ideas drawn from religion, mysticism, occultism, science, and psychology.

In anthropology, the foremost perspectives on magic are functionalist, symbolist and intellectualist, which are used to describe how magic works in a society. In his book 'Dictionary of Concepts in Cultural and Anthropology', published in 1991, Robert H. Winthrop states that the functionalist perspective holds the idea that all aspects of society are meaningful and interrelated. This means that magic performs a latent function in the society. According to the Dictionary of Anthropology, published by Blackwell in 1997, the symbolist perspective shows the subtle meaning in rituals and myths that define a society. The intellectualist perspective regards magic as logical – "bad science" which is based on a flawed understanding of the work, according to Sir James Frazer (1911) and Edward Burnett Tylor (1920).

4.1.2 Theories of magic, religion and science

Theories of magic can be classified as psychological theories or sociological theories. Psychological theories regard it as a personal phenomenon intended to meet individual needs. Thus theories of magic include that magic is neurosis, magic is bad science, and magic is anxiety relief.

Magic, science, and religion are categories of beliefs and systems of knowledge used with in society. In western societies, the centre of the study of magic for many of the great theories in sociology and anthropology has been interactions, similarities and differences. Earlier researchers are Frazer (1911), Tylor (1920), Malinowski (1935), Wax (1960), Tambiah (1968) and Mauss (1972). From point of view of the functionalist and intellectualist, magic is considered as science and technology. The symbolist considers magic to be most like religion.

Our understanding of magic comes from different writers but in Christian societies it is heavily influenced by the Catholic writer Wax (1960) who described a variety of deviant religious practices which he called magic. Wax's work has had a profound effect upon how we see and perceive magic today. Rather than seeing magic as an empirically inaccurate or logically fallacious system of philosophy, magic has been seen by Christian theologians as an impious, evil and blasphemous perversion of religion.

However, Christian theologians have not been the only people interested in magic.

Anthropologists have always been interested in the role magic plays, in what are often referred to as 'primitive' societies. Within anthropology, the intellectual conception of magic has been treated by Tylor (1920) who suggested that magic was an elaborate and systematic pseudo-science, by which people attempt 'to discover, to foretell and to cause certain events. Tylor endorsed Wax's position, he saw magic as an intellectual error or harmful superstition, rather than seeing it as part of life. Frazer (1925) endorsed Tylor's position, as he also saw magic as a pseudo-science and superstition. Indeed, without the work of Malinowski (1948), this would probably have become our understanding of magic, but Malinowski (1954), whilst reaffirming Frazer's position regarding magic as a pseudo-science, made a key distinction between magic as a form of practical reason and magic as a kind of science. Malinowski saw magic as akin to science, in that it has a definite practical aim and is governed by a theory and a system of principles.

Mauss (1972) classifies magic as a social phenomenon, akin to religion but in a distinct category. In his book A General Theory of Magic, Mauss points out that in practice magic bears a strong resemblance to religion. Both magic and religion use similar types of rites, materials, social roles, and relationships to accomplish aims and engender belief. Mauss argues that the distinction between magic and religion is both of sentiment and practice. Magic is secretive and isolated, rarely performed openly to preserve occult knowledge. Religion is predicable and proscribed and is usually performed openly to impart knowledge to the community. Magic and religion share many ritual forms as Mauss concludes that "a magic rite is any rite that does not play a part in organized cults. It is private, secret, mysterious and approaches the limit of prohibited rite" (p.24). In practice, Mauss believes that magic defers from religion in desired outcome. Religion seeks to satisfy moral and metaphysical ends, while magic is functional art seeking to accomplish tangible results. In this respect magic resembles technology and science. Mauss states that the similarity between these social phenomena is limited, because science is based on experimentation and development, while magic is "a priori belief" (p.92)

Stanley Tambiah provides different anthropological approaches to magic, religion and science. Tambiah (1990) suggests that magic, religion and science all have their own "quality of rationality" (p.2), and have been influenced by politics and ideology. He believes that the perceptions of these three ideas have evolved over time as a result of Western thought. Although the lines of demarcation among these ideas depend upon the perspective of a variety of anthropologists Tambiah states that religion is based around an organized community (the church), and it is supposed to encompass all aspects of life. Religion is effective and attractive because it is generally exclusive and strongly personal. Religion is convenient in the sense that morality and notions of acceptable behavior are imposed by God and the supernatural. Science, on the other hand, has a clear divide between nature and supernatural, making its role far less all-encompassing than that of religion's role. Tambiah suggests that science is "a system of behavior by which man acquires mastery of the environment" (p.8). Tambiah states that magic is a strictly ritualistic action that implements forces and objects outside the realm of the Gods and the supernatural. These objects and events are said to be efficacious and the supernatural is unnecessary. Magic is considered as a "proto-science" and the possibility of anything happening outside of Gods was denied. For example, spells are suggested as ineffective and blasphemous because religion ultimately "assumed the direction of the world by a conscious agent who could be deflected from this purpose by prayer and supplication" (p.19)

4.2 People's belief in magic

Malinowski (1954) realized that magic arises and functions in situations of emotional stress, crises of life and tribal mysteries. Whenever there appears to be no rational explanation magic opens up an escape route from such situations and thereby provides a cultural function. When people face an impasse, or have insufficient knowledge, then magic plays a crucial role because it provides a way of ritualizing human optimism, thereby enhancing peoples' faith in hope over fear. Malinowski put it very well when he wrote "magic expresses the greater value for man of confidence over doubt, of steadfastness over vacillation, of optimism over pessimism".

When magic is seen in this way it is actually akin to science in that it always has a definite aim intimately associated with human instincts, needs and pursuits. The magic art is directed towards the attainment of practical ends and is like any other theory, in that it has a system of principles which dictate the manner in which the act has to be performed in order to be effective. Malinowski advanced the view that magic, in all its forms, is made up of three essential components. *"Firstly, in its performance, certain words must always be used. Secondly there must be certain ceremonial actions at which one key individual always officiates. Finally magic has to have integrity which must be based on some form of tradition. Thus the essence of all magic is its traditional integrity, for magic can only be efficient if it has been transmitted without loss and without flaw from one generation to another, until it can be seen as having come down from early times to the present performer."* (Malinowski 1954, p.86)

In western societies the true value and significance of magic as a social phenomenon does not lie in its ability to provide a valid understanding of truth but in its ability to provide a spiritual function. Marguiles (1972) has argued that in our society, the Organization Development (OD) consultant is seen as the expert par excellence in much the same way as the medicine man was seen as a magical healer in primitive societies. Marguile's research supports Brooker's (1967, 1972) work which focused on the fact that we have no problem in comparing primitive legal systems, government and marriage ceremonies with our own. Indeed we do this even in situations where the primitive societies have no courts, or their governments recognise no such things as different states, or where marriage means polyandry instead of monogamy. What, in Brooker's view, is strange is our lack of willingness to compare certain types of industrial behaviour with its primitive counterparts, which has led to many negative terms being applied to irrational behaviour in industry. Brooker argued that there is a need to re-define magic and has proposed the following definition. In his view magic refers to those patterns of behaviour in which conscious attempts are made to manipulate variables in the environment but which include no means of comparing results with intent, in order to modify the manipulative behaviour.

4.3 Features of magical practice

Magical practice has a long history and is often seen in our societies. Its main features include magical language, witchcraft, Magicians, rituals, and magical symbols.

Magical language

This is the use of language to access or guide magical power during the performance of magic. Tambiah (1968) argues that the connection between language and magic is due to a belief in the inherent ability of words to influence the universe. Malinowski argues that "the language of magic is sacred, set and used for an entirely different purpose to that of ordinary life" (p.213). He suggests that this belief if an extension of the man's basic use of language to describe his surroundings and states that "the knowledge of the right words, appropriate phrases and the more highly developed forms of speech, gives man a power over and above his own limited field of personal action" (p235).

Witchcraft

It is defined as magical beliefs and practices. It is a means for people to magically affect the world around them through various spells, rituals or events intended in either a harmful or benevolent way.

Magicians

These are any practitioners of performing magic. They may be specialists or common practitioners who possess some esoteric knowledge, trait, or experience that is culturally acknowledged to convey magical powers.

Rituals

Magical rituals are defined as actions used to work magic. For example, speech or magical language is one of rituals, which is used in ritual to help foster the proper mindset to believe in the ritual. It is archaic and out of ordinary. Other rituals are gestures, possibly performed with special objects at a particular place or time.

Magical symbols

Magic often utilizes symbols that are thought to be intrinsically efficacious. Anthropologists suggest two primary categories of the implementation of symbols. These are the "principle similarity" and the "principle of contagion". Sir James Frazer (1854-1938) categorized these principles as "sympathetic magic" and "contagious magic". Frazer pointed out that these concepts were "general or generic laws of thought, which were misapplied in magic". (Tambiah 1990, p52)

For many cultures that utilize magic, symbols are seen as a type of technology. Natives may use symbols and symbolic actions to bring about change and improvement. Many symbolic actions are derived from mythology and unique associations.

4.4 The relationship between magic and candlestick charting

Candlestick charting has many of the facets of magic. Firstly there are spells as the users refer to a range of terminology to describe stock movements. For example they talk about long black candlesticks as a sign the market will fall. Secondly there must be rites and symbols. Candlestick charting is full of symbols and the recording of the information takes on the performance of a ritual where the investors who claim to understand candlestick charting seek to predict the future performance of the market.

Candlesticks, which are used in charting for financial analysis, are symbols of the movements of the prices of financial assets. Investors who use candlestick charting have adopted the historical meanings given to different candlesticks and candlestick patterns. For example, a Long Black candlestick is a symbol of a stock market fall, while a Long White candlestick is a symbol of a stock market advance. However, many investors have gone further in that they adjust their investing decisions according to the appearances of certain candlesticks and candlestick patterns. In this regard candlestick patterns have taken on the meaning of some kind of magical language which is used to guide investors' decisions.

Actions taken by investors who believe that candlestick charting can be used in this way are therefore similar to practitioners of a kind of magic. These people consider candlesticks charting as a kind of science. As a result of observed changes in candlestick patterns they believe they can predict the future and beat the market.

In modern terms independent financial advisors are cast in the roles of the magicians or shamans in primitive societies. If it could be shown the application of signs and symbols of candlestick charting provide with an incontrovertible proof that it works, candlestick is a form of science. If not, then belief in candlestick charting has to be seen as magic.

4.5 Magic of candlestick charting

Candlestick charting is one of most popular technical analysis techniques and it is commonly used by investors especially professional traders. It is suggested that candlestick charts provide guides to investors on the future movements of the share prices in stock markets. People who believe in candlestick charting play a magic performance with meanings released by candle lines and patterns.

4.5.1 A brief history of candlesticks

Candlesticks were originally created by the Japanese rice trader named Homma and first appeared after 1850 in the town of Sakata in Japan. This was long after the country's unification under the Tokugawa Shogunate, a feudal military dictatorship that lasted for almost three hundred years from 1603 to 1868 which gave Japan its first real taste of centralization. According to Hirschmeier and Tsunehiko (1975), a rice exchange, namely the Dojima Rice Exchange, was established in Osaka in 1730 under the country's centralized commodities markets. The business began as a venue for the purchase and sale of the physical commodity, then this exchange developed a scheme of warehouse receipts. Rice farmers who needed immediate cash began to sell receipts for future deliveries of rice and these receipts were traded on the Dojima Exchange. This is considered to be the world's first commodity futures contracts (according to Nison 1991). It was then developed over many years and finally used as a system of candlestick charting on the financial markets.

Munehisa Homma (1724-1803, Sakata, Japan) was a famous rice trader on the exchange. He was also a wealthy rice farmer and merchant. He believed that markets were influenced by human emotions that often created a gulf between prices and intrinsic value. He created candle lines and patterns and attempted to capture a measure of these emotions and apply them to predict future movements of rice prices. His work of charts with candlesticks was called candlestick charts. Nison (1991) points out that from these beginnings candlestick charting was developed and used to analyse other commodity and securities markets. It has been the dominant form of technical analysis used in Japan.

From 1603 to 1868 Japan was cut off from the world without external influences. Although there were treaties with western nations all attempts to open up Japanese society ended in failure. This period finally came to an end in 1878. Candlestick charting had been developed in Japan to predict the price movements of simple agricultural commodities in what was a small, isolated society. Industrialization and commercialization did not occur until after 1885.

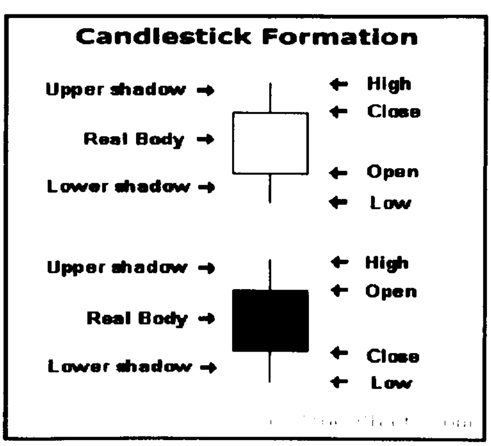
The Japanese had been using candlestick charting techniques to trade in global markets for many years. But in the western world this remained a secret until the year 1991 when Steve Nison published a book entitled "Japanese Candlestick Charting

Techniques: A Contemporary Guide to the Ancient Investment Techniques of the Far East" and introduced the candlestick technical analysis to western society.

In the western world, the technical analysis, usually credited to Charles Dow, appeared in the late 1800s. But candlestick charting techniques were being used in Japan at least 100 years earlier than the appearance of western technical analysis. Today, candlestick charting is believed to be the earliest version of technical analysis.

4.5.2 The formation of candlesticks

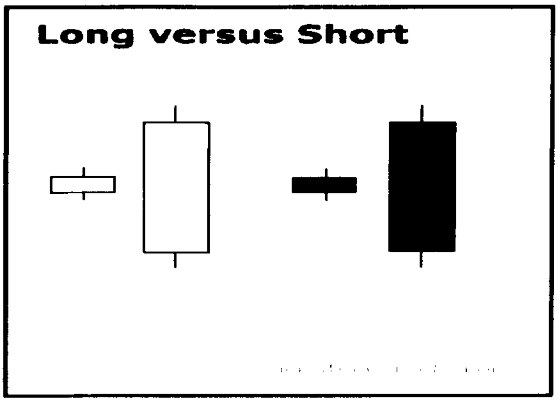
To produce candlesticks a data set of a financial asset that contains open, high, low and close values for each time period is used. The detailed explanation of the formation of candlesticks, including pictures of candlesticks and candlestick patterns, was quoted directly from the website: www.stockcharts.com. The interval between the opening price and closing price is the body of the candlestick, colored white if the closing price is greater than the opening price and colored black if the opening price is greater than the closing price. The distance by which the low price is less than the interval is called a 'Shadow' or 'Low shadow' and is represented by a line segment over the distance. The distance by which the high price is greater than the interval is called a 'Wick' or 'Up shadow' and is represented by a line segment over the distance. Wicks and shadows can be virtually any length, including zero. The following graph represents the formation of the candlestick.



The colors of candlesticks indicate the upward and downward movement of the market. For example, candlesticks are white on 'Up' days and black on 'Down' days.

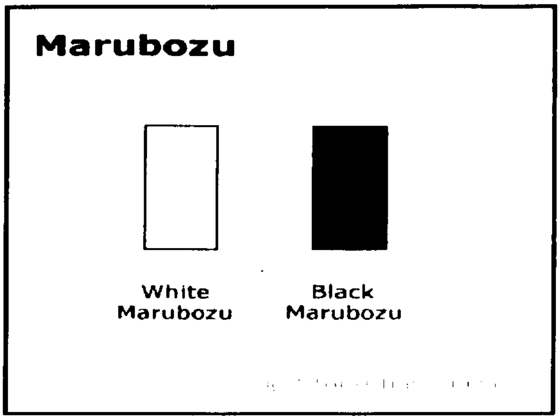
Long versus short bodies

A long or a short body of a candlestick has different meanings. The following graph represents the formation of the long and short bodies of a candlestick.



Long white candlesticks show strong buying pressure. The longer the white candlestick is, the further the close is above the opening. This indicates that prices advanced significantly from opening to closing and buyers were aggressive. While long white candlesticks are generally bullish, much depends on their position within the broader technical picture. After extended declines, long white candlesticks can mark a potential turning point, or support level. If buying gets too aggressive after a long advance, it can lead to excessive bullishness.

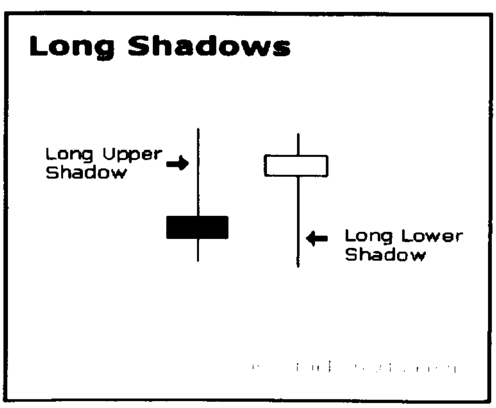
Long black candlesticks show strong selling pressure. The longer the black candlestick is, the further the close is below the opening. This indicates that prices declined significantly from the opening and sellers were aggressive. After a long advance, a long black candlestick can foreshadow a turning point or mark a future resistance level. After a long decline a long black candlestick can indicate panic or capitulation.



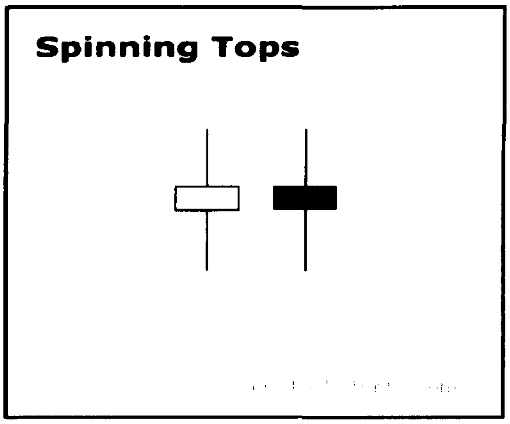
Even more potent long candlesticks are the Marubozu brothers, Black and White. Marubozu do not have upper or lower shadows and the high and low are represented by the opening or closing.pressure. A White Marubozu forms when the opening equals the low and the closing equals the high. This indicates that buyers controlled the price action from the first trade to the last trade. A Black Marubozu forms when the opening equals the high and the closing equals the low. This indicates that sellers controlled the price action from the first trade to the last trade.

Long versus short shadows

The upper and lower shadows on candlesticks can provide valuable information about the trading session. Upper shadows represent the session high, and lower shadows the session low. Candlesticks with short shadows indicate that most of the trading action was confined near the opening and closing. A candlestick with long shadows shows that trading extended well past the open and close.



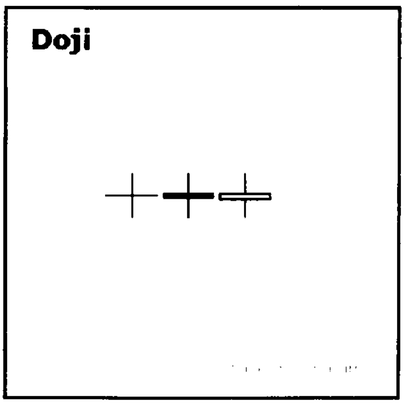
Candlesticks with a long upper shadow and short lower shadow indicate that buyers dominated during the session, and bid prices higher. However, sellers later forced prices down from their highs, and the weak close created a long upper shadow. Conversely, candlesticks with long lower shadows and short upper shadows indicate that sellers dominated during the session and drove prices lower. However, buyers later resurfaced to bid prices higher by the end of the session and the strong close created a long lower shadow.

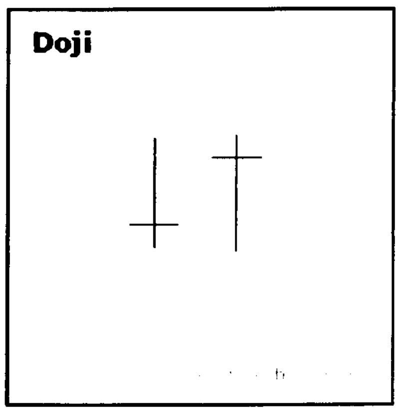


Candlesticks with a long upper shadow, long lower shadow and small real body are called spinning tops. One long shadow represents a reversal of sorts; spinning tops represent indecision. The small real body (whether hollow or filled) shows little movement from open to close, and the shadows indicate that both bulls and bears were active during the session. Even though the session opened and closed with little change, prices moved significantly higher and lower in the meantime. Neither buyers nor sellers could gain the upper hand and the result was a standoff. After a long advance or long white candlestick, a spinning top indicates weakness among the bulls and a potential change or interruption in trend. After a long decline or long black candlestick, a spinning top indicates weakness among the bears and a potential change or interruption in trend.

Doji

Doji are important candlesticks that provide information on their own and as components of in a number of important patterns. Doji form when a security's open and close are virtually equal. The length of the upper and lower shadows can vary and the resulting candlestick looks like a cross, inverted cross or plus sign. Alone, doji are neutral patterns. Any bullish or bearish bias is based on preceding price action and future confirmation. The word "Doji" refers to both the singular and plural form.





Ideally, but not necessarily, the open and close should be equal. While a doji with an equal open and close would be considered more robust, it is more important to capture the essence of the candlestick. Doji convey a sense of indecision or tug-of-war between buyers and sellers. Prices move above and below the opening level during the session, but close at or near the opening level. The result is a standoff. Neither bulls nor bears were able to gain control and a turning point could be developing.

Doji and Trend

The relevance of a doji depends on the preceding trend or preceding candlesticks. After an advance, or long white candlestick, a doji signals that the buying pressure is starting to weaken. After a decline, or long black candlestick, a doji signals that selling pressure is starting to diminish. Doji indicate that the forces of supply and demand are becoming more evenly matched and a change in trend may be near. Doji alone are not enough to mark a reversal and further confirmation may be warranted.

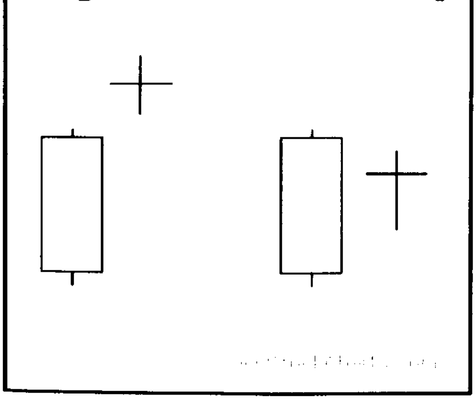
4.5.3 The candlesticks, candlestick patterns and their magic meanings

According to Nison (1991) a candlestick which is produced using open, high, low, and close prices of a financial asset is called single candle line,. and two or more candle lines can form a candlestick pattern.

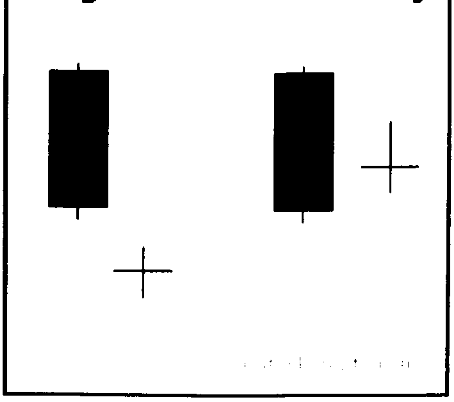
Examples of the single candle lines, often seen in the financial markets, are Long White, Long Black, Hammer, Hanging Man, star, Doji Star. Examples of candlestick patterns, often seen in the markets,are Three White Soldiers, Three Black Crows, Engulfing position, and Morning or Evening Star.

Over 70 candlestick single lines and 70 candlestick patterns are provided by Nison (1991) and Nison (1994). Each of these candlestick lines and candlestick patterns has magic meanings signaling investor the changes in the movements of the stock prices. For instance, single candle line 'Doji' is generated when the market close price is the same as the opening price, together with the high and low price. Nison (1994) devotes an entire chapter to describe the 'Magic of Doji'. He claims that 'The Doji is a distinct trend change signal.' This means that investors treat Doji as the magic behind the market. When a Doji appears at the top of an up trend it indicates a coming down turn; When Doji appears at the bottom of the down trend it indicates a bull market is approaching.

Long White Candle + Doji

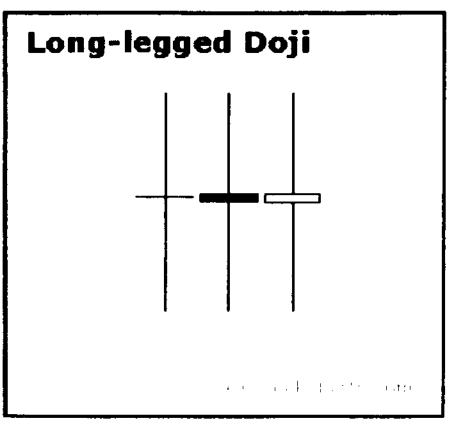


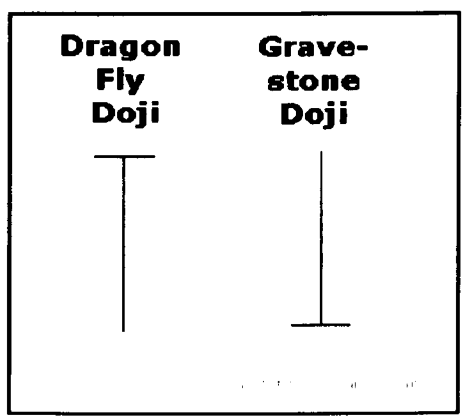
Long Black Candle + Doji



After an advance or long white candlestick, a doji signals that buying pressure may be diminishing and the uptrend could be nearing an end. Whereas a security can decline simply from a lack of buyers, continued buying pressure is required to sustain an uptrend. Therefore, a doji may be more significant after an uptrend or long white candlestick. Even after the doji forms, further downside is required for bearish confirmation. This may come as a gap down, long black candlestick, or decline below the long white candlestick's opening. After a long white candlestick and doji, traders should be on the alert for a potential evening doji star.

After a decline or long black candlestick, a doji indicates that selling pressure may be diminishing and the downtrend could be nearing an end. Even though the bears are starting to lose control of the decline, further strength is required to confirm any reversal. Bullish confirmation could come from a gap up, long white candlestick or advance above the long black candlestick's opening. After a long black candlestick and doji, traders should be on the alert for a potential morning doji star.





Long-legged doji have long upper and lower shadows that are almost equal in length. These doji reflect a great amount of indecision in the market. Long-legged doji indicate that prices traded well above and below the session's opening level, but closed virtually even with the opening. After a whole lot of yelling and screaming, the end result showed little change from the initial opening.

Dragon fly doji form when the opening, high and closing are equal and the low creates a long lower shadow. The resulting candlestick looks like a "T" with a long lower shadow and no upper shadow. Dragon fly doji indicate that sellers dominated trading and drove prices lower during the session. By the end of the session, buyers resurfaced and pushed prices back to the opening level and the session high.

The reversal implications of a dragon fly doji depend on previous price action and future confirmation. The long lower shadow provides evidence of buying pressure, but the low indicates that plenty of sellers still loom. After a long downtrend, long black candlestick, or in support, a dragon fly doji, could signal a potential bullish reversal or bottom. After a long uptrend, long white candlestick or at resistance, the long lower shadow could indicate a potential bearish reversal or top. Bearish or bullish confirmation is required for both situations.

Gravestone Doji

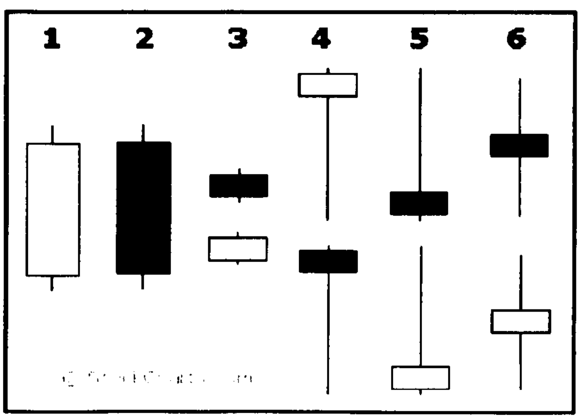
Gravestone doji form when the open, low and close are equal and the high creates a long upper shadow. The resulting candlestick looks like an upside down "T" with a long upper shadow and no lower shadow. Gravestone doji indicate that buyers dominated trading and drove prices higher during the session. However, by the end of the session, sellers resurfaced and pushed prices back to the opening level and the session low.

As with the dragon fly doji and other candlesticks, the reversal implications of gravestone doji depend on previous price action and future confirmation. Even though the long upper shadow indicates a failed rally, the intraday high provides evidence of some buying pressure. After a long downtrend, long black candlestick, or support, focus turns to the evidence of buying pressure and a potential bullish reversal. After a long uptrend, long white candlestick or at resistance, focus turns to the failed rally and a potential bearish reversal. Bearish or bullish confirmation is required for both situations.

Before turning to the single and multiple candlestick patterns, there are a few general guidelines to cover.

Bulls versus Bears

A candlestick depicts the battle between Bulls (buyers) and Bears (sellers) over a given period of time. An analogy to this battle can be made between two rugby teams, which we can also call the Bulls and the Bears. The bottom (intra-session low) of the candlestick represents a try for the Bears and the top (intra-session high) a try for the Bulls. The closer the close is to the high, the closer the Bulls are to a try. The closer the close is to the low, the closer the Bears are to a try. While there are many variations, I have narrowed the field to 6 types of games (or candlesticks):



1. Long white candlesticks indicate that the Bulls controlled the ball (trading) for most of the game.
2. Long black candlesticks indicate that the Bears controlled the ball (trading) for most of the game.
3. Small candlesticks indicate that neither team could move the ball and prices finished about where they started.

4. A long lower shadow indicates that the Bears controlled the ball for part of the game, but lost control by the end and the Bulls made an impressive comeback.
5. A long upper shadow indicates that the Bulls controlled the ball for part of the game, but lost control by the end and the Bears made an impressive comeback.
6. A long upper and lower shadow indicates that the both the Bears and the Bulls had their moments during the game, but neither could put the other away, resulting in a standoff.

Prior trend

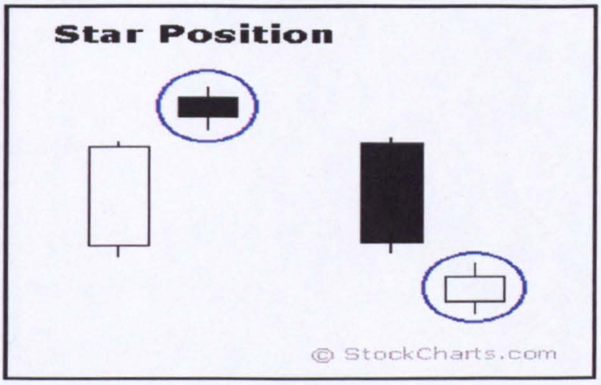
In his book, *Candlestick Charting Explained*, Greg Morris (1995) notes that for a pattern to qualify as a reversal pattern, there should be a prior trend to reverse. Bullish reversals require a preceding downtrend and bearish reversals require a prior uptrend. The direction of the trend can be determined using trend lines, moving averages, peak/trough analysis or other aspects of technical analysis. A downtrend might exist as long as the security was trading below its down trend line, below its previous reaction high or below a specific moving average. The length and duration will depend on individual preferences. However, because candlesticks are short-term in nature, it is usually best to consider the last 1-4 weeks of price action.

Candlestick positions or patterns

Many candlestick positions or patterns are formed with two or more than two single candlesticks. Their magic meanings are believed to be signals to investors showing the movements of the stock prices. For example, Star and position and Harami pattern.

Star

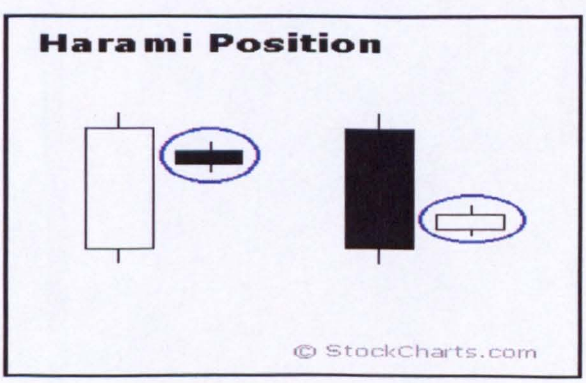
A candlestick that gaps away from the previous candlestick is said to be in star position. The first candlestick usually has a large real body, but not always, and the second candlestick, in star position, has a small real body.



Depending on the previous candlestick, the star position candlestick gaps up or down and appears isolated from previous price action. The two candlesticks can be any combination of white and black. Doji, hammers, shooting stars and spinning tops have small real bodies, and can form in the star position. Later we will examine 2- and 3-candlestick patterns that utilize the star position.

Harami

A candlestick that forms within the real body of the previous candlestick is in Harami position. Harami means pregnant in Japanese, hence the second candlestick is nestled inside the first.



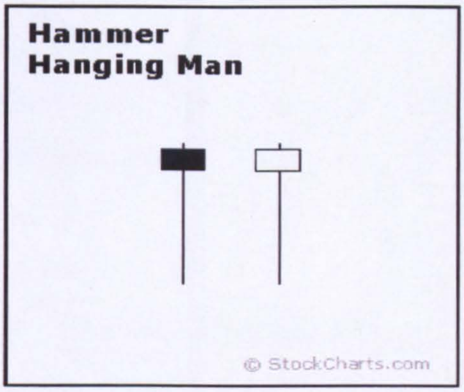
The first candlestick usually has a large real body and the second a smaller real body than the first. The shadows (high/low) of the second candlestick do not have to be contained within the first, though it is preferable if they are. Doji and spinning tops have small real bodies, and can form in the harami position as well. Later we will examine candlestick patterns that utilize the harami position.

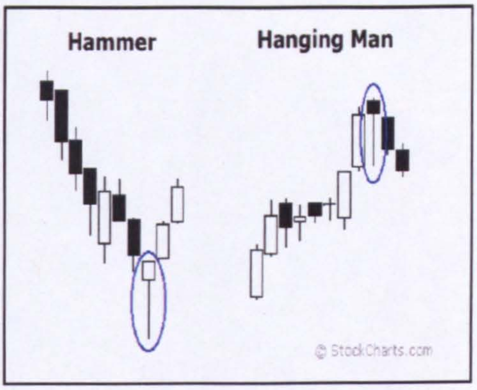
Long shadow reversals

There are two pairs of single candlestick reversal patterns made up of a small real body, one long shadow and one short or non-existent shadow. Generally, the long shadow should be at least twice the length of the real body, which can be either black or white. The location of the long shadow and preceding price action determine the classification.

The first pair, Hammer and Hanging Man, consists of identical candlesticks with small bodies and long lower shadows. The second pair, Shooting Star and Inverted Hammer, also contains identical candlesticks, except, in this case, they have small bodies and long upper shadows. Only preceding price action and further confirmation determine the bullish or bearish nature of these candlesticks. The Hammer and Inverted Hammer form after a decline and are bullish reversal patterns, while the Shooting Star and Hanging Man form after an advance and are bearish reversal patterns.

Hammer and Hanging Man



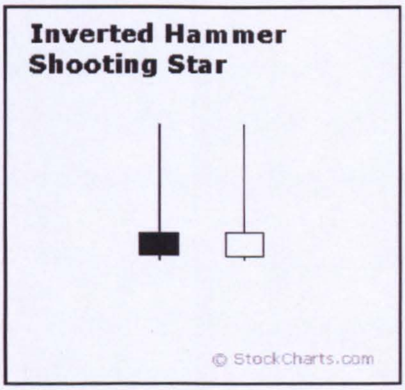


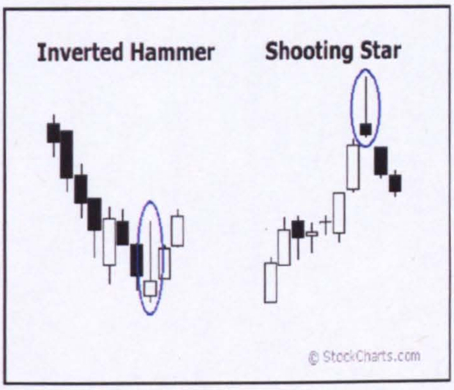
The Hammer and Hanging Man look exactly alike, but have different implications based on the preceding price action. Both have small real bodies (black or white), long lower shadows and short or non-existent upper shadows. As with most single and double candlestick formations, the Hammer and Hanging Man require confirmation before action.

The Hammer is a bullish reversal pattern that forms after a decline. In addition to a potential trend reversal, hammers can mark bottoms or support levels. After a decline, hammers signal a bullish revival. The low of the long lower shadow implies that sellers drove prices lower during the session. However, the strong finish indicates that buyers regained their footing to end the session on a strong note. While this may seem enough to act on, hammers require further bullish confirmation. The low of the hammer shows that plenty of sellers remain. Further buying pressure, and preferably an expanding volume, is needed before acting. Such confirmation could come from a gap up or long white candlestick. Hammers are similar to selling climaxes, and heavy volume can serve to reinforce the validity of the reversal.

The Hanging Man is a bearish reversal pattern that can also mark a top or resistance level. Forming after an advance, a Hanging Man signals that selling pressure is starting to increase. The low of the long lower shadow confirms that sellers pushed prices lower during the session. Even though the bulls regained their footing and drove prices higher by the finish, the appearance of selling pressure raises the 'white flag' – the signal to sell. As with the Hammer, a Hanging Man requires bearish confirmation before action. Such confirmation can come as a gap down or long black candlestick on heavy volume.

Inverted Hammer and Shooting Star





The Inverted Hammer and Shooting Star look exactly alike, but have different implications based on previous price action. Both candlesticks have small real bodies (black or white), long upper shadows and small or nonexistent lower shadows. These candlesticks mark potential trend reversals, but require confirmation before action.

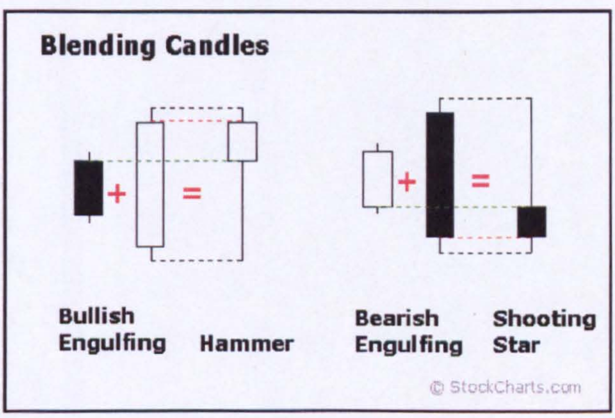
The Shooting Star is a bearish reversal pattern that forms after an advance and in the star position, hence its name. A Shooting Star can mark a potential trend reversal or resistance level. The candlestick forms when prices gap higher on the open, advance during the session out close well off their highs. The resulting candlestick has a long upper shadow and small black or white body. After a large advance (the upper shadow) the ability of the bears to force prices down raises the white flag. To indicate a substantial reversal, the upper shadow should be relatively long and at least 2 times the length of the body. Bearish confirmation is required after the Shooting Star and can take the form of a gap down or long black candlestick on heavy volume.

The Inverted Hammer looks exactly like a Shooting Star, but forms after a decline or downtrend. Inverted Hammers represent a potential trend reversal or support levels. After a decline, the long upper shadow indicates buying pressure during the session. However, the bulls were not able to sustain this buying pressure and prices closed well off their highs to create the long upper shadow. Because of this failure, bullish confirmation is required before action. An Inverted Hammer, followed by a gap up or long white candlestick with heavy volume, could act as bullish confirmation.

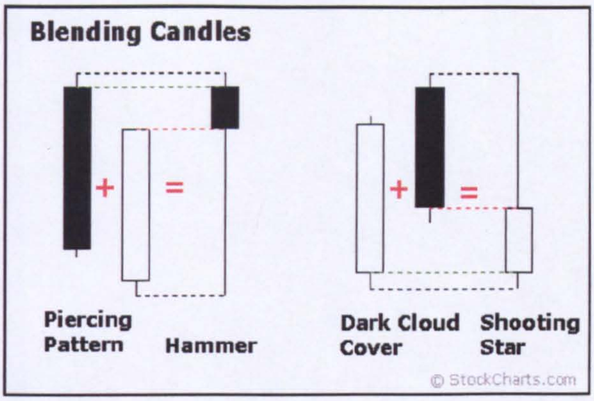
Blending candlesticks

Candlestick patterns are made up of one or more candlesticks and these can be blended together to form one candlestick. This blended candlestick captures the essence of the pattern and can be formed using the following:

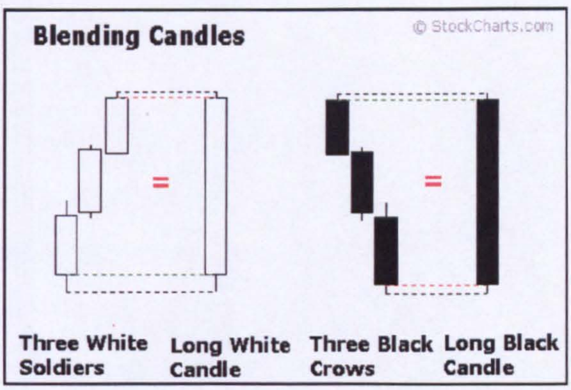
- The opening of the first candlestick
- The closing of the last candlestick
- The high and low pattern



By using the opening of the first candlestick, the close of the second candlestick, and the high/low of the pattern, a Bullish Engulfing Pattern or Piercing Pattern blends into a Hammer. The long lower shadow of the Hammer signals a potential bullish reversal. As with the Hammer, both the Bullish Engulfing Pattern and the Piercing Pattern require bullish confirmation.



Blending the candlesticks of a Bearish Engulfing Pattern or Dark Cloud Cover Pattern creates a Shooting Star. The long, upper shadow of the Shooting Star indicates a potential bearish reversal. As with the Shooting Star, Bearish Engulfing and Dark Cloud Cover Patterns require bearish confirmation.

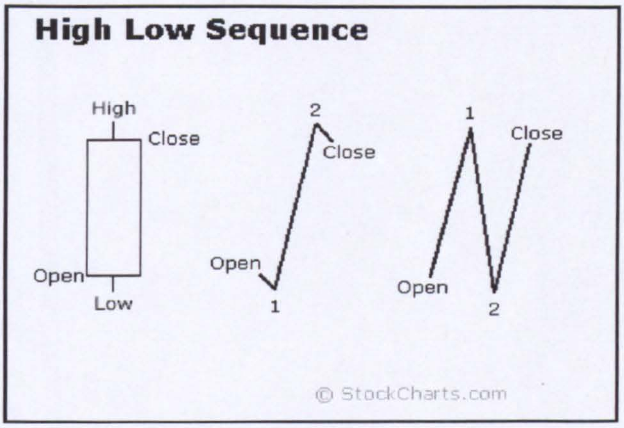


More than two candlesticks can be blended using the same guidelines: open from the first, close from the last, and its high/low of the pattern. Blending Three White Soldiers creates a long white candlestick and blending Three Black Crows creates a long black candlestick.

For a comprehensive list of chart patterns, see Candlestick Dictionary which may be found at Stockcharts.com website and is attached in the appendix.

What candlesticks do not tell us?

Candlesticks do not reflect the sequence of events between the opening and the closing, only the relationship between the opening and the closing. The high and the low are obvious and indisputable, but candlesticks (and bar charts) cannot tell us which came first.



With a long white candlestick, the assumption is that prices advanced for most of the session. However, based on the high/low sequence, the session could have been more volatile. The example above depicts two possible high/low sequences that would form the same candlestick. The first sequence shows two small moves and one large move: a small decline off the opening to form the low, a sharp advance to form the high, and a small decline to form the close. The second sequence shows three rather sharp moves: a sharp advance off the opening to form the high, a sharp decline to form the low, and a sharp advance to form the close. The first sequence portrays strong, sustained buying pressure, and would be considered more bullish. The second sequence reflects more volatility and some selling pressure. These are just two examples, and there are hundreds of potential combinations that could result in the same candlestick. Candlesticks still offer valuable information on the relative positions of the open, high, low and close. However, the trading activity that forms a particular candlestick can vary.

4.5.4 The development and the test of candlestick charting

Caginalp and Laurent (1998) applied the candlestick charting to analsye 349 stocks from Commodity System Inc. and using 'bull' or 'bear' market signals. They point out bull market signals as the following:

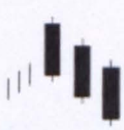
- Three White Soldiers:  a downtrend following by three long, white, candlesticks in a row which close at progressively higher prices.

- Three Inside Up: a downtrend followed by a black day that contains a small white day that succeeds it followed by a white candle that closes with a new high for the three days.

- Three Outside Up: a downtrend followed by a large white day that engulfs the first day's.

- Morning Star:  a downtrend continues in a long, black day and is followed by a downward gap and a small body, either black or white, after which prices reverse, closing past the midpoint of the first day's body.

The bear market signals are identified as followings:

- Three Black Crows:  an uptrend followed by three long, black, candlesticks in a row which close at progressively lower prices.

- Three Inside Down: an uptrend followed by a white day that contains a small black day that succeeds it followed by a black candle that closes with a new high for the three days.

- Three Outside Down: an uptrend followed by a large black day that engulfs the first day's body amid falling prices and is followed by a black candle that closes with a new low for the three days.

- Evening Star:  an uptrend continues in a long, white day and is followed by an upward gap and a small body, either black or white, after which prices reverse, closing past the midpoint of the first day's body.

Caginalp and Laurent (1998) derive candlestick trading decision rules carefully to illustrate each signal. They used the decision rules to detect the bull and bear signals.

Horton (2007) follows Caginalp and Laurent's study and examines the application of Stars, Crows, and Doji candlesticks to select stocks.

Caginalp and Laurent (1998) conclude that candlestick signals and methods have value in predicting turning points of the movements of share prices. But Marshall, Young. and Rose (2006), and Horton (2007) argues that Caginalp and Laurent using Caginalp and Laurent's candlestick charting rules and methods, have no value in trading individual stocks.

4.6 Summary

In this chapter the original meaning of magic has been explained. Magic is a part of religious culture and people also treat it as a part of social science. This is why candlesticks were given magical meanings. In fact, when investors use candlestick charting techniques for trading stocks, they see the magic behind the candlesticks charts and then they believe what will happen to the movements of share prices on stock markets. Investors believe that if a prediction comes true then this proves that candlestick charting must work. However, if the predictions are found not to come true then this situation can easily be rationalized by the belief that the signs must have been misread – so a future attempt in which the signs are read correctly must end in success because, even though great losses have been suffered, the system must work eventually.

There are many candlesticks or candlestick patterns but only those which appear frequently have been explained in this chapter.

Chapter 5 Research Methodology

5.0 Introduction

Research methodology is defined as the theory of how research should be carried out. It is fundamental for a researcher to ensure that the research being conducted is planned and designed appropriately to achieve research objectives. Saunders, Lewis and Thornhill (2003) point out that a research methodology includes the theoretical and philosophical assumptions upon which the research is based and the implications of these for the method or methods adopted. This involves design and structure of the research in a timely and orderly manner.

This chapter outlines the methodology employed in this research and looks at past "May events" and the performance of the FTSE 100 Index over the given period to evaluate the effectiveness of the information signals released by candlestick charting. In addition the attitudes towards, and knowledge of, the applicability of candlestick charting to stock market analysis has been obtained from interviews with finance professionals. These provide the quantitative and qualitative evidence to support the Efficient Market Hypothesis. The focus of this chapter is to provide a methodological framework for this study with research design, data collection and data analysis. The explanation presented here includes the choice of methodology and the reasons for using case study to achieve the research objectives.

5.1 Research objectives

The main aim of this research is to evaluate the magic and reliability of the candlestick charting system in terms of its ability to signal the movements of stock market prices in a mid-term period for 25 years from 1984 to 2008. The objectives of this research have been discussed in Chapter 1 and the focus of the investigation concentrates on five objectives:

(1) To evaluate various signaling effects on changes in stock market prices in the period from 1984 to 2008.

Signaling effects on stock markets have always been very important for investors while making decisions. In order to obtain a better understanding of the signaling effect and its development, the historical stock daily prices of the FTSE 100 Index for the period from 1984 to 2008 have been chosen as data population for this research.

(2) To interpret the signals released by candlestick charting against the performance of stock market prices in the given period.

The signaling effect of this research focuses on candlestick charting, thus detailed meanings of candlestick indicators, which were produced based on the data collected, have been interpreted and explained to assess the effectiveness of using candlestick charting in the areas of stock market investment.

(3) To analyse the relationship between candlesticks and (the events of) major stock market price movements.

Candlestick charting is claimed to be the best popular technique to unlock the future. An analysis of the relationship between candlesticks and the movements of prices of the FTSE 100 Index for the given period should enable an evaluation of whether or not candlestick charting works for predicting the future movements of stock prices.

(4) To attempt to provide extended quantitative evidence of the reliability of candlestick charting in terms of predicting the movements of stock prices.

Although the relationship between candlesticks and the movements of stocks have been ascertained it has been necessary to carry out a correlation and regression analysis to provide quantitative evidence to support arguments considered in this research.

(5) To try to explain the popularity within the financial community of the candlestick charting.

It appears that that candlestick charting is one of the most commonly used methods in financial analysis. Do investors, especially financial professionals, know what they are doing?

(6) To draw some conclusions which add further support to the theory of market efficiency in finance.

In theory, technical analysis can not predict the future movements of the stock market. But in practice, technical analysis is used as one of the methods for analyzing the performance of the markets. Candlestick charting is the most popular method used for stock market analysis. So if it does not work, why do people keep using it? This research is intended to investigate this. Findings consistent with other research on market efficiency should be based on a combined quantitative and qualitative investigation.

5.2 Research Design --- A Combination of Quantitative and Qualitative Approaches

According to Cooper and Schindler (2008), "many definitions of research design are available and there is no single definition imparts the full range of important aspects" (p.140)

Kerlinger (1986) states that "Research design is the plan and structure of investigation so conceived as to obtain answers to research questions. The plan is the overall scheme or program of the research. It includes an outline of what the investigator will do from writing hypotheses and their operational implications to the final analysis of data." (p.279)

Phillips (1971) suggests that "Research design aids the researcher in the allocation of limited resources by posing crucial choices in methodology" This requires a researcher to choose research methods to carry out a study (p.93).

Research methods can be classified as qualitative and quantitative. Saunders, Lewis and Thornhill (2000) define quantitative methods as being based on meanings derived from numbers. Quantitative data collection results in numerical and standardised data, and its analysis is conducted through the use of diagrams and statistics. In a more detailed treatment, Cooper and Schindler (2008) point out that quantitative research "attempts precise measurement of something. In business research, quantitative methodologies answer questions related to how much, how often, how many, when, and who" and "Quantitative research is often used for theory testing" (p.164). Quantitative methods were initially developed in the natural sciences to facilitate the investigation of natural phenomena.

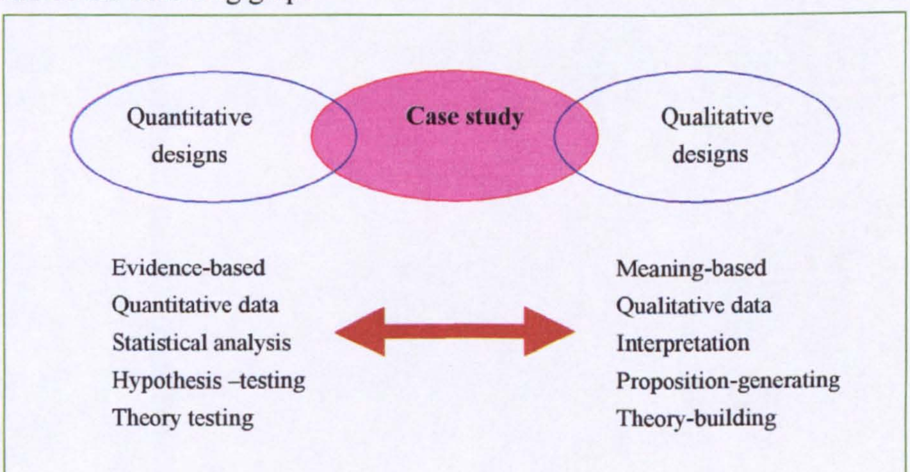
Saunders, Lewis and Thornhill (2000) also define a qualitative methodology as based on meanings expressed through words. Qualitative data collection results in non-standardised data which requires classification into categories and its data analysis is conducted through the use of conceptualisation. Carson, Gilmore, Perry, and Gronhaug (2001) state that the purpose of qualitative methodology is based on "researcher immersion in the phenomenon to be studied, gathering data which provide a detailed description of events, situations and interaction between people and things, providing depth and detail" (p65). Qualitative methods were initially developed in the social sciences to facilitate the investigation of social and cultural phenomena. Qualitative methods are constructive and interpretive in nature.

Many research methods are available for researchers to choose from in order to solve problems and achieve research objectives. However, research design – i.e. choosing the correct method - is the key to successful research. Research design consists of determining the appropriate research method. Creswell (1994) states that research design is a plan of structure and strategy designed by the researcher to carry out research. This means that research design is about organizing research activities, including the collection of data in ways that are most likely to achieve the research objectives. According to Mayloy and Blackmon (2005), the process of research design and structure covers five stages and these are research definition (define a research topic and research questions), design research (plan development), do research (data collection and analysis), interpretation and reporting research findings. In other words, these are procedures and techniques that are employed in carrying out the theoretical and empirical investigations to achieve the research objectives.

Empirical studies provide many research strategies. Saunders, Lewis and Thornhill (2000) introduce research strategies defined as experiment, survey, case study, grounded theory, ethnography, action research, cross-sectional and longitudinal studies, and exploratory, descriptive and explanatory studies.

Researchers can choose quantitative methods or qualitative methods or a combination of both approaches. After careful consideration of quantitative and qualitative research methods, A case study was chosen as the main approach for this study.

Yin (1994) states that when investigating "how" or "why" questions, in combination with examining contemporary events, the use of a case study is most suitable.[11] Both quantitative and qualitative approaches can be used in a case study. According to Mayloy, H. and Blackmon, K. (2005), a case study as a research design can be expressed in the following graph:



Case study as research design   Source: Mayloy and Blackmon (2005, p251)

A combined quantitative and qualitative approach has been chosen in this research for the following reasons: Firstly, quantitative data such as daily stock prices and daily stock indices were collected to reveal the relevance between past and current events. These are numerical and standardised data. Secondly, analysis is conducted through the use of diagrams and statistics. Thirdly, investigations based on qualitative methods are suitable for the analysis of different sets of events, for example, changes in policies and regulations. Finally, the fundamentals of the economic and social environment within which it is conceived and nurtured are questioned. The research design of this study is directed towards the interpretive philosophy by using quantitative and qualitative methods through a case study. This is linked to a philosophical belief in the phenomenological paradigm. Creswell (1994) states that "in qualitative analysis several simultaneous activities engage the attention of the researchers: collecting information from the field, sorting the information into categories, formatting the information into a story or picture, and actually writing the qualitative text" (pp.153-154). Locke, Spirduso and Silverman (1987) realize that the intent of qualitative research is to understand a particular social situation, event, role, group, or interaction. Miles and Huberman (1984) note that undertaking a qualitative method is largely an investigative process where the researcher gradually makes sense of a social phenomenon by considering, replicating, cataloguing and classifying the object of study. This study involves the examination of historical events and identifying regulations that should be interpreted as qualitative analysis. Also the behaviour of investors in reaction to information signals is evaluated as a qualitative analysis.

Creswell (1994) suggests that both quantitative and qualitative research design must include the approach to data collection, analysis, and report writing. For completing this procedure, the main issue is to decide the research strategies --- selecting the suitable methods.

5.3 Decisions on data collection

Creswell (1994) suggests that the data collection includes setting the boundaries for the study, collecting information and establishing the protocol for recording information. He points out that the information is collected through observations, interviews, documents, and visual materials. Therefore, the parameters of data collection should be identified and the types of data should be indicated, including a rational for the data collection.

5.3.1 Population

Supporters of candlestick charting believe that this system of symbols derived from past stock market performance (more than 12 hours old) enables the 'enlightened' to predict the future performance of the stock market. They therefore believe that candlestick patterns can be used to predict the future.

The purpose of this thesis is to determine whether or not this is true. In other words can candlesticks really be used to predict the future movements of the stock market, or do its practitioners just think they can, in the same way that people often believe in magical things which are not true.

The actual performance of the stock market is nothing more than a very reliable collection of data detailing the rises and falls of the stock market from the mid 1960s to the present day. As this study is conducted in the UK the prime source is known as the FTSE of which there are a number of variants to represent the performance of UK companies, providing investors with a comprehensive and complementary set of indices that measure the performance of all capital and industry segments of the UK equity market. (Source: http://www.ftse.com/Indices/UK_Indices/index.jsp). For the purposes of this study the FTSE 100 has been used because it is the most commonly quoted record of stock market performance.

Clearly in a thesis of this length it is impossible to cover the entire life of the FTSE Indices but a small analysis of a couple of years would be quite inadequate. Thus some form of selection needs to be made.

The FTSE 100 Index has been chosen to represent the UK stock market as a whole. It was introduced in April 1984. In order to cover the history of the FTSE 100 Index with a complete data set the historical daily prices of the FTSE 100 Index from 1984 to 2008 has been chosen as the population for this research.

5.3.2 Sampling

Saunders and Lewis (2003) suggested that a case study is concerned with one particular happening or case, examining events and factors of the focused area in a meticulous and systematic way. This is the commonest research approach. Robson (1993) defined case study as the development of detailed, intensive knowledge about a single case or a number of related cases. It is agreed that case study is a very worthwhile way of exploring existing theory and providing a source of new hypotheses.

There is a research choice – meaning that a decision on what sort of sample is used must be made. There are a variety of choices offered.

a) A random sample of weeks across the entire period of nearly 50 years could be taken. This has a statistical soundness about it but at the same time it has a serious disadvantage in that 5 days is really not enough time for events to cause clearly discernable measurements.

b) A sample of one complete year could be taken which could mean a very thorough analysis but one which could easily be discounted as unrepresentative because of any exceptional events or economic conditions which might have existed in that year.

c) A selection of months could be taken. This relates back to a discussion of methodology. In this thesis the month of May has been chosen because events in May are the same as in any month. Moreover, the stock market exhibits a high volatility in May meaning that the utility of charting is most likely to be identified in this month.

The month of May was deliberately chosen as a month that has a history of considerable stock exchange activity. This has been the major decision in this research. For the purposes of this research it has the advantage of providing a maximum number of opportunities to test the claims of candlestick charting.

Bearing all these guidelines in mind a sample of stock exchange FTSE 100 data for a number of months has been taken. The question is which months to choose for the case study and over what length of time.

Following discussions about which months to choose for the study clarified another dimension. In order to test the theory it is necessary to ensure that there is more than average movement of stocks – i.e. the exchange must be lively and include significant numbers of falls. This is because a key element of the research is to determine whether or not there is any way to predict stock price movements using candlesticks. The ideal month to choose for the case study is therefore one which gives the richest data set. This is the month of May. If indeed there is a correlation between candlesticks and stock prices then it should be most obvious in this month. In other words, if candlestick charts do work in May then they are less likely to work in any other month.

Furthermore, other months can be excluded from the study for a variety of other reasons. December, for example, contains two public holidays, December 25 and 26 but in many firms December 24 is also a half or full day holiday. Then the proximity of January 1st (the next public holiday) means that many organizations treat December

27 -31 as an additional holiday.

January and February are liable to be affected by poor weather conditions. Increasingly parts of South England are being affected by flooding. Also January is the start of the financial year for some firms and that seems to affect the flow of information into the market.

The other months also present problems. For example, April is the month in which companies have to take stock of their performance over the financial year that has just finished. Not only do the final stages of such a review reduce speculation in the companies' shares, but there is also another factor that came as a surprise to the researcher.

The last stages of a company's performance are often kept secret, which means that some of the normal information that spreads around the market is missing. According to one city broker interviewed in this research, this shortage of information does not seem to influence journalists and one comes across "leaks" that are given by "unidentified but usually reliable sources". These "leaks" are then published by various newspapers and journals and do influence the markets, to a degree. As the broker said it is quite unlikely that the journalist bothered to get out of bed the day he wrote his piece and most are just fiction.

July and August are also months in which holidays affect the workings of the industrial and commercial communities to affect the activity of the Exchange. September and October are often called the hurricane months and they are also a half way house for companies reporting their financial year based on the tax year end. May however has the reputation of being an active month and, unlike November and February is not affected much be bad weather. The only other month that might have been used in this research is June which does not have any specific reputation for investors' behaviour.

There is one final reason why May has been chosen for the case study which goes back to a cryptic saying about the stock market which identified May a good month to test one's investing skills and then walk away until the summer is over. i.e. the last weeks of September. As noted above, May is a hyperactive month. This saying goes as follows: "Sell in May and go away". This has been described in detail in an article entitled "Sell in May and go away? Not so fast" published by David Schwartz, a stock market historian and CNBC Europe regular, on the London Stock Exchange Website on 7th of April 2005. David Schwartz carried out a case study of the "end of May" phenomena since 1936. He claims that "there have been just 10 similar early May drops since the Grate Depression and 9 of those can be connected to big stock market falls". Geoff Cutmore published an article "Will stock history repeat itself?" in the journal Money Market (July 2006) to broadly introduce Schwartz's findings to private investors.

Therefore, in this research, the case study consists of a sample of stock indices together with the techniques used for their technical analysis, specifically, candlestick charting. Candlesticks are used for the analysis of the movements of index prices and trend lines for the month of May in the years from 1984 to 2008. This was covered through the case study of "May events" and stock market crashes in the given period. In each year, the month of May was determined as the reaction period of stock market. In general, the FTSE 100 Index represents the performance of share prices of the 100 UK top companies listed in the London stock exchange. In this study, the performance of the FTSE 100 Index in each month of May between 1984 and 2008 has been considered as these twenty-five samples reflect the UK stock market as a whole. An evaluation of whether or not the candlestick charts for May, which was considered as a typical month to represent the sample data population, would have enabled the downtrend of the stock prices in these months to be predicted. This was done by a detailed analysis of what was happening to the FTSE 100 Index and making a projection of what the candlestick charts indicate for the future, and comparing the projection with the actual futures to assess how reliable the candlestick charting is.

According to Ryan, Scapens and Theobald (1992), case study are often referred to as a small sample which is applied to draw some inferences about that population by studying the samples. In this study, the performance of the FTSE 100 Index in each month of May between 1984 and 2008 was considered as these twenty-five samples reflect the UK stock market as a whole because, as explained above, this month is typical.

It would be impractical to collect and analyse the entire population given the time constraints. Thus it is important to select an appropriate sample to conduct the research. Henry (1990) suggests that using samples makes possible a higher overall accuracy that using entire population. Because the smaller number of cases for which we need to collect data means that more time can be spent on designing and collecting the data. Collecting data on fewer cases also means that more detailed information could be obtained.

5.3.3 Research methods

Research methods are designed for both data collection and analysis. It is understood that using the right methods to collect data from reliable sources are vital for a researcher.

The types of data collected and method used

The data collected by a researcher are classified as primary data and secondary data. Primary data are first-hand data and collected by the researcher. Secondary data are known as re-analysis data that have already been collected by other researchers for some other purpose. Saunders, Lewis and Thornhill (2003) considered secondary data to include both raw data and published summaries. Both primary and secondary data are very important for research. These data provide precise information and empirical research outcomes.

Secondary data can be collected from published government statistics, books, journal and magazine articles, newspapers, and internet websites. They provided an idea of the sort of data that are available. In addition, these books and articles contained full references to the sources of data. These were found to be helpful in tracking down the original data sources. The main websites sources for stock market analysis are the following: London stock Exchange website: www.londonstockexchange.com, Thomson DataStream website: www.datastream.com, National Statistics website: www.statistics.gov.uk , www.uk.finance.yahoo.com , and www.news.ft.com .

The data colleted for this study includes both primary data and secondary data. The quantitative data collected for this research is the historical daily prices of the FTSE 100 Index through the period from 1984 to 2008. This is secondary data obtained from the Yahoo Finance website. The same data set is also available from Bloomberg. The primary data collected for this research is views of application of candlestick charting provided by financial professionals in City of London using unstructured interview.

In short, as the main research strategy for this study, a case study has been carried out using both quantitative and qualitative methods. To make this clearer, a summary table of the research methods used is shown in Table 5.1:

Table 5.1 Research methods used in the case study

Purposes	Methods	
	Quantitative	Qualitative
Data collection	Collecting secondary data - Daily prices of the FTSE 100 Index	Interview method used to collect primary data
Analysis and interpretation	- Secondary data analysis of the performance of the FTSE 100 Index. - Event studies of the major falls and advances of the FTSE Index. - Correlation and regression analysis	- Observation of changes in daily prices - Interpretation of candlestick charts of the performance of FTSE 100 Index - Documentation method used to present the results of case study

The above table indicates that both quantitative and qualitative methods have been used to collect primary and secondary data. To analyse the major falls and advances of the FTSE 100 Index, and to analyse the relationship between candlesticks and the performance of the FTSE 100 Index for the given period, quantitative methods have been used for the events studied. And qualitative methods have been used to observe changes in daily prices of the FTSE 100 Index, to interpret the meanings of candlestick indicators and to document and present results of the case study. Interviews have also been carried out with finance professionals in order to establish attitudes to candlestick charting as a qualitative method of stock market analysis.

Correlation and regression analysis has been carried out on the results obtained from the case study in order to determine the relationship between candlestick patterns and the major falls or advances of the FTSE 100 Index. This is a quantitative approach.

5.4 The case study

The case study research method is commonly used in social research and economic and business studies. Hakim (2000) noted that 'case study' refers to research that investigates a few cases, or just one, in considerable depth. Hammersley and Gomm (2000) suggested that 'case study' is employed to identify a specific form of inquiry. They point out that the aim of case study research is to understand something. When researchers select cases, they consider the cases as the objects of study. People are interested in cases, only because by studying them, they can learn about other cases or about some general problems. People need to learn about a particular case or cases. The case may be an individual, an event, an institution or even a whole national society. Robson (1993) defined case study as the 'development of detailed, intensive knowledge about a single "case", or a small number of related "cases". Morris and Wood (1991) pointed out that using case study could gain a rich understanding of context of the research and processes being enacted.

Hakim (2000) presented the view that case studies take one or more selected examples of a social entity, such as communities, social groups, organisations, events, life histories, families, work teams, roles or relationships. These cases are studied by using a variety of data collection techniques. It is understood that using a variety of data collection techniques and methods provides a more rounded, holistic study than with any other design.

Using the case study research method has many advantages. Firstly, a case study can provide a richly detailed 'portrait' of a particular social phenomenon. Secondly, case studies can focus on particular aspects or issues to refine knowledge. Moreover, a case study can accumulate evidence underlying a topic. Case studies are designed to achieve experimental isolation of selected social factors or processes within a real-life context, so as to provide a strong test of prevailing explanations and ideas. Yin (1994) argued that experimental isolation specifies the factors to be excluded or included and identifies one or more social settings in which they are present, or absent, as required for a case study. Furthermore, case studies can provide the evidence for a conclusion, or explanations, by looking at the most favourable illustration of it.

Case studies are typically based on two or more methods of data collection. The data collection methods employed may include questionnaires, interviews, observations, documentary analysis. By using multiple sources of evidence, case studies present more rounded and complete account of social issues and processes. For example, the multiple investigations make case study one of the most powerful research designs, and the fieldwork for case studies, includes the analysis of administrative records and other documents, depth interviews, larger-scale structured surveys, participant and non-participant observation.

It has been argued that case studies are practical considerations. As previously noted, case studies typically use a variety of methods and types of evidence, whereas most other research designs rely on a single type of evidence. Therefore, case studies overlap with and are readily linked to all other types of study. Yin (1993) presented a longer discussion of the role of theory in doing case studies. His empirical studies of case study research show how case study research is carried out with examples from educational research, management studies, community studies and evaluation. Yin (1994) provided an excellent review and guide to all aspects of case study research. He describes the case study procedure as follows: design, selection of cases, implementation and management, analysis and reporting results, with numerous examples present throughout. Yin presented the full range of case study designs used in theoretical and police research. Saunders, Lewis and Thornhill (2000) argued that a simple well-constructed case study could enable researchers to challenge an existing theory and also provide a source of new hypotheses.

However, the case study research method also has some disadvantages. Hakim (2000) points out that the principal weakness of case studies is that results can be shaped strongly by the interests and perspective of the researcher. On the other hand, the flexible character of the case study design makes very diverse types of study. Hakim (2000) divides case studies into five types: individual case histories, community studies, case studies of social groups, case studies of organisations and institutions, case studies of specific events, roles or relationships. Yin (1993) used a quite different classification. He identified exemplary cases and critical (strategic) cases as two main types.

In this study 25 potential sources of data have been used and as will be demonstrated in a later chapter, all 25 months can be investigated in the search for specific events (i.e. 3 white candlesticks, or a doji star etc). In addition, interviews have been carried out with seven financial professionals. It could be argued that samples used in this research are relatively small and it is difficult to make a statistical generalization about the population which it was selected. Nevertheless, it is usually accepted that there is a role for case study in generating hypotheses which can be tested subsequently at a later stage (Ryan, Scapens, and Theobald 1992). This has been carefully considered and applied to this research.

5.5 Event study

Within the context of a case study as the main approach, a particular form of that method, the 'event study' was selected and used to support the case study.

An event study is defined as the application of transaction data from financial markets to predict the financial gains and losses associated with newly disseminated information. McGuckin et al. (1992) originally developed the event study method.[34] Mitchell and Netter (1994) and MackKinlay (1997) explain the general event study method.

On the stock markets, an event study examines the average stock market reaction to a particular stock market event, by averaging across the same events in different companies, or at different times in the same company. In short, an event study measures the impact of a specific event on the value of the share price of the firm or price of a stock market index. The event could be a macroeconomic event, for example an announcement of change in interest rate, or a company specific event, for example an announcement of earnings, directors' trading strategies, a rights issue or of a merger and acquisition etc. The major falls and crashes of the stock market were defined as events while analysing the financial data.

The logic behind the event study method was explained by Warren-Boulton and Dalkir (2001) for research in the specific context of mergers:

> "Investors in financial markets bet their dollars on whether a merger will raise or lower prices. A merger that raises market prices will benefit both the merging parties and their rivals and thus raise the prices for all their shares. Conversely, the financial community may expect the efficiencies from the merger to be sufficiently large to drive down prices. In this case, the share values of the merging firms' rivals fall as the probability of the merger goes up. Thus, evidence from financial markets can be used to predict market price effects when significant merger-related events have taken place." (pp.467)

In order to conduct an event study researchers need to decide on the type of event, identify the day and time period of the event announcement, select samples of companies, and collect data of the stock prices on these samples. The data collected could be the actual daily or monthly return. For each company, the abnormal return must be calculated by deducting the expected return from to actual. The expected return is estimated from many asset pricing models such CAMP, APT, Market Model. All abnormal returns are computed to obtain a simple picture of cumulative average abnormal return which is to measure average abnormal stock price movements. After that, there is a need to undertake a statistical test of the null hypothesis of zero-abnormal cumulative returns. The final step is to examine the results of the event study.

The event study method has been chosen for the following reasons: Firstly, it is a quantitative approach related to the movements of stock prices on stock markets. It fits into the given area of research. Secondly, the available data samples have been used to identify the movements daily prices of the FTSE 100 Index. This will provide the evidence to demonstrate the possibility of earning abnormal returns in the context of stock markets crashes.

In this research, the major events, for example the major falls and advances of the stock prices that happened in the May of each year were chosen for the period from 1984 to 2008. As already pointed out, the samples of share prices in this study were the daily FTSE 100 prices taken from the May of each year in the given period. The specific events studied are the major events, i.e the major falls and advances of the stock market with the appearances of candlesticks, which happened in the month of May in each year. These events affected the movements of stock prices. They are macroeconomic events such as announcement of changes in the interest rate and changes in regulations, or political events, such as the general election in the UK, and wars.

There are two main advantages to the event study method. Firstly, the expected effects of an event will be reflected immediately in stock prices. Secondly, the event study takes risk into account. The disadvantage of an event study is that it can be sensitive to the model applied. Some information about the event may have leaked out beforehand. And sometimes it takes time for the market to fully react to an event.

5.6 Secondary analysis

Secondary analysis is any re-analysis of data collected by another researcher or organisation. Secondary analysis is commonly applied to quantitative data from previous studies. Yin (1994) suggested that secondary analysis is also feasible to employ in analysis of numerous case study reports or event of reports on single cases.

There are many approaches to use secondary analysis. Hakim (2000) suggested three main approaches to obtain a secondary analysis:

(1) To use a single dataset to replicate the original researcher's results or to address entirely different questions. This is the simplest approach.

(2) To use a single dataset that is extended by the addition of data from other sources. This is a secondary approach. This approach provides a richer basis for the secondary analysis study.

(3) To use multiple datasets to provide an overall assessment of findings on a topic. This is the most complex secondary analysis.

Empirical studies show us that a large proportion of economic research is based on the secondary analysis of macro-level time series. The data consist of a large number of national statistical indicators and measures collected from a great variety of official surveys and statistical series.

The secondary analysis method has many advantages: Firstly, secondary data are available for the researcher to examine thoroughly the literature on a particular event. Secondly, the sources of secondary data are varied and reliable. Saunders and Lewis (2000) point out that secondary data is reliable, objective, and plentiful in supply; furthermore, secondary data can provide comparative and contextual data. Thirdly, secondary data can result in unforeseen discoveries. It is very important to gather secondary data as all statistical data are published data. It provides the precise information and reliable data related to stock markets, and helps researchers to understand the history and development of stock markets. It also represents the changes of regulation and the improvement of technological skills for risk management on stock markets. By doing secondary data analysis, it is possible to identify research objectives and find out the regularity of performance of share prices.

Within a case study, secondary data analysis has centred on the performance of the daily prices of the FTSE 100 Index for the given period.

5.7 Observation

The observation method was used to collect primary data. Saunders and Lewis and. Thornhill (2003) suggest that researchers can collect primary data from interviews, questionnaires, observations, and investigations or surveys. In general, observation is a very important method for collecting primary data. Researchers can record information obtained by observation. The primary data is evidence to be analysed and can be used to support arguments. However in this study the observation method was used to look for triggers and sequences of events while interpreting daily candlesticks in charts within the case study.

5.8 Documentary

The documentary method was used for examining primary data and to obtain secondary data. Documentary secondary data are often used in research projects with primary data or other sources of secondary data. Saunders, Lewis and Thornhill (2003) show that documentary secondary data include both written and unwritten documents. Written documents are notices, correspondence, minutes of meetings, reports to shareholders, diaries, transcripts of speeches and administrative and public records. Written documents also include books, journal and magazine articles, and newspapers. Robson (1993) suggested that non-written documents include tapes and video recordings, pictures, drawings, films and television programmes.

In this research the documentary secondary data have been used to support the case study. This research involves an analysis of historical prices of stock indexes and daily prices of the indices. These data were recorded and published as historical data.

These are secondary data which provide the details of what happened before so that any similarities with current events could be identified. In the chosen cases study, in the form of a time series, the movements of daily prices of the FTSE 100 Index in May in each year for the last twenty years from 1984 to 2008 were evaluated. The results were documented and presented in the case study. Also there was a need to record and document the respondents' opinions when carrying out unstructured interviews for this study.

5.9 Interviews

An interview is one method of collecting data from respondents for purposes of research. Sekaran (2003) classifies interviews as unstructured and structured. Interviews can be conducted either face to face or by telephone or online.

According to Sekaran (2003) the difference between an unstructured and a structured interview is that in the former the interviewers questions are broad and open ended in order to explore the general issues and establish the basis for further questioning. In this case the interviewee is given the freedom to express general views and opinions. In a structured interview the questioning follows a predetermined set of questions which are designed to establish certain facts about a research topic. In this case the interviewees are all asked the same questions in the same order. In practice it is often the case that an unstructured interview forms the first stage of the research and is used as a method of determining the questions for a follow-up structured interview.

For this thesis unstructured interviews have been carried out with seven financial professionals working in the City of London. The purpose of these interviews was to gain insights into professionals' attitudes to candlestick charting as a method of predicting future stock market movements. Unstructured interviews have been used for this purpose because these encourage the respondents to freely express their opinions on the applicability of candlesticks and in particular under what circumstances candlesticks may or may not be useful.

5.10 The theory behind the applied quantitative data analysis

Correlation and regression analysis has been used to investigate the relationship between the events of major falls (or advances) and the associated candlestick charts in every month of May in the given period from 1984 to 2008. This is a quantitative approach. The theory behind the correlation and regression analysis is causality theory (D. Hume, 1711-1776).

In the literature causality denotes a necessary relationship between one event (this is called the "cause") and another event (this is called the "effect") that is the direct consequence of the first.

An application of the causality theory is the correlation and regression analysis. Regression involves using historical data to find the line of best fit between two variables (one is independent and another is dependent, one dependent on the other), and use this to predict futures.

This is used very often in the business forecasting. One variable is a function of one or more variables. For example:

- Returns depend on share price
- Sales and profits

According to Smailes and Mcgrane (2000, pp81-99), the following definitions of variables, explanations of equations are used for correlation and regression analysis:

Variables

There are two variables – dependent variable and independent variable. The dependent variable is Y and must always be on the vertical axis. The independent variable is X and always goes on the horizontal axis.

A Scatter Diagram can be used to test the relationship between two variables. Then add in the line through the centre of this diagram and the equation of the trend line. This best line is called the line of best fit.

Equation of a straight line

The general equation of any straight line is: $y = a + bx$

Where a is the intercept: the y value when $x = 0$

b is the gradient or slope: the change in y when x increases by one unit

If b is negative, the line will be downwards sloping – as x increases, y decreases. This is called a negative relationship.

We can find the line of best fit by using the historical data of x and y to calculate a and b.

Formulae:

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$a = \frac{\sum y}{n} - b\frac{\sum x}{n}$$

The correlation coefficient

The correlation coefficient measures the strength of a linear relationship between two variables. Its range of values is -1 through 0 to +1.

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

If r is negative it indicates a negative relationship. This means that the line will be downwards sloping.

SPSS16. for Windows was used to carry out the correlation and regression analysis of the relationship between candlestick patterns and the major falls and advances in the month of May over the period from 1984 to 2008. Microsoft Office 2003 Excel was used to produce candlesticks charts and summary results of analysis. The detailed analysis and the test of the hypothesis are presented in chapter 7.

5.11 Framework for Analysing the Study

In this research, one of the major stock indexes has been selected to represent the performance of share prices on global stock markets. The FTSE 100 Index represents the behavior of the UK stock market and also is examined internationally. The daily price of the FTSE 100 stock indexes was used to investigate the reliability of the candlestick charting system. These case studies were carried out to determine whether or not the investors could rely on the information signals released by the candlesticks charts to help them make investment decisions. Firstly, the performance of the stock index in each May in the given time period has been reviewed. The arguments concerning investor's behavior and the reliability of the candlestick charting system has been investigated case by case. Secondly, event studies have been used to analyse the relationship between candlestick charting and major falls or crashes and to identify the signaling effects on the movements of stock prices. Do markets behave as if they have a memory? In other words, do events repeat themselves? This study looks at whether major past falls of stock prices in all the months of May in that period have performed similarly and could an investor have made abnormal returns by assuming that events repeat.

The case study includes event studies on FTSE 100 Index and its daily prices taken from the month of the May in each year in the given period. An analysis of the relationship between stock price behavior and major events provides qualitative (interpretation of candlestick charts) and quantitative (statistical analysis) evidence to support the financial theory of the Efficient Market Hypothesis and identify the degree of reliability of candlestick charting. This allows a determination of whether or not the candlesticks charting system is reliable and whether or not abnormal returns can be earned during the given time period.

The data analysis covers testing the hypothesis of the research. The SPSS 16.0 package for Windows which is leading software for financial analysis was used to carry out the tests. Microsoft Excel for Windows 2003 was used to produce the candlestick charts against the performance of the May events for the selected sample Months in the given period. The graphical method was also used to display the data.

The correlation and regression analysis was carried out to evaluate the relationship between candlestick charting and the major fall events or crashes of the stock market.

5.12 Possible bias due to methods used

Using candlestick charting to valuate the performance of FTSE 100 Index for the given period in this research was based on researcher's personal understanding of candlestick charting techniques. The researcher has no work experience as a professional trader in global financial markets. As a result, it is possible to have some incorrect judgements and this could have caused possible bias in findings. However, interviews with financial professionals have been designed to look for views of other people on applicability of candlestick charting in practice.

In addition, only a small number of people have been interviewed in this research.

Their views on candlestick charting may also have bias. Therefore, one of suggestions for further study is to carry out structured interviews to collect more evidence.

5.13 Summary

In order to carry out this research into the UK stock market and find answers to the research questions, an appropriate research methodology was designed and then implemented. This chapter presents the research methodology by outlining the methods applied and the reasons of choosing these methods. It provides the detailed research strategy for collecting empirical evidence. Finally, a framework for analysing the study is addressed and the contents of data analysis is included and explained.

Chapter 6 Case Study

An examination of candlestick charting in practice

6.0 Introduction

All investors face the same time horizon when they make investment decisions. None can have perfect information relating to future events and thus all investment decisions are made in an uncertain world. Whilst probability theory and econometrics may enable investors to balance risks, all investors are interested in information which might give a guide as to *how* future prices may unfold. In part this is what is so attractive about charting and it may explain why some investors have so much faith in this method of trying to understand and predict stock market prices.

My research seeks to test whether the very sophisticated form of charting known as "candlestick charting" can provide clues as to future market movements. In stock markets May appears to be an important month for investors. There is an old saying 'Sell in May and Go Away'. Over the last forty years there have been 48 crashes and of these, 19 have been in May. If candlestick charting can provide valuable insights into future stock market movements then they should be best identified in this month.

For those investors who believe that the past provides a valuable guide to the future, charting is an important source of information. My research seeks to test whether or not candlestick charting can provide a guide as to how a market is likely to perform. I have gathered the daily prices of the FTSE 100 Index for two reasons. Firstly the index can be traded as an individual investment and secondly it reflects the UK's financial performance as measured by a stock market.

Candlestick charting is a sophisticated method of charting which purports to show investors detailed signals of prices movements. Advocates of this method hold the view that if the task is done properly, and on a daily basis, insights can be gained about future movements in stock prices. It is to test this hypothesis that I have gathered the data and have taken a specific interest in May, because that month often produces a high degree of stock volatility.

I propose to present the data as follows:

1) The performance of the UK stock market in the month of May for the period April 1984 to June 2008.

2) To identify any signalling effect of candlestick charting to each of the months.

3) To identify if any candlesticks indicated major falls in each of those months.

6.1 The Market in General

Before one can understand the individual performance of the security market for May one needs to see an overview of how the FTSE 100 Index has performed over a certain time period. My research looks at the period from April 1984 to June 2008, as reflected in the history of the FTSE 100 Index. The following graph represents the market performance of the FTSE 100 Index over this period.

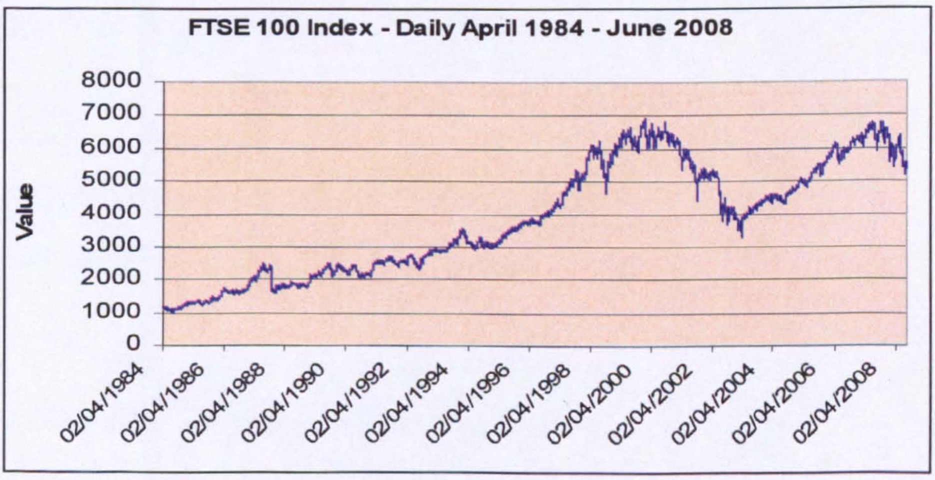


Figure 6.1 FTSE 100 Performance – Daily Closing Price, 1984 - 2008

Looking at the index one immediately sees that it rose from its base year, 1984, until 2000 in a general upward direction. The years following 2000 have been far more volatile, reflecting a period of decline and then, from 2003, a general upward movement. It is against this background that candlestick charting seeks to provide investors with a competitive advantage by signalling future upward and downward movements in the index.

The daily data of stock market performance in May, for the last twenty five years, presents the history of the UK FTSE 100 Index. In theory if candlestick works there should be a strong correlation between the charting and the FTSE 100 Index.

Therefore, as the first phase of this research, an investigation of the performance of FTSE 100 Index, for the last twenty five years, was carried out to seek any evidence of a relationship between the stock market and candlestick charting.

6.2 Data Analysis

The FTSE 100 index was selected to represent the UK stock market as a whole. The data, a set of daily prices of the FTSE 100 Index including open, high, low and close prices, was taken from Yahoo Finance website for the period of twenty five years from April 1984 to June 2008.

Using Microsoft Excel and VBA function, the data was evaluated by programming to identify the major falls. A decline of 5%, or above, was defined as a major stock market fall. A decline of 10% or above was considered as a stock market crash.

Also, the main candlesticks were calculated and identified by the designed programme and are as represented in Microsoft Excel.

Proponents of charting always believe that the charts provide evidence of how market prices will move. The case studies show the FTSE 100 Index for every month of May with a corresponding candlestick chart, together with the signalling indicators for the key events that took place.

The selected samples events are 25 May months in total and each month's analysis will cover the following areas:

- Stock performance – review and analyse the price movements of the FTSE 100 Index for the month of May, to identify the big falls.

- The interpretation of the candlestick chart – evaluate the signals revealed by the candlestick chart of the FTSE 100 Index to examine whether the candlestick chart predicted any major falls.

- The relationship between the stock market and the candlestick charting – to seek evidence that stock market movements could be explained by candlestick charting.

6.3 Investigating the performance of the FTSE 100 Index

May 1984

Stock performance

The FTSE 100 index was introduced on 2 April 1984 and immediately brought an attention to investors with an up and down trading records for the first month of its history. Figure 3.2 represents the performance of the FTSE 100 Index in May 1984.

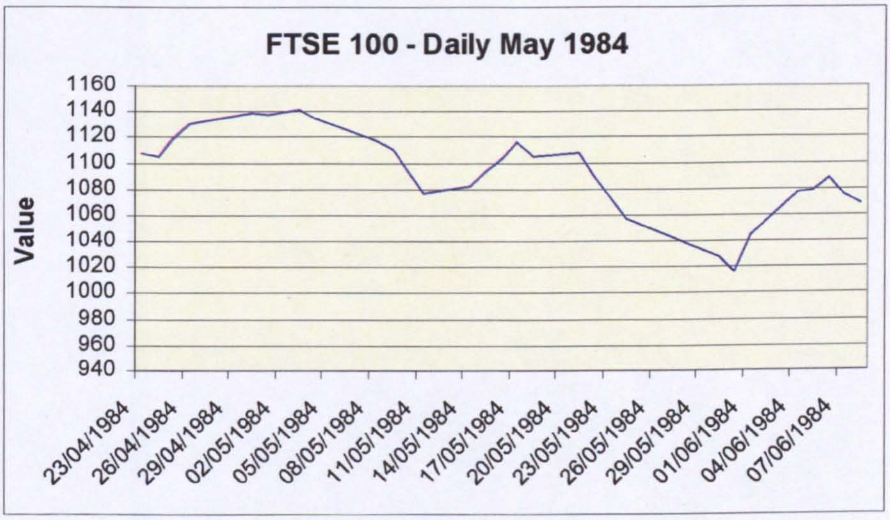


Figure 6.2 **FTSE 100 Performance – Daily, May 1984**

The FTSE 100 began an upward from 1108 points at the end of April and reached 1142 on 3 May, then it declined to 1076 on 11 May. After a short advance from 1076 to 1117, on 17 May the FTSE 100 Index started another decline and closed at 1016.6 on 31 May. The stock appeared to have an advance in the beginning of June 1984.

Major falls (changes)

The falls in May 1984 were identified as significant events in the UK stock market. There were three falls during that month and two were identified as big falls. The first major fall was from 03 May to 11 May with a 6% decrease in value. Another big fall occurred between 17 May and 31 May with a 9% decrease in value in a period of eight trading days.

Interpretation of the candlestick chart

The following candlestick chart provides the magic candlesticks to explain what happened to the FTSE 100 Index in the first May of its trading records. At the end of April 1984, the very short bodies of candle lines indicate little price movements and represent consolidation. It should be noticed that the FTSE 100 had two days "gapped up to open" pushing prices up to the higher point of 1142 on 3 May. On 4 May the FTSE 100 "gapped down" to open indicating selling pressure. In the following week the FTSE 100 continued to fall on 8, 10, 11 May with black candlesticks, and closed at 1076 at the end of the week.

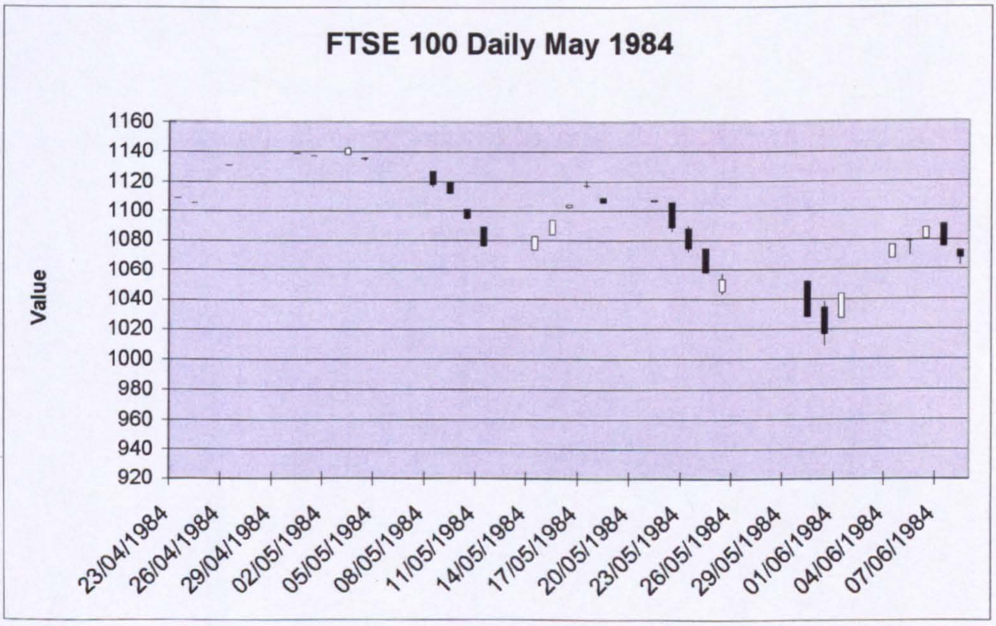


Figure 6.3 **FTSE 100 Performance – Daily, May 1984**

Figure 3.3 shows that the FTSE 100 displayed a sudden increase, by two white candlesticks, two gapped up to open and formed a doji start position on 17 May. This doji star gapped away from the previous candlestick, sending signals that buying pressure might be diminishing and the advance could be nearing an end. This was confirmed as a gap down and a long black candlestick followed in the next two trading sessions and the FTSE 100 continued to decline to a new low of 1017 point on 31 May.

The relationship between the candlesticks and the market

In this month, the relationship between candlesticks and the market could be explained as follows:

- The Doji star indicates the end of an uptrend and the market direction was at the point of changing.
- The long black candlestick after a doji star confirms the decline of the market.
- A gap up or down candlestick confirms the uptrend or downtrend.
- Significantly no candlesticks identified the sudden bullish behaviour as the FTSE 100 suddenly rose.

Therefore, in its first month candlestick charting successfully signalled the downtrend of the stock market but failed to indicate the subsequent upward trend.

May 1985

Stock performance

The FTSE 100 was bullish prior to the month of May 1985. After a strong uptrend (with waved correction) the FTSE 100 advanced 4% from its low and formed a high around 1342 on the 15 May. Then buying pressure came to an end and the stock market declined over 2% to close at 1313.8 on 24 May.

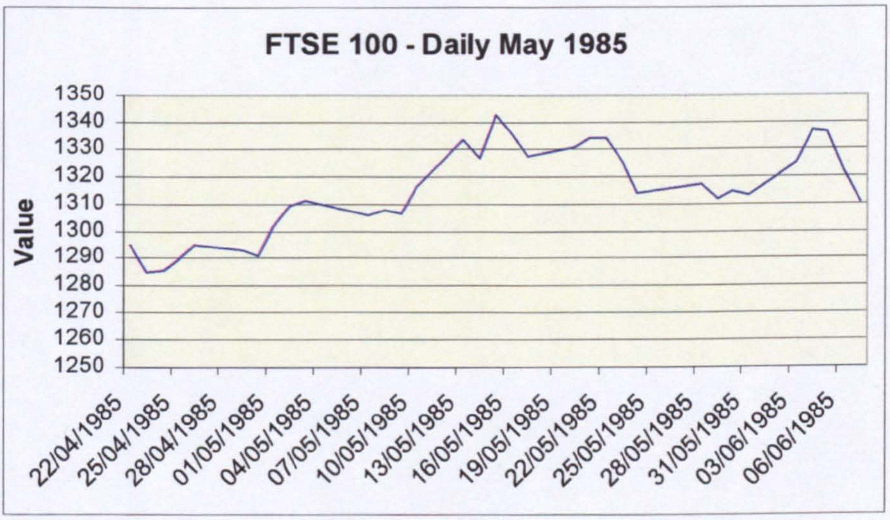


Figure 6.4 **FTSE 100 Performance – Daily, May 1985**

The bears were still in control and the decline was extended and until the end of May 1985. The stock market started a new uptrend when moving into early June 1985.

Major falls

The FTSE 100 had an obvious increase in its value, although four small falls appeared on the way up.. No major fall was identified in May 1985.

Interpretation of candlestick chart

There were three continuous "opened higher" sessions in the end of April 1985 indicating buying pressure and that the bulls were in control. The gapped up doji star that appeared on the 25 April was a significant indicator. Although the bears attempted to overcome the advance and the FTSE 100 did close lower than its opening value on 26 May, the bulls pulled the price back into an uptrend from 30 April. In the first week of the May, the significant "three advanced soldiers" (three long white candlesticks) indicated the strong buying force in the market. In the end of this week the FTSE 100 formed a small doji, indicating that the market was changing and the buying pressure came to an end.

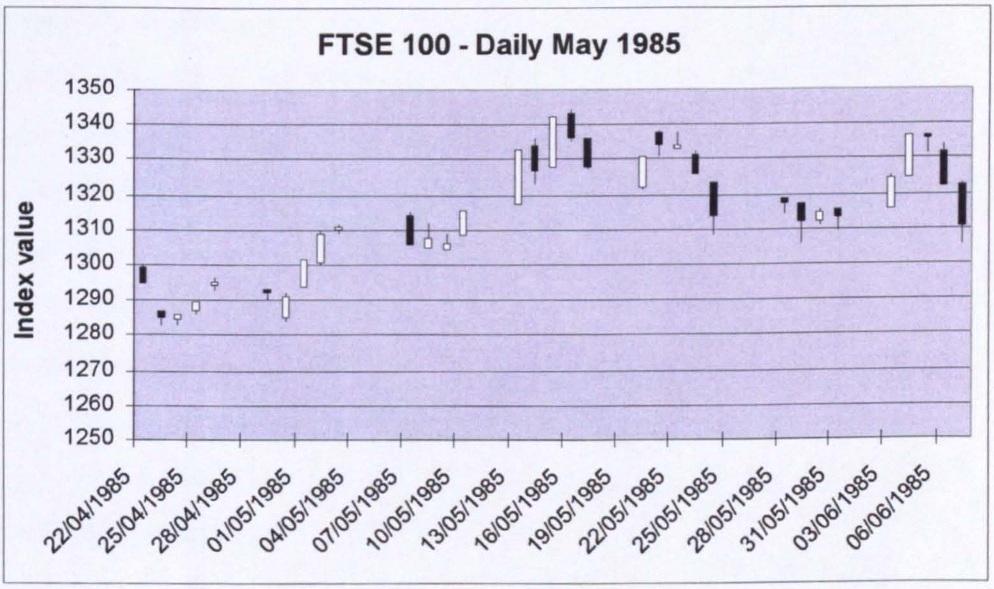


Figure 6.5 **FTSE 100 Performance – Daily, May 1985**

In the second week, the FTSE 100 opened higher than the previous week's high but the bears drove the price down, resulting on 7th May, in a long black candlestick. In the following days the bulls again pushed up the price and were in control of the Market. This was confirmed by the 'White Marubozu' on 10 May.

The candlesticks in the third week were particularly interesting. The bulls and the bears were fighting each other, trying to control the market. The two very long 'White Marubozu' candlesticks demonstrated that the market was still in the bulls' hands until the 'Long Black' candlestick appeared on 15 May, indicating a bearish reversal pattern '(Dark Cloud Cover)' together with the previous candlestick's long white marubozu. The decline of the market was confirmed by the next day's black candlestick.

On 20 May 1985 the FTSE 100 opened lower than the previous week's closing point but the bulls pushed it up and were in control during the intra-day trading session and managed to close higher than its opening. On 21 May, yet again, stocks opened higher than the previous closing price, but unfortunately, the bears drove the prices down and brought about selling pressure. A 'Gravestone Doji' candlestick appeared on 22nd May indicating that buyers dominated trading and pushed the prices higher during that session. However, by the end of the session, sellers resurfaced and drove prices back to the opening level.. The Gravestone Doji' candlestick is explained as a reversal signal but the reversal implication of this candlestick depends on the previous price action and future confirmation. The long upper shadow of a gravestone doji candlestick indicates a failed rally. The next day's black candlestick confirmed the downtrend and bears controlled the market until the end of May when three 'Hammer' look-alike candlesticks formed, indicating the end of the decline and that the market condition was changing.

The relationship between the candlesticks and the market

The candlesticks provided important signal information to the movements of FTSE 100 Index on the market. Both uptrends and downtrends were indicated by candlesticks prior to the trend. The signal information could be highlighted as:

- The pattern of the "Three Advanced Soldiers" indicated the strong buying force in the market and pulled the prices higher.
- The Doji star showed the end of an uptrend and that the market direction was changing.
- The 'Dark Cloud Cover' pattern of candlesticks signalled that bears took over control and the market moved to a decline.

- The Gravestone Doji' candlestick sent a reversal signal.
- Both uptrend and downtrend were indicated by candlestick prior the trend.

Therefore, for this month (May 1985) the theory can be said to have some validity.

__May 1986__

Stock performance

The FTSE 100 had a short advance and touched 1660.5 on 30th April. Then the stock went down 3.5% to the earlier lower point of 1601, On the 9th May. After rebounding to 1623.3 on 13th May, when the second trading week started, the FTSE 100 continued its decline, a further 3.6 %, stopping at1564, which is the lowest point during this month. Then the market went up and on the 28th May the prices were pushed back to 1624.8.

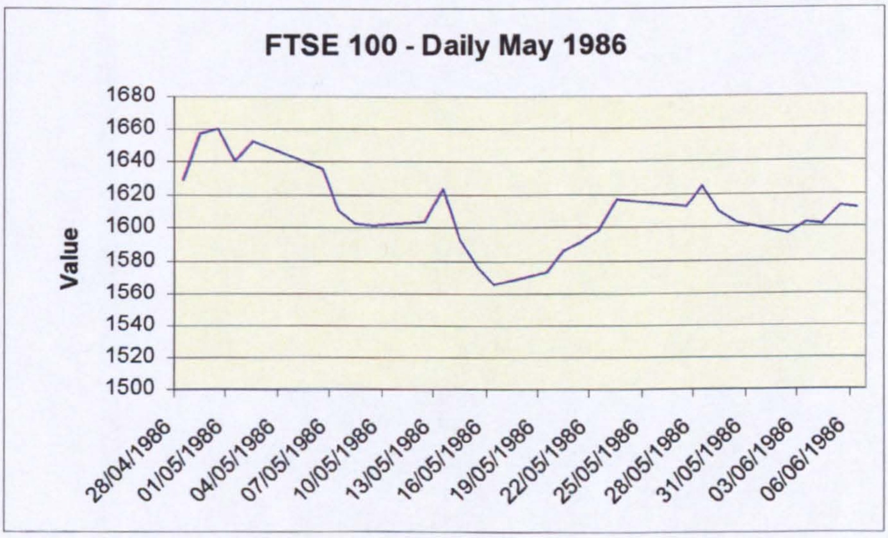


Figure 6.6 **FTSE 100 Performance – Daily, May 1986**

The above chart shows that the FTSE 100 declined slightly and developed a horizontal consolidation from the end of May 1986.

Major falls

In this period there were two obvious falls in which the FTSE 100 fell about 3.5%. However these are not considered to be big falls. The rise which occurred in week three was also significant with a 3.4% increase in prices. The FTSE 100 had a total of 6.8% decrease in its value.

Interpretation of candlesticks chart

The candlestick chart shows that the FTSE 100 was clearly in a bull phase starting from a low of around 1620.Then the stock declined dramatically, without any significant signal information, during the first week of May 1987. The two long black candlesticks show that the selling pressure was very strong. The bears drove prices down and forced the first fall ending with two small hammers, indicating that the selling pressure was weak and the market condition was changing. But a very small doji occurred on 12th May, showing little price change between opening and closing and the bulls managed to close higher than the opening value.

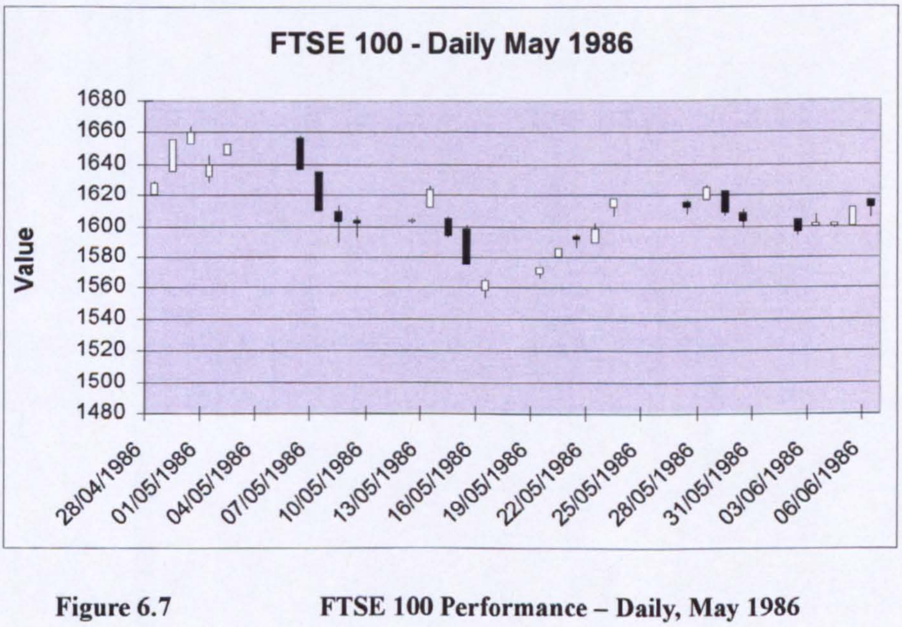


Figure 6.7 **FTSE 100 Performance – Daily, May 1986**

In the next session, the first trading day of the second week, the stock gapped to open higher than the previous session and was in the bulls' control. But thereafter, only one day's advance, the FTSE 100 gapped to open lower, resulting from the bears overcoming the buying pressure and forcing prices down to a new low, creating the second fall in this month. It was noticed that at the end of this week, on opening, the stock gapped down but the bulls pushed the prices up and managed to close at higher than the opening value. This sent a message to investors that the market condition was changing.

Next, in the third week, the FTSE 100 gapped up to open and closed higher than its opening value, confirming the advance. The bulls continued to force the prices up as demonstrated by continuing gapped up openings from many sessions during that week.

During the last week of the May the FTSE 100 declined and small candlesticks, with a horizontal level, indicated the market had moved into consolidation.

The relationship between the candlesticks and the market

- There was no significant signal before the first fall in this period.
- .Two small hammers indicated the end of a downtrend.
- The small doji and a gapped up opening in the second week, were an advance signal but the stock was in fact in heavy decline. This was hard to predict by investors.
- The windows – gapped up to open significantly indicating an uptrend was underway.

May 1987

Stock performance

From the following chart it is very clear that the market was bullish throughout May 1987 as the FTSE 100 continued an advance from previous months.

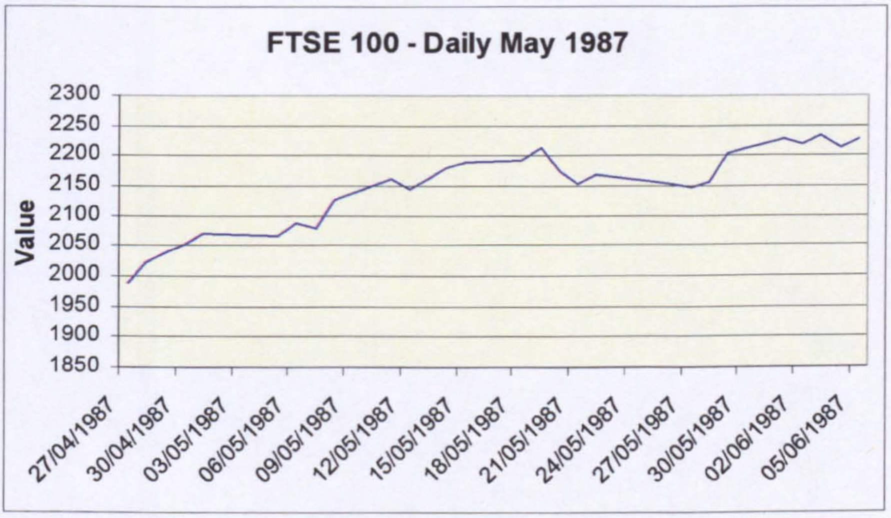


Figure 6.8 **FTSE 100 Performance – Daily, May 1987**

The FTSE 100 advanced 11.5% and touched the high at 2214.3 on 18 May. Then it had a slight reaction decline and developed a short period of consolidation. The stock rallied again and continued to extend the uptrend from the 27th May when it started at 2145.7.

Major falls

No major falls occurred during this month.

Interpretation of candlesticks chart

Before entering May 1987 the FTSE 100 opened higher than its previous session closure and extended its advance. The gapped up doji star appeared at the beginning of May, indicating the market was changing. The bears tried to overcome the buying pressure and on 4th May, the first day of the first trading week in this period forced a lower closure than its opening value. But the bulls continued to push prices higher, showing strong buying pressure until the gravestone doji appeared at the end of second week, on 15 May. This is a reversal signal indicating the uptrend could come to an end and that the market was about to suffer a change.

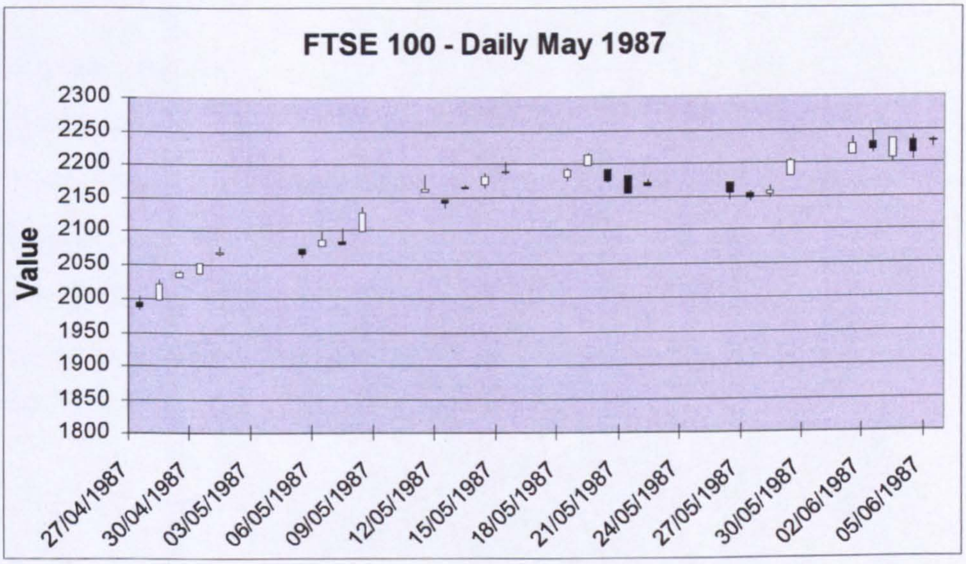


Figure 6.9 **FTSE 100 Performance – Daily, May 1987**

After two trading session in which the bulls tried to continue to push the prices up, the FTSE 100 performed a "gapped down" to open and moved on to a reaction decline and consolidation.

Two small doji, identified in the last trading week of May, sent signals to investors that the bulls were taking over the control and a new uptrend was approaching. On 29 May, the white candlestick gapped up to open, confirming that the stock started a new advance.

The relationship between the candlesticks and the market

The candlesticks could be explained as the indication of changing in market condition and identified the uptrend.

- The doji star, the reversed hammer, the gravestone doji were reversal candlesticks indicating the advance in this period.
- The continued gapped up to open candlesticks show a significant indication in predicting the development of uptrend.

__May 1988__

Stock performance

The FTSE 100 appeared to have experienced an advance before 27th April 1988 and reached 1806.7. There was a little decline at the end of April and then the stock was back up to its previous high at 1807.2. The stock declined 2.8% in total from 4th May resulting in a sharp fall in the second trading week. Then the stock moved up and down and the trading was in a range between 1756.8 and 1789.2 until the end of May. The FTSE 100 started a new rally on 31st May 1988.

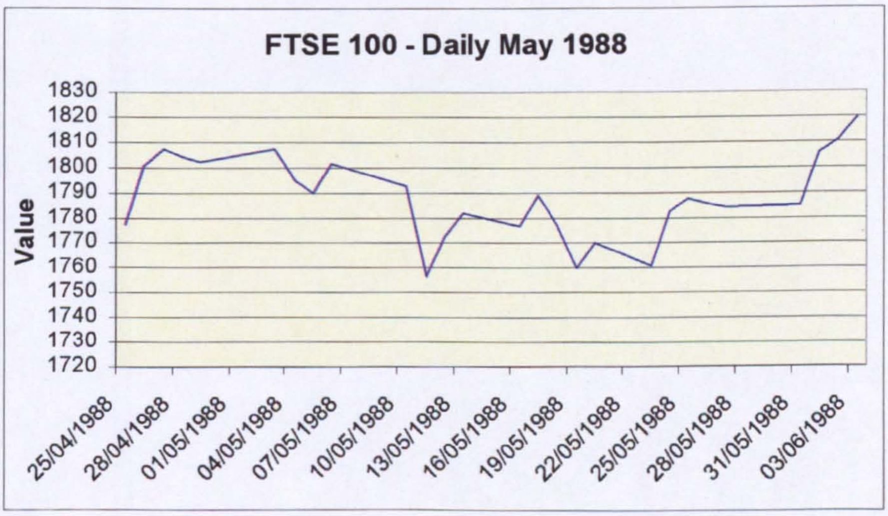


Figure 6.10 **FTSE 100 Performance – Daily, May 1988**

The following figure represents the market performance of FTSE 100 Index during the month of May 1988.

Major falls

In this period there were two obvious falls in which the FTSE 100 fell about 2.8%. However these are not considered to be big falls.

Interpretation of candlesticks chart

After two days of gapped up opening, two white candlesticks occurred on 25th-26th May indicating that the bulls pushed the prices up strongly. On the following session the stock gapped up to open and the bulls forced the prices up higher but the bears drove prices down and managed to close at lower than the opening value indicating the end of an advance. On the next two days, the 'doji' and the 'spinning top candlesticks' conformed that the market was in a state of indecision. On the 3rd of May a hanging man candlestick was formed sending a signal that the decline was underway. The following session, a black candlestick gapped down to open and confirmed the decline. A further hanging man candlestick confirmed the decline.

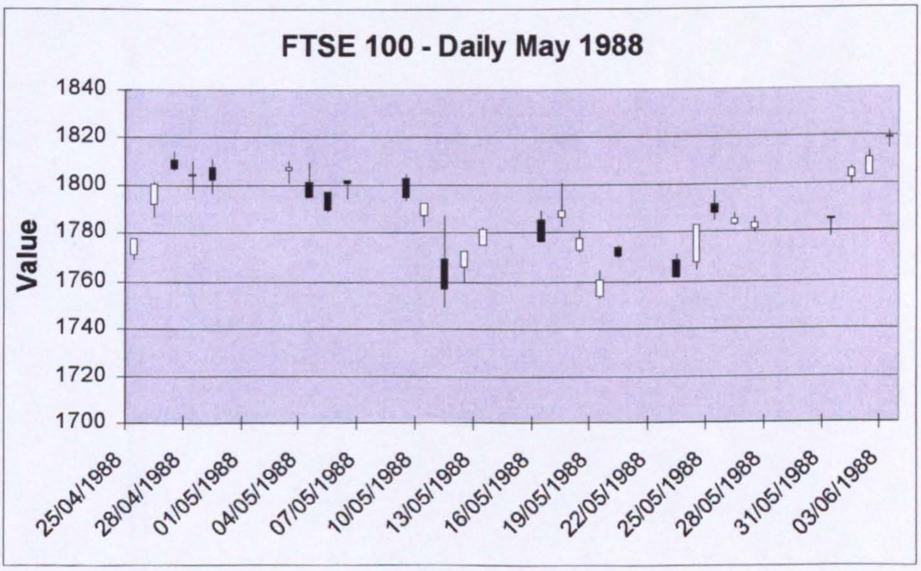


Figure 6.11 **FTSE 100 Performance – Daily, May 1988**

The second week began with a black candlestick which has a long up shadow showing that the bulls tried very hard to push the prices back to a high but the bears were too aggressive and forced to prices down. In the following sessions again the bulls pushed the prices harder with a gapped up to open a session and they took over control at the end of this trading week.

In the third week the stock jumped down after a inverted hammer was formed and continued to gap down to open. It appeared although the bulls were in control. The decline stopped when it fell near to the low point of 11th May. On Friday 20th May the stock gapped up, again indicating strong buying pressure.

In the last week, after a growth session, three spinning top candlesticks appeared and the market moved into consolidation until a Dragonfly Doji occurred on 31st May, indicating that the FTSE 100 would perform a new rally. The following day, the white candle gapped up to open, which confirmed this.

The relationship between the candlesticks and the market

The period of consolidation and both up and down trend were indicated by the specific candlesticks:

- There were a number of candlestick indicated that the stock moved on to consolidation. For example, the doji and spinning top at the beginning and the end of May.
- The hanging man, hammer and revised hammer indicated the down trend.
- The dragonfly doji indicated the approaching of the rally and the write candlestick with a gapped up to open confirmed the advance.

May 1989

Stock performance

After an advance in late April, from 28 April, the FTSE 100 was horizontally extended in an undulating pattern along a slight up trend within a rang of 2100 to 2150 for about two weeks. In the third week stock prices suddenly rose and touched a high of 2204.7 on 19 May. Then the stock declined about 5.3%, back to the previous range around 2100.

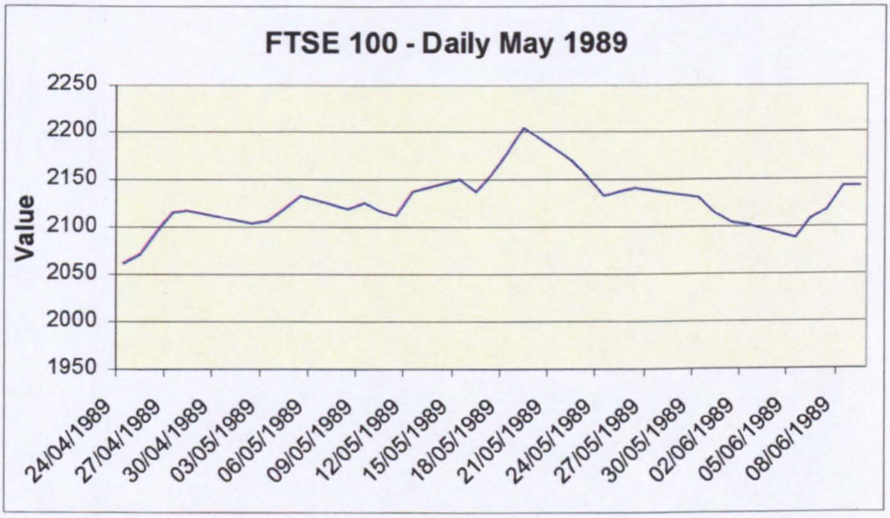


Figure 6.12 FTSE 100 Performance – Daily, May 1989

Major falls

The above chart clear shows that the decline in this period was significant and extended into early June. A 5.3% decline was considered as a major fall in the market.

Interpretation of candlesticks chart

The story behind this month's candlestick was that the bulls managed to push the prices up. It can be seen that most of candlesticks are small, indicating little change in price during an intra-trading session.

After a five-day advance the FTSE 100 formed a spinning top on 28 April, indicating the end of an advance. In the first week of May, a gapped up doji with the next day's white marubozu formed a bullish engulfing pattern warning investors, a coming decline. This was confirmed by a follow-up black marubozu. The decline continued for another three days and formed an abandoned doji star, indicating an advance was near. This was confirmed by a strong gapped up white candlestick. In the following week, a follow-up advance occurred which formed an

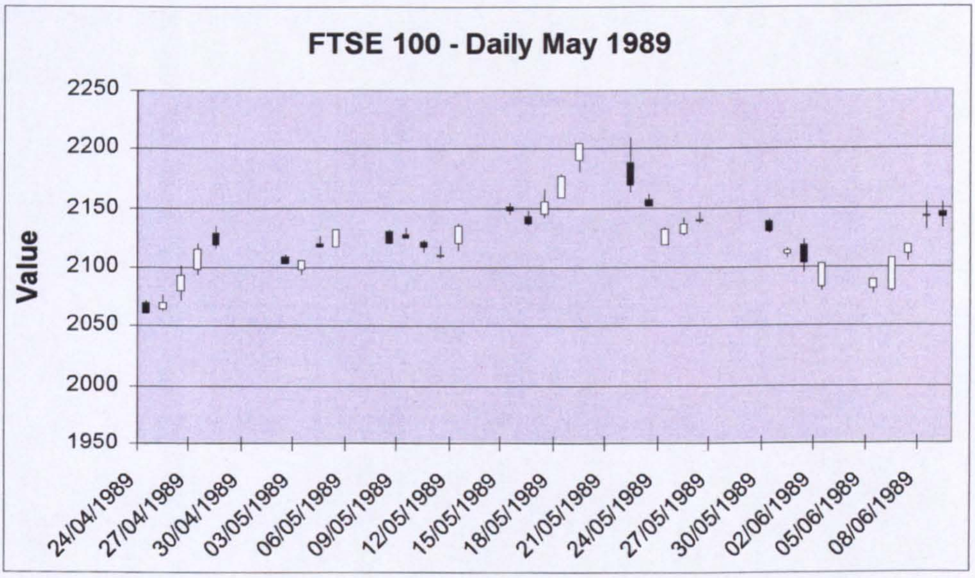


Figure 6.13 **FTSE 100 Performance – Daily, May 1989**

advanced three soldiers pattern signalling the end of this advance. This was confirmed the next day, with a black candlestick and the major fall started. The long up shadow of a black candlestick indicated that buyers tried very hard to push the prices higher but the sellers forced the prices down. The next two days gapped down openings showed strong selling pressure. But the bulls took control and the stock had a three day advance, ended with a doji on 26 May as a result a one week-decline set in.

The relationship between the candlesticks and the market

The performance of FTSE 100 was well represented by the candlesticks.

- A spinning top on 28 April, indicating the end of an advance.
- A bullish engulfing pattern warning investors a coming decline. This was confirmed by a follow-up black marubozu.
- An abandon doji star indicating an advance was near. This was confirmed by a strong gapped up white candlestick.
- An advanced three soldiers pattern signalled the end of this advance.

Although the major fall that started on 21 May was indicated by an advanced three soldiers pattern there is a need to look at the periodic UK economic condition to seek others possible reasons which affected the investors' decision.

May 1990

Stock performance

From April onwards the FTSE 100 Index had declined, from about 2160 to a low point of 2103. Then at the end of April stocks started a strong up trend on 1st May (1990) which continued until the end of May, reaching 2345. The rally continued into June 1990. Figure 6.14 showed that there was strong bull performance through May 1990. The FTSE 100 increased by 10.7% in value during the month.

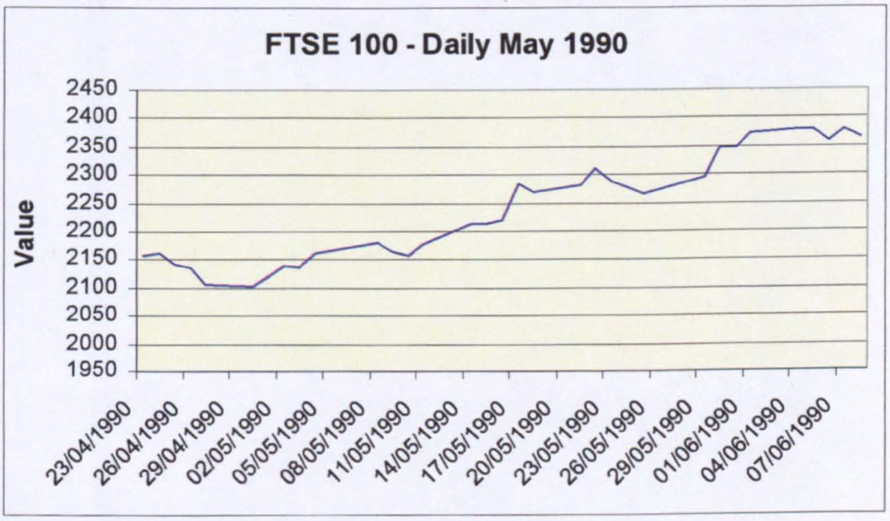


Figure 6.14 **FTSE 100 Performance – Daily, May 1990**

Interpretation of candlesticks chart

At the end of April 1990 the FTSE 100 Index declined for five days until it formed a hammer candlestick on 30 April 1990. This hammer candlestick is an indicator of a market rally. This was confirmed when the FTSE 100 opened higher in the next session. For four days the index opened higher indicating strong buying pressure, and the market was under the bulls' control.

The following chart shows that a inverted hammer was formed in week three, after a long white marubozu, indicating changing buying and selling pressures. Although in the following week the bulls tried to push the price and gapped up to open higher, the bears forced the price down as demonstrated by the appearance of two inverted hammer candlesticks. But at the end of May, the market jumped up on opening and the up-trend was continued.

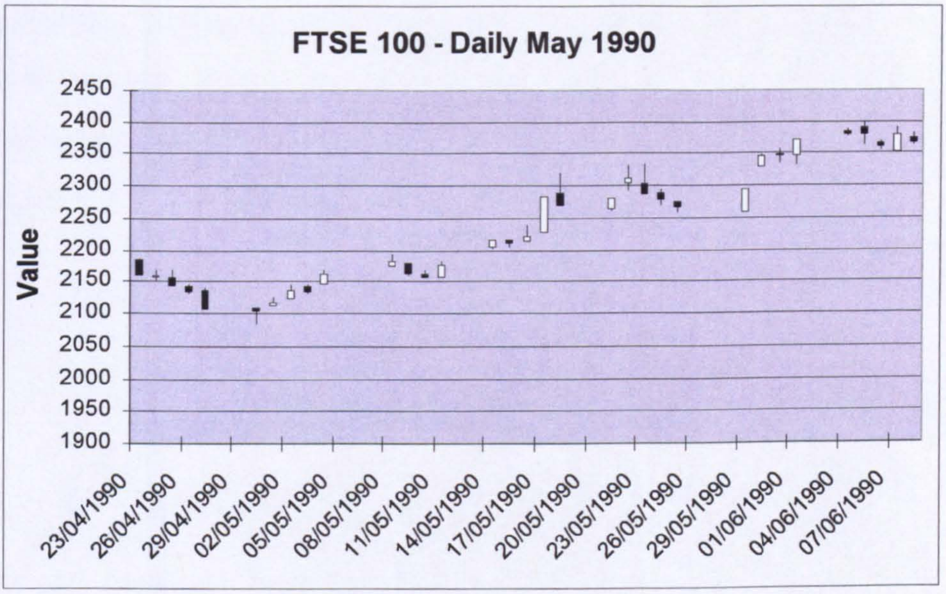


Figure 6.15 **FTSE 100 Performance – Daily, May 1990**

The relationship between the candlesticks and the market

The candlesticks indicate the price direction of the FTSE 100 Index.

- Continuing gapped-up openings indicate the buying pressure as the stock climbed up to reach higher prices. This is significant in this month's stock performance
- Hammer candlesticks acted as up trend reversal indicators while inverted hammer candlesticks were a down trend signal.

May 1991

Stock performance

The FTSE 100 Index experienced a week of continuous decline at the end of April 1991. Then the market started a strong rally from 26 April 1991 at 2471, and reached a peak of 2541.8 on 9th May 1991. Then the FTSE 100 Index suddenly fell sharply by 3.5% to 2453.9 by 17th May 1991. It then remained in a state of consolidation only moving up slightly from 20th May 1991 until the end of May, and closed at 2515.8 on 3rd of June 1991.

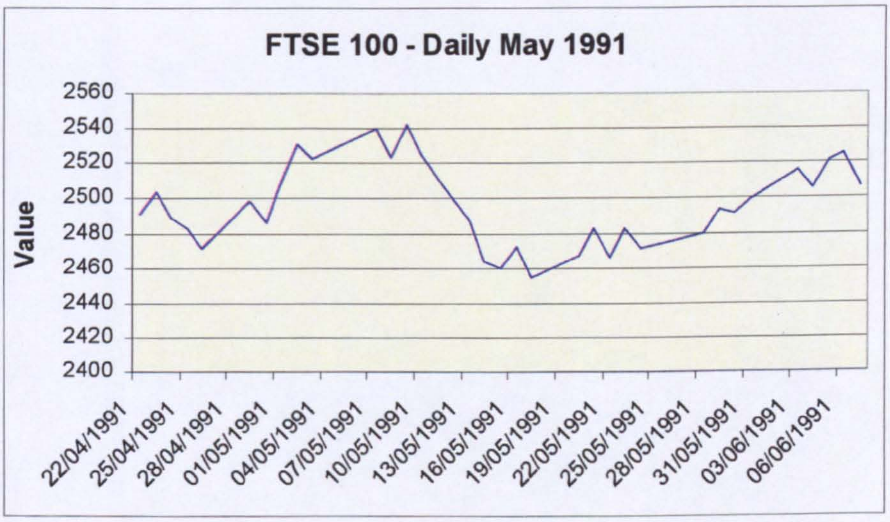


Figure 6.16 **FTSE 100 Performance – Daily, May 1991**

The fall was identified as a significant event but was not defined as a major fall because the FTSE 100 Index only fell by 3.5%.

Interpretation of candlesticks chart

There was a five day continuous decline, shown by black candlesticks at the end of April 1991. The bulls took over control and the FTSE 100 Index started a two week rally. The long candlestick appeared on 26th April, showing strong buying pressure. The doji candlestick, during an up trend, indicated that the trend would continue.

The gapped-up opening was result of strong buying pressure and the bulls pushed the price higher. The small doji candlestick was in the form of harami. The dark cloud cover formed on the 9th and 10th of May signalling that the market had come under the bears' control. The gapped down opening caused a sharp fall and the bears brought down the price. The spinning candlesticks appeared on 15th of May indicating the end of the fall which was confirmed when the next two day opened higher, but the bears pushed the price back.

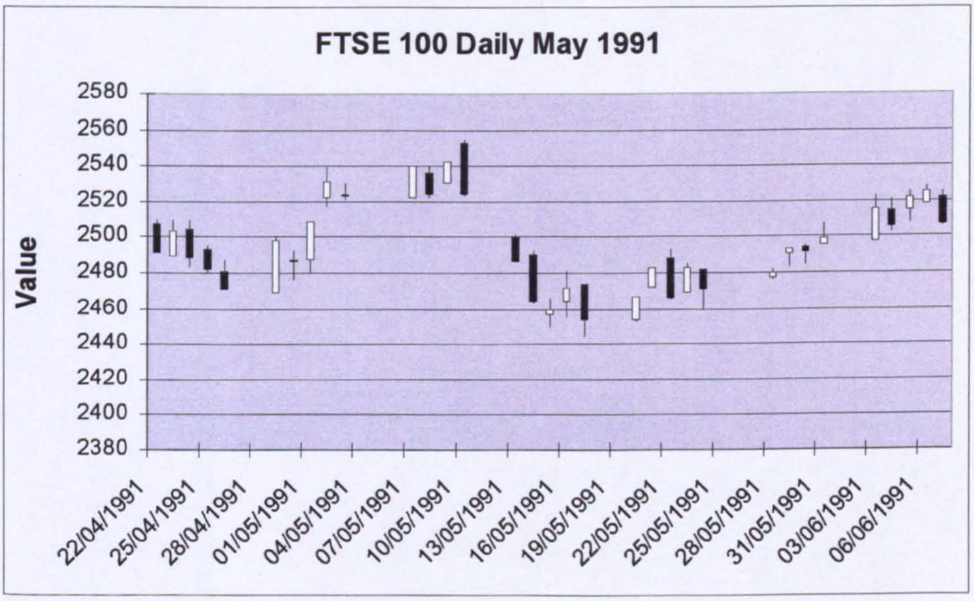


Figure 6.17 **FTSE 100 Performance – Daily, May 1991**

In the third week of this May the FTSE 100 Index gapped up to open higher which resulted in a Marubozu candlestick meaning the bulls were in control of the market and the buying pressure was strong.

The spinning candlesticks appeared on 28th May, indicating that the power of the bulls and the bears was equal, but the FTSE 100 Index gapped up to open, resulting in two hanging men and a shooting star, indicating that the market would fall. But the stock actually rose with a long white candlestick after May 1991.

The relationship between the candlesticks and the market

- Dark cloud cover indicated a sharp fall which did follow.
- Spinning candlestick signalled that the market was changing.
- The hanging man provided the opposite meaning which was hard for investors to understand and interpret.
- The shooting star failed to predict the up trend.

May 1992

Stock performance

The FTSE 100 Index was fairly stable until the 5th of May 1992, but then rose sharply by 2%, from 2662.2 to a high of 2737.8. Then it fell to 2682.6 on 15 May. A slight upward movement appeared in the third week, then the stock started to move to a down trend on the first trading day of the last week, and this downwards movement continued into June 1992.

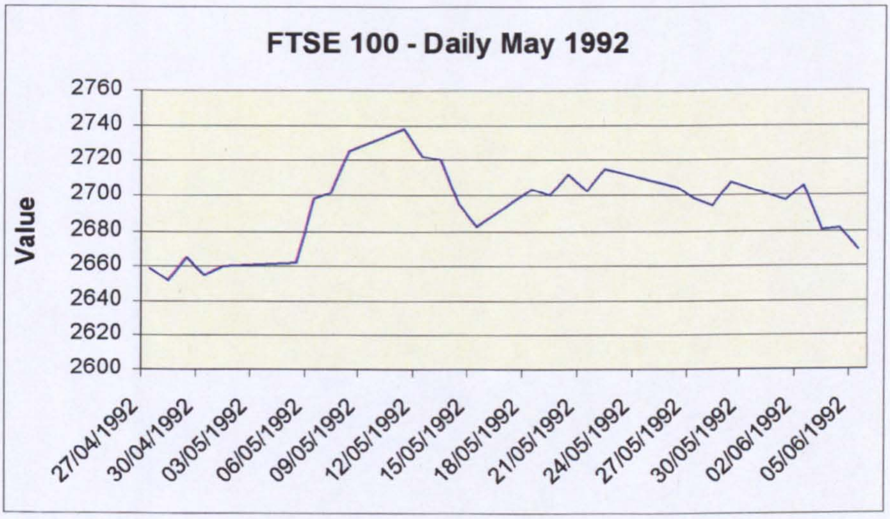


Figure 6.18 **FTSE 100 Performance – Daily, May 1992**

Interpretation of candlesticks chart

A long white candlestick and a significant hammer candlestick had formed before the FTSE 100 Index moved into May 1992, indicating that the market condition was changing. This was confirmed by a doji candlestick on the 1st of May.

In the first week of the May, two bullish engulfing blending candlesticks were formed which signalled a potential upward movement. The second bullish engulfing included a doji which confirmed the rally. Two very long white candlesticks showed that buying pressure was very strong and the market was under the control of the bulls.

In the second week, at the highest point, a shooting star formed sending signals to investors that the upward trend had come to an end and the market was about to change. This was immediately confirmed by an inverted hammer candlestick. The FTSE 100 Index fell sharply to 2682.6. Two long black candlesticks and a gap down candlestick indicated that the selling pressure was strong and that the bears controlled the market.

In the third week the bulls tried to push prices higher but the stock market did not respond and small candlesticks represented the little changes in stock prices.

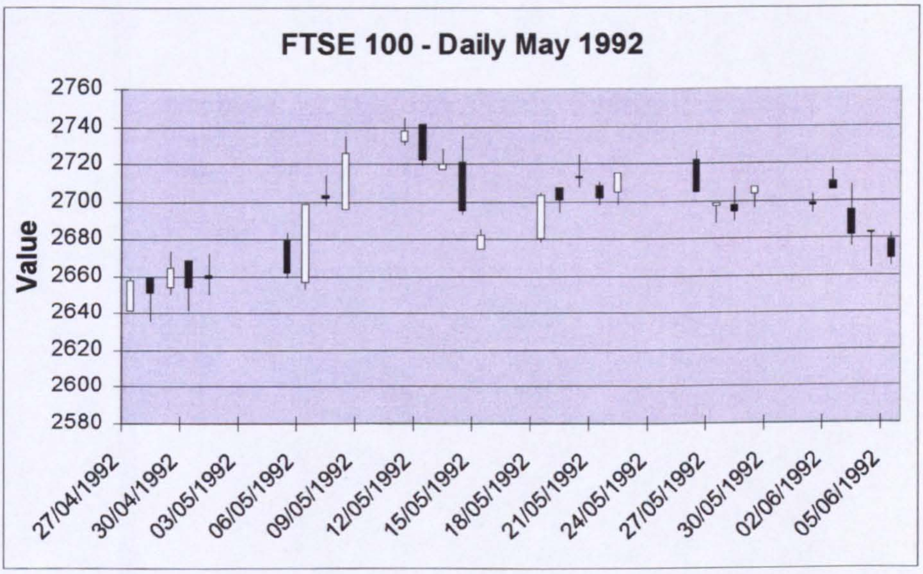


Figure 6.19 **FTSE 100 Performance – Daily, May 1992**

In the last week of this month a long black candlestick appeared, signalling that the market would fall. The following day this was confirmed with a gap down hammer candlestick. The market started to fall on 2nd June 1992.

Major Fall

No major fall was identified in this month.

The relationship between the candlesticks and the market

Although no major fall was identified certain candlesticks could have provided investors signals to indicate movements in index values.

- Single candlesticks such as hammer, doji, long white candlestick indicated the upward movement of stock.
- Blending candlesticks in the form of "bullish engulfing" predicted upward movement.
- A shooting star appeared on the top of the rise and could have informed investors of an immediate fall in stock prices.
- A gap down to open candlestick indicated the market could continue to decline.

May 1993

The UK stock market, as represented by the FTSE 100 Index, was volatile in this month and investors had a tough time as the market appeared to rise and fall although the general direction was slightly upward.

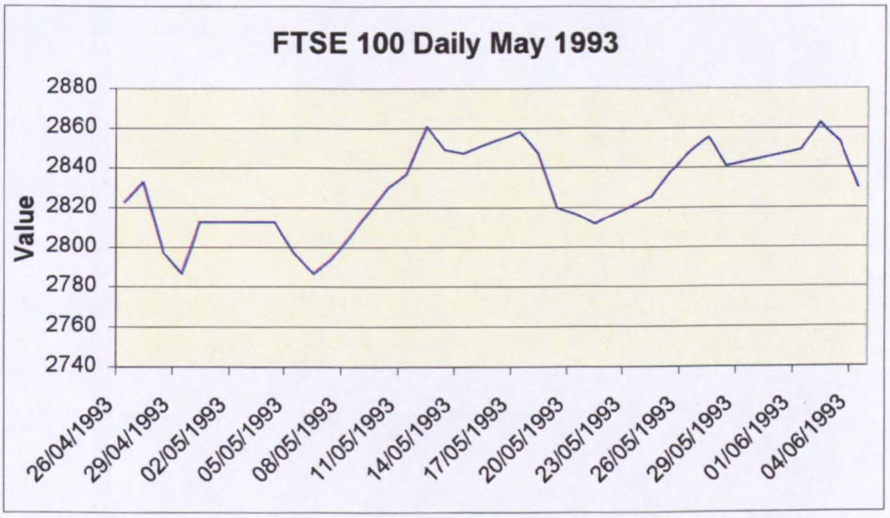


Figure 6.20 **FTSE 100 Performance – Daily, May 1993**

The FTSE 100 Index had started to fall on 27 April and continued until the end of the first week of May, to a low point of 2786.3. But then the market went up suddenly, by 2.7%, and reached a new high of 2860.8. After a few days horizontal performance the market fell sharply by 1.6% to 2812.2 on 21 May. At the end of this month the FTSE 100 Index rose by 1.5% to 2855.3 on 27 May. Then it fell slightly as it entered the first week of June.

Interpretation of candlesticks chart

The FTSE 100 Index started its fall on 27 April when a bearish engulfing blending candlestick was formed. The bulls tried hard to push the prices up, as indicated by a white candlestick on 29 April, but failed. The stock continued to decline in the first week of this month following two black candles, and the second black candle gapped down to open. The decline stopped when a white candle appeared on 7 May and the bulls took over control.

In the following week three advanced white candlesticks were formed, the first one being very long, indicating a strong buying pressure, and the third one gapped up to open, showing the bulls had pushed up prices by 2.7% to a new high point of 2867.4. Then the dark crows formed at the point of this new high.

In the third week another dark cloud was created and three black crows followed in a downward slide to 2801.

Then the market suddenly rose, with three advanced white candlesticks and finally a spinning star was formed. This spinning star sent out a signal to investors that this was the end of rally, which was confirmed by the black candlestick which formed on 28 May 1993.

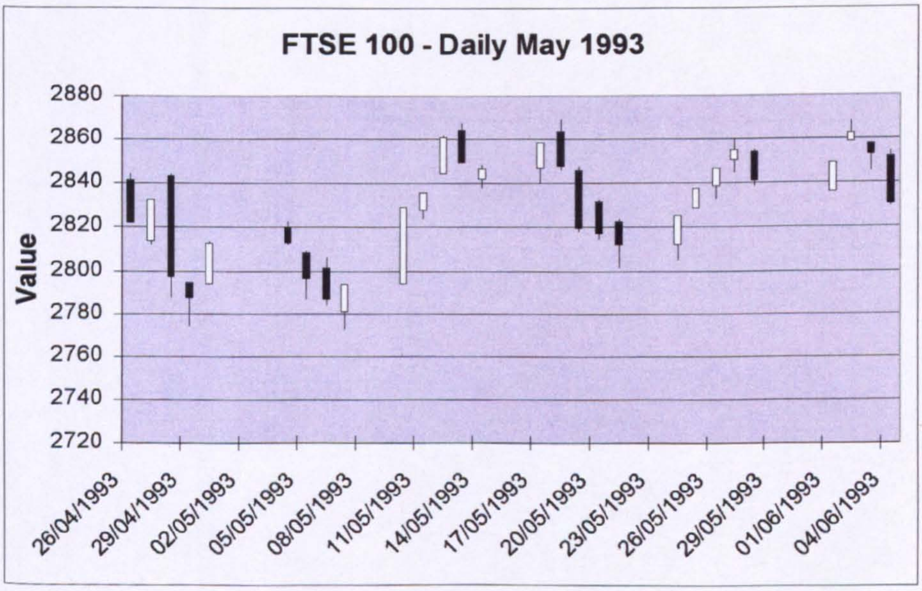


Figure 6.21 **FTSE 100 Performance – Daily, May 1993**

The relationship between the candlesticks and the market

- A bearish engulfing candlestick pattern indicated a potential fall in the prices of stock.
- A long white candle and three advanced white candles show strong buying pressure but there was no indication of this before the stock suddenly rallied. This happened with both rallies in this month.
- Dark cloud candlestick patterns predicted an immediate fall in the market.

May 1994

Stock performance

The FTSE 100 Index displays an obvious major fall during this month. The market showed a rise at the end of April 1994 and then declined by 2.5% of its value, from 3150 on 27 April to 3070 on 4 May 1994. Then, for a week, the market was stable. Then a slight rise to 3136.3 on 10 May, was followed by another week of stability. Then the market suddenly plunged from 3135 on 18 May to 2931.9 and, by 1st June, the FTSE 100 Index had lost 6.5% of its value.

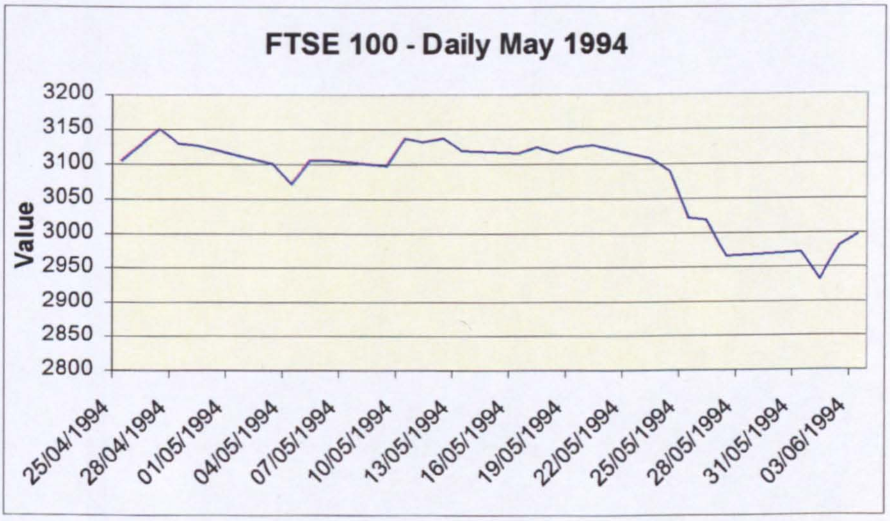


Figure 6.22 **FTSE 100 Performance – Daily, May 1994**

Interpretation of candlesticks chart

Candlestick charting shows a slight undulation of prices from the week at the end of April until 18 May. The bulls tried to push prices up bur bears brought the prices down to a level on or just above 3100. In the first week of May there had been a bullish engulfing pattern which investors could interpret as a rising signal. This was confirmed by the ensuing spinning top and hammer candles.

In the second week in the month the hammer showed signal of a rise but then two dark cloud covers indicated that the market was about to change. These two dark cloud covers indicated a resistance level at about 3150.

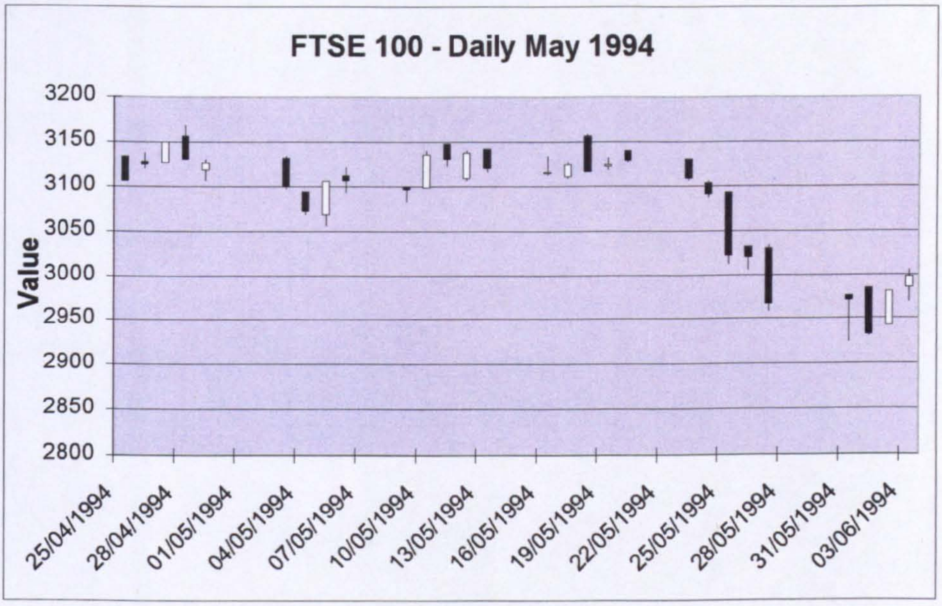


Figure 6.23 **FTSE 100 Performance – Daily, May 1994**

In the third week a gravestone formed and then a bearish harami position appeared, indicating a downturn in the market. The FTSE 1000 Index plunged sharply from on 18 May and reached a lowest point of 2925 in this month on 31 May. A hammer with a very long lower shadow was formed indicating the market condition was changing. A hammer is a bullish reversal pattern that forms after a decline, meaning that the downturn could be near its end.

The relationship between the candlesticks and the market

In this month many candlestick patterns were identified which are believed to provide investors information about rise and fall of the stock market.

- Bullish engulfing, hammer and doji are reversal signals which predict an upward movement of stock prices.

- Dark cloud cover signal a big fall in the market, which happened after two days.
- The harami formed by a doji after a long black candle is a bullish signal, indicating a rise. But this was not true in this case. Instead of rising the stock fell dramatically.

__May 1995__

Stock performance

There was a bullish development of the market as it moved up steadily, with strong buying interest. It can be seen from the following chart how this trend developed.

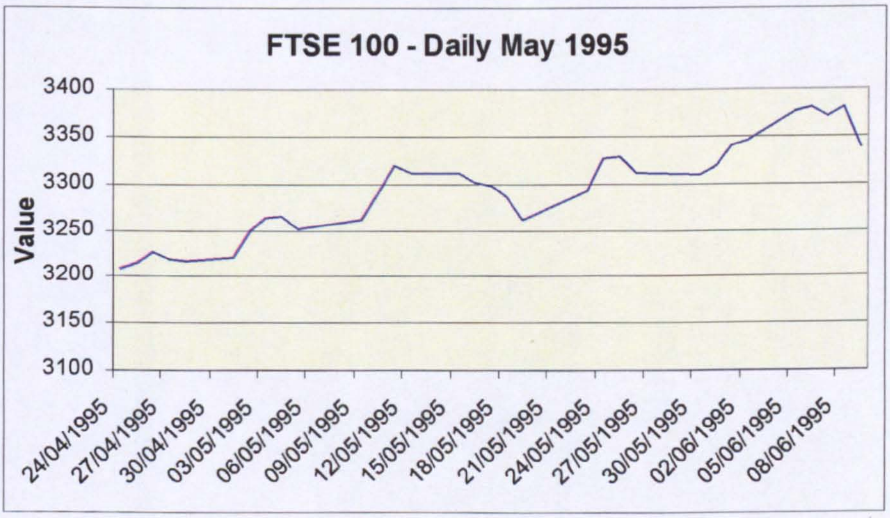


Figure 6.25 FTSE 100 Performance – Daily, May 1995

In the first week of this month the FTSE 100 Index went up by 3.4% and reached 3317.9 on 11 May 1995. Then the stock declined by 1.7% to 3261 on 19 May. After this slight fall the stock again moved up strongly, reaching 3380.8 on 8 June. Overall the FTSE 100 Index increased by 5.4% during this month.

Major fall

No major fall happened in this month of the May as it was a bull market. Only a small short decline of 1.7% was identified during this month.

Interpretation of candlesticks chart

The candlestick charting showed that the FTSE 100 Index declined on the first two days of the first week in this month. Looking at the last week of April there was a hammer with a real white body on 24 April, sending a signal that the market was moving up. On 28 April a black candle line was formed, meaning selling pressure might be diminishing. This was confirmed after two days when a long white candlestick formed on 1 May. The stock rose and a gapped up to open doji appeared. The bulls pushed the prices higher on the following day but the bears brought prices down and a gapped down to open session formed a doji candle, on 5 May.

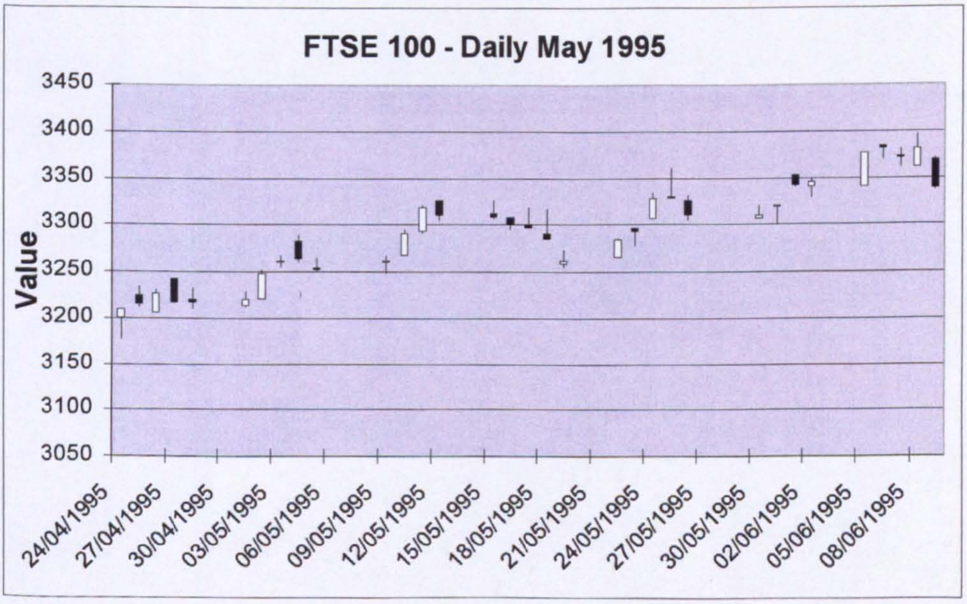


Figure 6.26 **FTSE 100 Performance – Daily, May 1995**

In the second week, after a doji was formed on the first trading day of this week, the market gapped up to open at a higher value and formed two advanced white candlesticks, showing very strong buying pressure until a blending candles, dark cloud cover, appeared. The dark cloud cover should send a signal to investors that prior trend was about to end.

The market declined in the third week. The stock opened lower than the previous closing price and formed four inverted hammers. The hammer, which appeared on the last day of this week, was a gapped down to open, but it resulted in a white real body, indicating that the bulls were in charge at the end of this trading week. There was a general upward movement and a bull market condition.

The dragon fly doji appeared on 30 May provided evidence of buying pressure but at the lowest point of the trading session, there were still plenty of sellers. The following day a big gapped-up to open continued a strong bullish reversal, and the market continued to rise well into June 1995.

The relationship between the candlesticks and the market

Both rises and falls were identified by candlestick charting.

- Doji, dragon fly doji and hammer, all were signals of potential upward movement.
- Dark cloud cover, gravestone doji were identified,sending signals to investors that the market is moving downward. – which it failed to do!!

May 1996

Stock performance

In general there was a bearish market in the month of May 1996. The FTSE 100 Index extended a previous fall by 3.9%, from 3852.7 on 22 April to 3707.3 on 8 May.

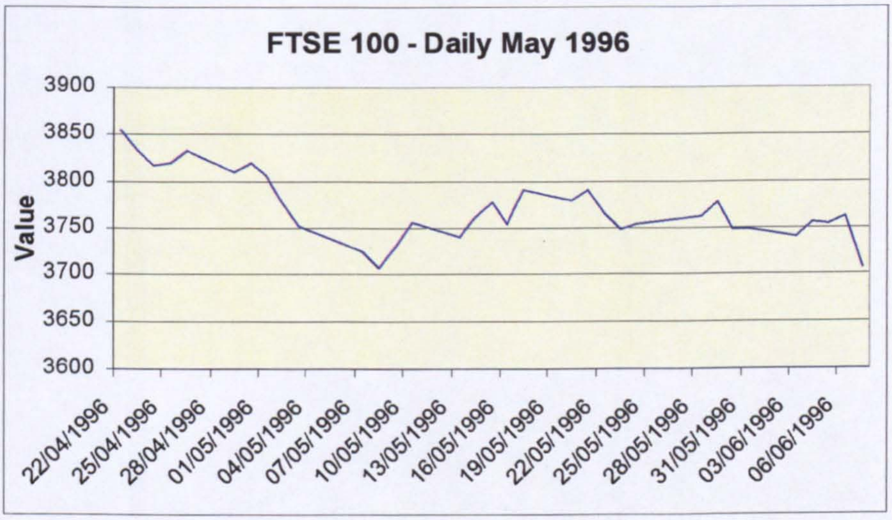


Figure 6.27 **FTSE 100 Performance – Daily, May 1996**

Then market rose by 2.2% to reach 3789.6 on 17 May. After that the bears were in charge and the market declined from 3789.6 on 17 May to 3747.8 on 31 May.

Major falls

There was an obvious fall, calculated as a decrease in value of 3.9% in the first two weeks of this month. A subsequent rally, to 3790, started but the market returned to the low of the 12th May.

Interpretation of candlesticks chart

Candlesticks charting clearly provides clear evidence that the market was in the hands of the bears. In the last days of April we can see a doji on the top, a gapped down to open spinning candlestick, and long black candlestick. These were signals providing evidence that selling pressures were strong and a decline could not be avoided. The bulls tried to push prices higher and formed a white candle and a gapped up to open white candle with a small real body. However, this short real body showed that buying pressure was not really strong. The bears took over the market as evidenced by a long black candlestick which also formed a harami position. The selling pressure was very strong, as another long black candle was formed and a long leg doji gapped down to open. The market continued to decline until an inverted hammer appeared at the value point of 3707.3, on 8 May. This inverted hammer indicated that the market condition was changing as selling pressure was reduced, showing a potential rally. This was confirmed by the following spinning candle and a long white candlestick. This long white candlestick also formed a harami with the candlestick on 13 May.

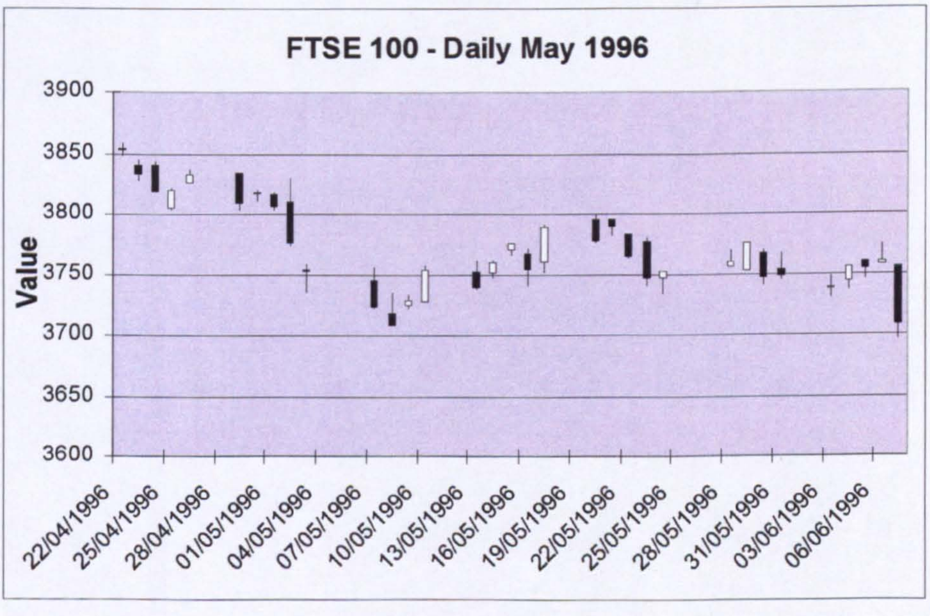


Figure 6.28 **FTSE 100 Performance – Daily, May 1996**

In the third week, after the first trading session, the candlestick of the second trading session opened higher than the previous closing, then a candle gapped up to open higher and forced prices up to about 3800 on 20 and 21 May. A bearish harami position was formed. Candles identified as dark cloud cover appeared on 19 – 20

May.

The FTSE 100 Index declined for four days, with four black candlesticks, moving down indicating heavy selling pressure, from 3791.3 on 20 May to 3752.1 on 24 May. A white hammer appeared on 24 May. This was a bullish signal, but the rally only lasted for two days, shown by an inverted hammer and a long white marubozu candlestick. Then the bears took control forming a black candle and an inverted hammer with a very short and black real body on 31 May, signalling that market continued its decline. The FTSE 100 Index continued its fall after May.

The relationship between the candlesticks and the market

Early candlesticks provided the signals evidenced by the market's upward movement and big falls in the month of this May.

- Doji, long white candlesticks helped to identify any upward movement.
- Dark cloud cover, inverted hammer pointed out a potential decline.

May 1997

Stock performance

May 1997 saw a strong bullish development of the market of the first two weeks of the month. The FTSE 100 Index continued a previous up trend from 4389.7 on 28 April until it reached 4691, which was the highest point of the month, on 12 May. During this period the market increased significantly by 6.8%. Then, after a very short period of decline of 1.8% in its value, it moved up again and peaking at 4681.6 on 27 May.

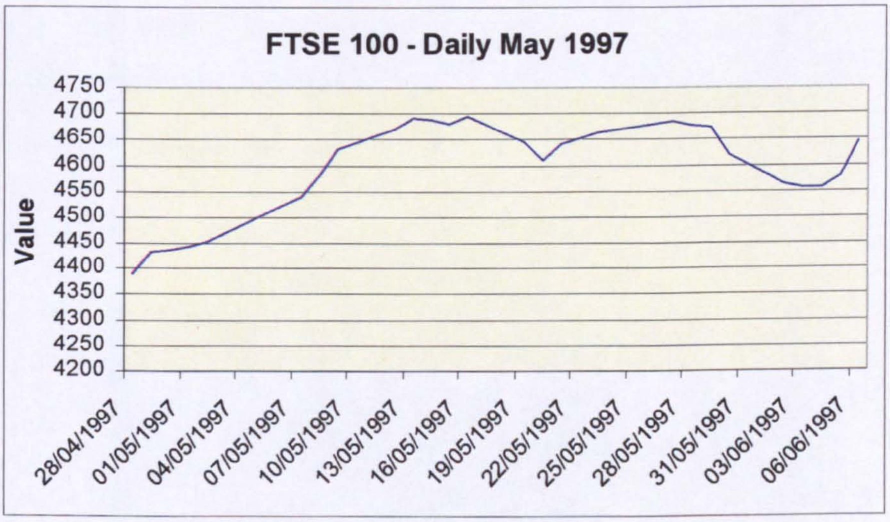


Figure 6.29 **FTSE 100 Performance – Daily, May 1997**

Then as we can see above, the FTSE 100 Index plunged by 2.5% between 28 May and 30 May. This fall was followed by a bullish reversal early in June.

Major falls

There were no major falls identified in this month but the market did experience two obvious falls when its value decreased by 2.5% and 2.9%.

Interpretation of candlesticks chart

Candlestick charting provides a clear picture of a significant increase in the stock's value over the first two weeks of the month. In these two weeks the candlesticks were all white. These white candles continued to move up to open, showing strong buying pressure as share prices were pushed even higher. For example, after a long white candle formed on 8 May a white candle gapped up to open, to push prices to the highest monthly point of 4691 on 13 May. At the top, two inverted hammer candlesticks and a doji indicated that the upward trend was coming to the end which it did at 4723 on 16 May. The followed up decline existed only for two day with two black candlesticks. The market again rose gradually until a doji appeared on 28 May at 4677.5. The stock declined after May, showing two long black candlesticks indicating that big changes in the values of the stock during that session. At the end of that week a recovery happened and two white candlesticks formed.

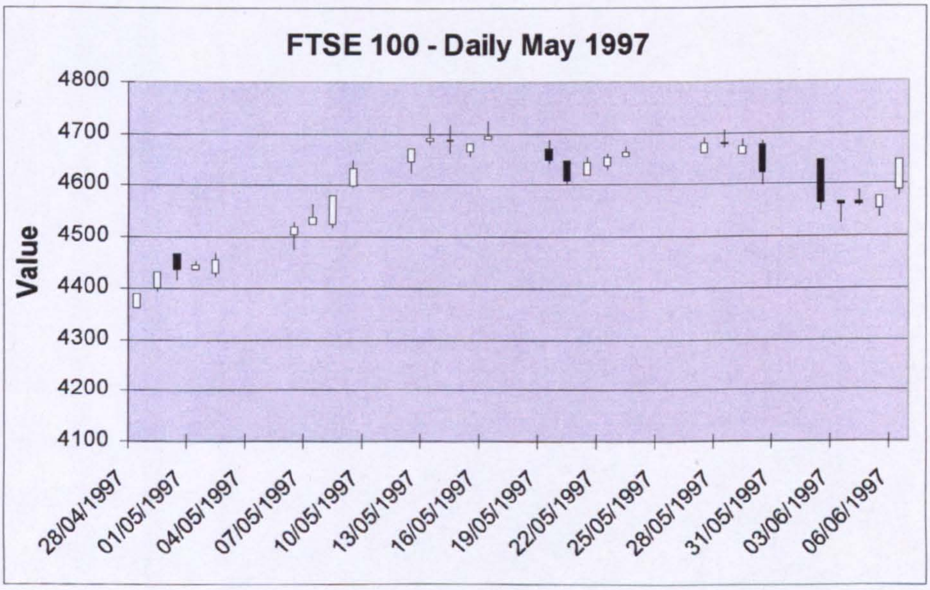


Figure 6.30 **FTSE 100 Performance – Daily, May 1997**

The relationship between the candlesticks and the market

Both up and down movements were explained by the candlesticks.

- The hammer at the bottom signalled the start of an upward trend.

- White candles and gapped-up to open, showed strong buying pressure.
- Doji start, inverted hammers at the top evidenced the end of upward trend.
- Double doji formed indicating a resistance level.

May 1988

Stock performance

There was a very tough month for investors as the market fluctuated wildly.

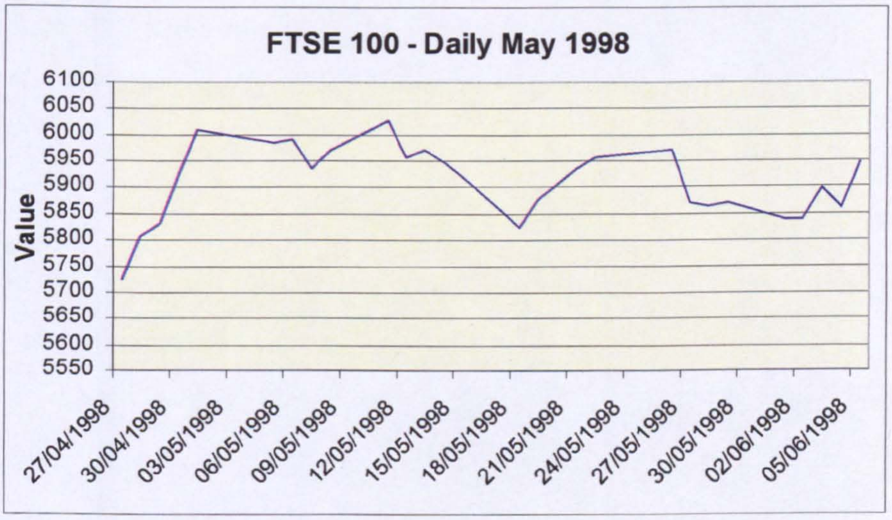


Figure 6.31 **FTSE 100 Performance – Daily, May 1998**

It can be seen from the above chart that the FTSE 100 Index had risen rapidly before the end of April. The market rose from 5722.4 on 27 April and reached 6010.3 on 1 May. Then the market declined 1.2%, to 5938, by 7 May. Then it went up by 1.5% to reach its highest point of the month, 6028.3, on 11May. The FTSE 100 Index plunged sharply by 3.5% starting from 12 May to its lowest point of 5826.2, which was reached on 18 May. Then the stock rose suddenly again by 2.5% and reached 5970.7 on 26 May. Then it came down by 2.5% and closed at the 5837.9 on 1 June 1998.

The trading range for this month was between 5800 and 6050 and the general direction was horizontal, with ups and downs in a bearish market.

Major falls

There were three obvious falls in this month. The biggest fall was the decrease in the stock value by 3.5% between 11 May and 18 May. However, no major fall was identified during this trading period.

Interpretation of candlesticks chart

The candlestick chart offers detailed insights into the trading pressures between the bulls and the bears. Before entering May 1998 the FTSE 100 Index had four days continuous advance, represented by four white candlesticks.

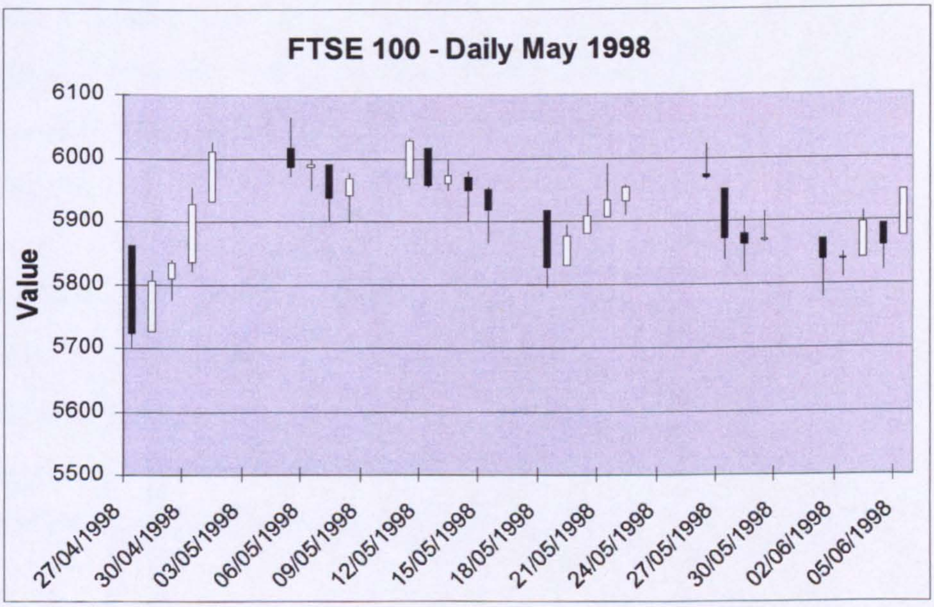


Figure 6.32 **FTSE 100 Performance – Daily, May 1998**

It can be seen that three out of these four white candlesticks have very a long real body, signalling that the buying pressure was very strong and that the bulls controlled the market. A long real body also indicated a big change in market value between opening and closing points. The FTSE 100 reached its highest point of 6064.6 on 5

May, but the bears pulled the prices down and it closed at 6017.6, where a inverted hammer was formed. This inverted hammer has a big real body and long upper shadow, signalling the end of upward movement and indicating that a potential bear market was approaching. This was confirmed by a hammer with a long lower shadow and a long black candlestick without upper shadow. This long black candlestick also formed a bearish harami with a subsequent white hammer. The long lower shadow indicated strong selling pressures.

In the next trading session the bulls tried to push prices up and the stock advanced but only for one day, represented by a long white candlestick on 11 May. The bears took control with strong selling pressures and forced the prices down, displayed by a long black candlestick without upper shadow. In the following trading sessions the market continued to open at lower points, and formed two hammers which have long lower shadows. The market continued to open lower and the bears brought prices to their lowest point 5794.5 and the fall ended with a very long black candlestick and strong selling pressure.

It surprised many that the market rose suddenly, without any signals that could be identified and the advance continued for four days, shown by four advanced white candlesticks. Among these white candles, the one appearing on 11 May, is an inverted hammer with a long upper shadow indicating the highest point of this trading session and bulls tried very hard to push prices even higher.

In the following week the market gapped up to open and the bulls continued to push prices higher but the bears forced the prices down and the market closed lower than its opening value, resulting in an inverted hammer with small real black real body and long upper shadow, on the 26 May. This inverted black hammer sent signals to investors that buying pressure was reducing and the advance came to the end. In the following trading session the market gapped down to open, and formed a very long black candlestick. This confirmed the fall of the market. The next day the index fell with heavy selling pressure and formed a hammer. An inverted hammer was formed in the following day and its real body is in the previous hammer's body, thus a harami position was also formed. This harami position should provide evidence that a new upward movement could appear. This was confirmed in the next trading session when a hammer appeared on 1 June 1998. The Market rallied after the end of May.

The relationship between the candlesticks and the market

Candlesticks provided signals to investors indicating the ups and downs of the stock market. But there remains the occasion when the market suddenly advanced without any indications explained by candlesticks. Thus a summary of the relationship between candlesticks and the market, for this month is as follows:

- Advanced white candlesticks indicated upward movement with strong buying pressure.
- A hammer, inverted hammer, and harami position at the top of that trend indicated the market condition was changing and helped to identify the falls.
- A hammer at bottom of the trend helped to identify an upward movement in the market.
- Long black candlesticks indicated strong selling pressure.
- But no indication was given that a sudden advance would occur. This happened twice in this period, and can be identified clearly in the first and third weeks of this month.

May 1999

Stock performance

The market experienced a period of considerable fluctuation and this was another tough time for investors. The market was generally falling and was in bears' control. There had been a rise at the end of previous month, and on 28 April the value of the stock was 6598.2.

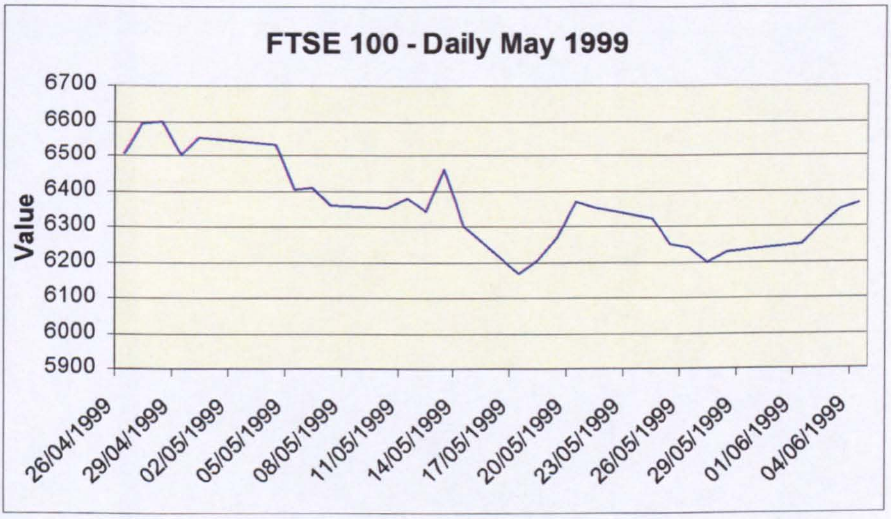


Figure 6.33 **FTSE 100 Performance – Daily, May 1999**

The FTSE 100 Index experienced a major fall of 7% from 6598.2 on 28 April to 6165.8 on 17 May. During this period the market presented two big drops. The first was from 6598.2 on 28 April to 6343.1 on 13 May, a decline of 4%. The second fall was a decline of 4.7% from 6456.6 on 13 May to 6165.8 on 17 May.

In the third week the market recovered for a few days and increased by 2.6% from 6202.6 on 18 May to 6368.3 on 20 May. Then at the end of this month the stock declined by 2.7% to 6199.5 on 27 May. It appeared to rally from 6226.2 after 28 May.

Major falls

The three falls in this month and were all significant and considered as big drops. One of these falls was defined as a major fall and as a whole, the decline in this period was 7% as shown in the above graph.

Interpretation of candlesticks chart

Candlestick charting for this month's stock performance shows that most candlesticks were black indicating a bear market in general. The black candlesticks provided evidence that the market had very strong selling pressure. The long black candlesticks represent significant changes between opening and closing values of each trading session. Even though bulls tried to push prices higher, the bears continued to bring prices down to close at lower than their opening value.

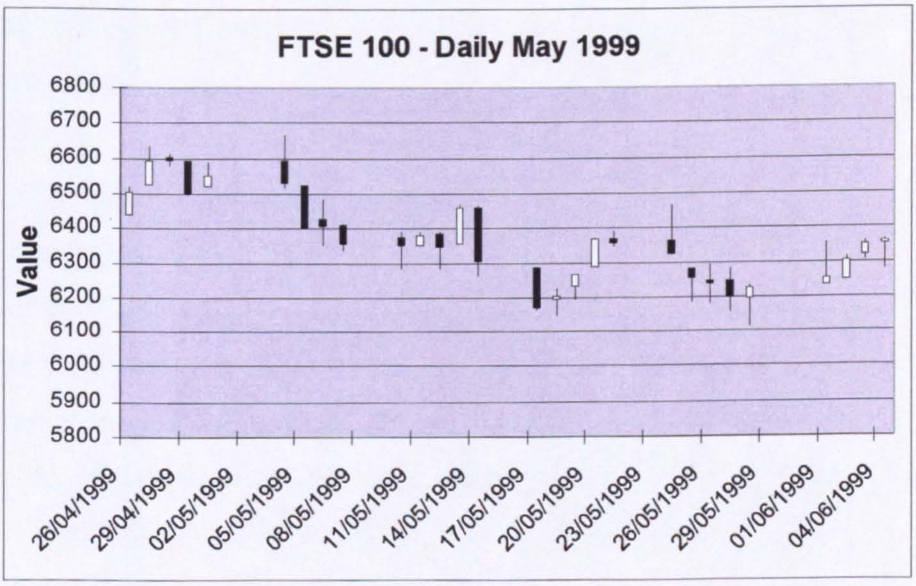


Figure 6.34 **FTSE 100 Performance – Daily, May 1999**

There was an upward movement at the end of April, shown by two advanced white candlesticks until a doji star appeared on 28 April, at 6598.2. This doji start appeared on the top of the rise sending signals to investors that the market condition was changing and that the upward trend would come to an end. The subsequent black marubozu candlesticks confirmed this and the market started its fall, eventually forming a bearish harami position.

On 4 May the market opened higher than the previous closing value, and the bulls tried to push the market higher, reaching a high point of 6663.8, but the strong selling pressure forced the prices down to close at 6527.4. The long upper shadow showed the highest price had been reached. On 5 May the stock gapped down to open and formed a long black marubozu, indicating considerable conflict between the bulls and the bears. Big changes in stock prices were noted between opening and closing values. The long black real body of this marubozu explains that selling pressure was very heavy and strong. On the following day the appearance of a spinning bottom reflected that selling pressure had reduced and the market condition was changing. This was confirmed by in the following sessions with two long leg hammers on 10 and 11 May. Then the bulls took control but only managed one session. Next day heavy selling pressure returned and formed a very long black candlestick, indicating that selling pressure remained strong.

In the third week the stock opened lower that its previous closing value. This brought a further reduction in the value of the market. But on Tuesday 18 May, a hammer with a white small real body was formed indicting that selling pressure was ending and a potential rally might be under way. This was confirmed the following day with an open-up white candlestick, then the stock showed a gapped up to open white marubozu with strong buying pressure. This upward movement ended on the last trading session of the week resulting in a spinning top forming on 21 May when the stock had a closing value at 6353.1.

In the last week of this month an inverted hammer formed on the first trading day, 24 May, with a very long upper shadow. This confirmed that buying pressure had come to an end and presaged the fall in the market. On 25 May the market had a big gap down to open and formed a perfect hammer. This brought a further reduction in the value of the stock. In the remaining sessions of this week a doji and spinning bottom were formed with a black real body indicating that the selling force had reduced and that the fall would come to an end. This was confirmed by the white hammer, which appeared on Friday 28 May. This white hammer has a very long lower shadow, indicating that the bears tried to push prices lower but the bulls had taken over control with stronger buying force. This also signalled a new rally was around the corner. This was confirmed on 1 June when a white inverted hammer was formed and the stock started a new up trend with white advanced candlesticks.

The relationship between the candlesticks and the market

Signals released by the candlestick charting identified all falls and provide insights into the behaviour of the market to investors.

- Spinning top, inverted hammers and harami positions, sent signals to help investors identify the falls.
- Hammers, spinning bottom and doji provided evidence identifying rises in prices.
- Long black marubozu and black candlesticks indicated selling pressure and margin of changes in stock values.
- White marubozu, and long candlesticks and advanced white candlesticks evidenced the rally with strong buying force to push prices higher.

__May 2000__

Stock performance

The FTSE 100 Index moved up and down with three falls and two advances in the month of the May 2000. Stock generally lost its value in the first three weeks then suddenly appreciated and developed a strong upward movement.

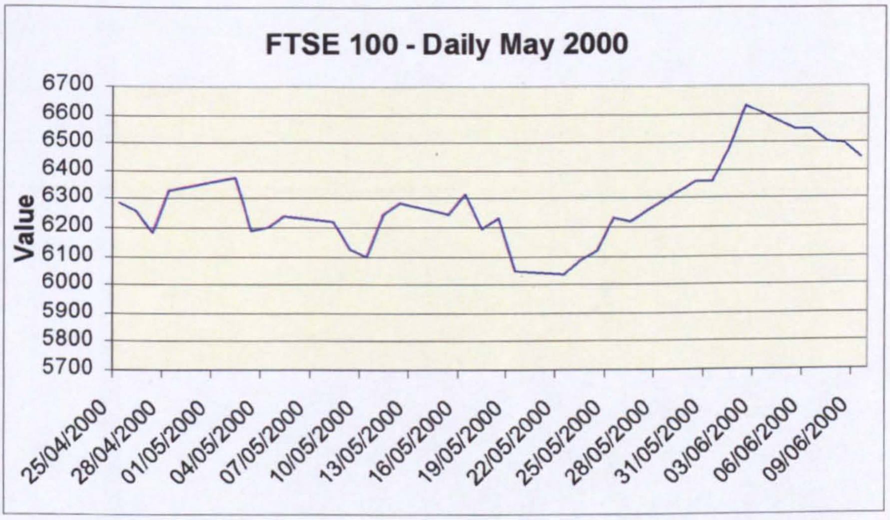


Figure 6.35 **FTSE 100 Performance – Daily, May 2000**

From above graph it can be seen that at the beginning of this month the FTSE 100 Index extended a previous bear market although there had been an advance at the end of April, reaching a high of 6,373. This month's falls started on 2 May. On 3 May it fell by 3% and there was a further 1.5% decline to a low of 6100.6 on 10 May. Then stock rose by 3.6% to reach 6318.4 on 16 May. Then once again, the stock plunged sharply by 4.7% and stopped at 6035.5 on 22 May. In the following two weeks, starting from 23 May the FTSE 100 Index advanced aggressively with a significant increase in its value, by 9.8%, to 6626.4 on 2 June, but then declined.

Major falls

The fall identified in the third week of this month was significant, with a decline of

4.7%. But the total decrease, calculated as 5.6%, was from 6373.4 on 2 May to 6035.5 on 22 May.

Interpretation of candlesticks chart

Candlestick charting showed that the bears and the bulls took charge of the market in turns. After a long white candlestick a spinning top was formed on 2 May, indicating that buying pressure was reduced and that the upward movement would come to an end. This was confirmed in the following session when a very long black candlestick appeared. This long black candlestick has no upper shadow and warned investors that selling pressure was very strong, resulting in a 3% fall within one trading session.

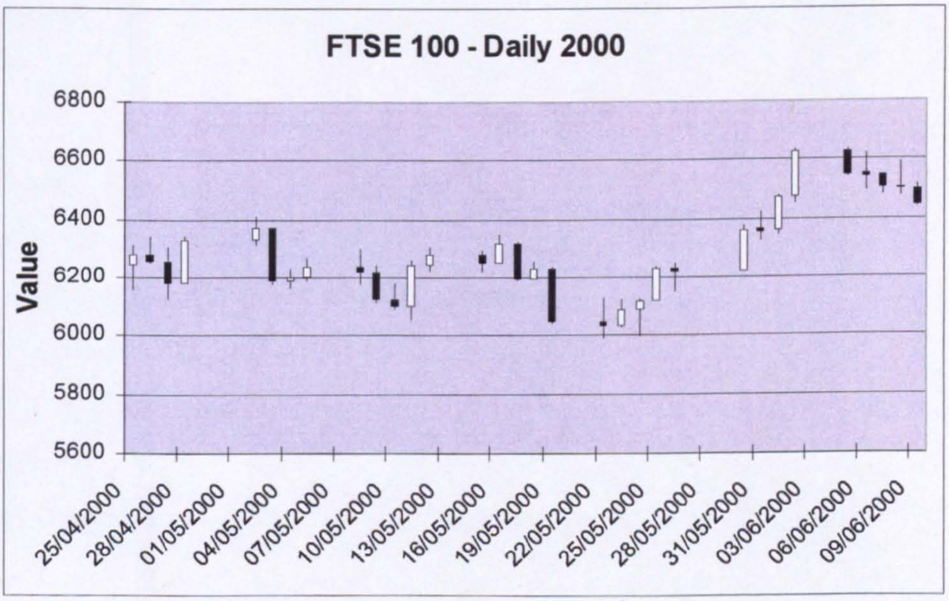


Figure 6.36 **FTSE 100 Performance – Daily, May 2000**

The market had a congestion period for three trading days with a doji and two spinning candlesticks and then it continued to decline and formed an inverted hammer on 10 May. This inverted hammer could be considered as a sign of a potential advance. The following day a very long white candlestick confirmed this and the stock increased by 3.6% to reach 6318.4 on 16 May. But, from 17 May, the market fell again with heavy selling pressure represented by two very long black candlesticks that appeared on 17 and 19 May until a doji was formed on22 May, indicating that the market condition was changing and a bull market could be just around the corner. This was immediately confirmed on the following two days with a white hammer, and a white candlestick that opened at higher than its previous closing value.

The market advanced with strong buying force, indicated by the opened up long white candles.

However the black hammer that appeared on 26 May should have been a sign of decline but the stock continued its upward trend. The three advanced white candlesticks showed strong buying pressure as the bulls pushed prices higher and higher.

The relationship between the candlesticks and the market

Candlesticks provided details about the selling and buying pressure.

- A spinning top indicated the falls of the market
- Long black and white candlesticks represent selling and buying pressures.
- The doji appeared on the top of the prior upward trend but failed to predict the fall.
- Doji and hammer at the bottom of a downward trend predicted the upward trend.

May 2001

Stock performance

There were three falls and three advances in this month of the May as stock was traded within a range from 5700 to 6000.

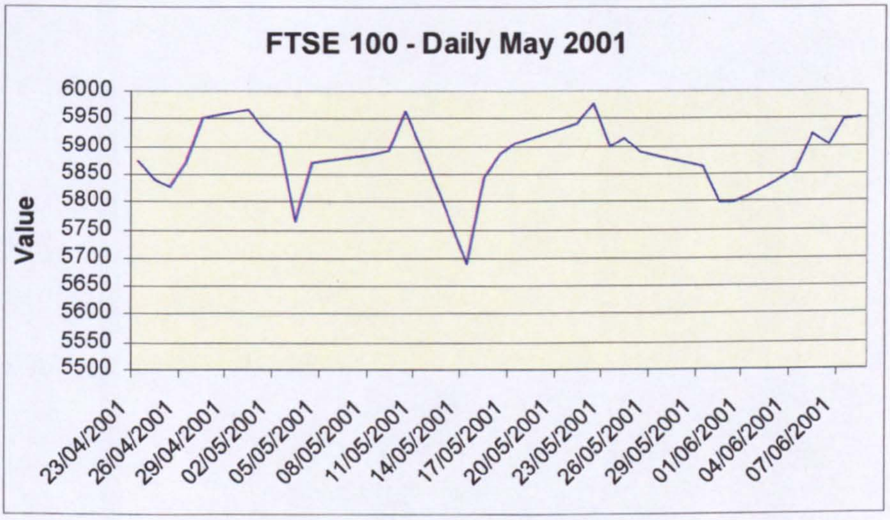


Figure 6.37 **FTSE 100 Performance – Daily, May 2001**

The above chart shows that both falls and advances were significant and could be easily identified. The bull market and bear market came in turns. The first fall was from 5966.9, on 30 April, to 5765.8 on 3 May, when the market declined by 3.5% within three trading sessions. The FTSE 100 Index rallied suddenly and moved back to a high of 5964 on 10 May.

The second fall was more dramatic and the market lost its value sharply by 4.8% within one trading session, on 14 May, then it moved up quickly to peak at 5976.6 on 22 May.

The third fall was from 5976.5 on 23 May to 5796.9 on 31 May with a loss of 3.1%.

The stock started a new rally on the 1st of June.

Major falls

Three falls happened in this month then could be considered as big falls but only one was defined as major fall, of 4.8%.

Interpretation of candlesticks chart

The following candlestick chart provides a interested story. After two days' advance on 30 April, a shooting star was formed on the top of a prior upward trend. A shooting star is a signal of reversal and also indicated that buying pressure was reduced and the market condition was changing. The black candlestick, in the following session, signalled the start of a bear market. Three black candlesticks continued to open lower and resulted in the formation of a very long black candlestick. This provides evidence that selling pressure was very strong as the bears pushed prices down.

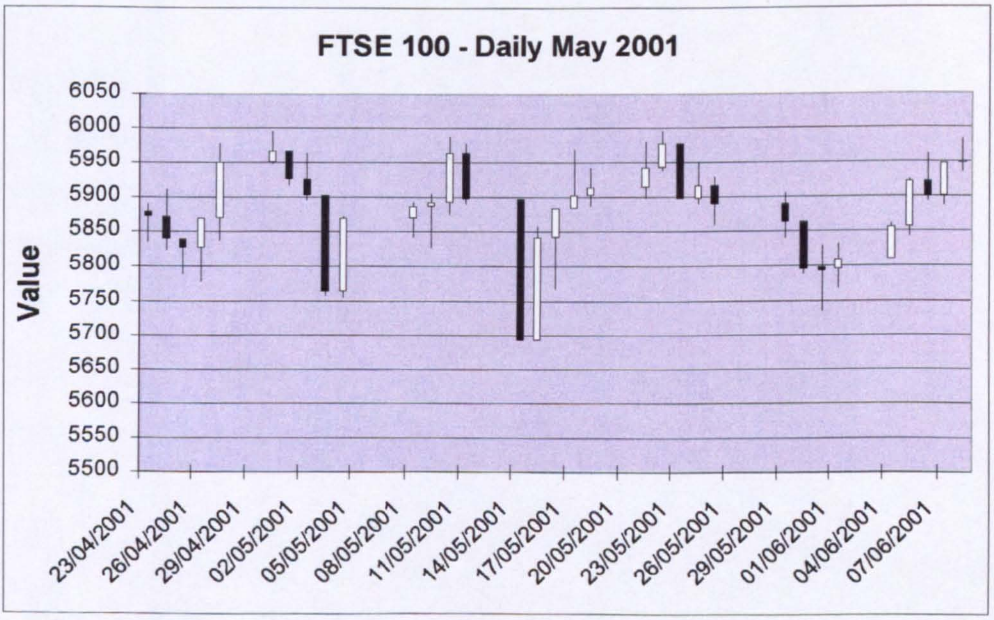


Figure 6.38 **FTSE 100 Performance – Daily, May 2001**

However the stock rose suddenly on 4 May without any indication identified and formed a long white candlestick. Then two hammers appeared on 7 and 8 May but are not meaningful as they were formed in the middle way of upward movement. The bulls pushed prices higher with strong buying pressure showed by a long white candle on 9 May. The next day the stock opened higher but the bears finally brought prices down and they closed lower than the opening value, resulting in a black candlestick.

The FTSE 100 Index continued to open lower on 14 May and the market declined by 4.8% with strong selling force demonstrated by an extremely long marubozu. Without any signal the stock again advanced strongly on 15 May, to reach the top of its trading range for the month, at about 6000. Again without any warning, the market moved down, stopping at 5796.1 on 31 May.

The relationship between the candlesticks and the market

These candlesticks are difficult to explain. There were two falls that were not predicted by candles.

- Long black and white candlesticks indicated the strong selling and buying pressures.
- A shooting star appeared at the top to identify a downward trend.
- There were no indicators to warn of major falls.

May 2002

Stock performance

During the first two weeks of May 2002 the trading range lay between 5100 and 5250. The FTSE 100 Index went up from 5125.5 on 1 May to 5203.1 on 3 May. Then the stock declined by 1.6%, stopping at 5119.9 on 7 May. Then it rose by 1.7% on 8 May and reached 5209. After a slight adjustment the stock advanced to reach its highest point of the month, at 5259.1, on 15 May.

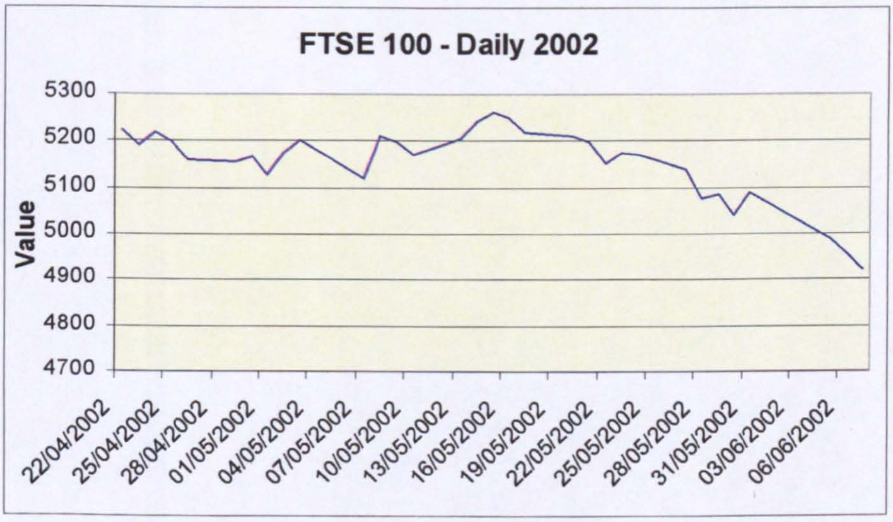


Figure 6.39 **FTSE 100 Performance – Daily, May 2002**

The graph next shows a bear market for the last two weeks of this month. The stock plunged from 5259.1 on 15 May to 5040.8 on 30 May, a 4.3% decline. The FTSE 100 Index continued to fall after 31 May.

Major falls

There three big falls in this month of the May. The fall in the last two weeks of this month was identified as a major fall with a 4.3% decline. The fall continued after May and a 6.8% decline was calculated.

Interpretation of candlesticks chart

Candlestick chart shows conflict between the bears and the bulls. After a decline, two small hammers were formed on 28 and 29 May indicating the market condition was changing. The stock rose for two days but formed a spinning candlestick which signalled that buying pressure had reduced. The stock opened higher but closed at 5119.9, resulting in a long black candlestick showing that selling pressure was very strong. In the next trading session the bulls pushed prices higher with strong buying pressure and formed a white marubozu. A small hammer and spinning candlesticks followed, indicating that the buying pressure had reduced.

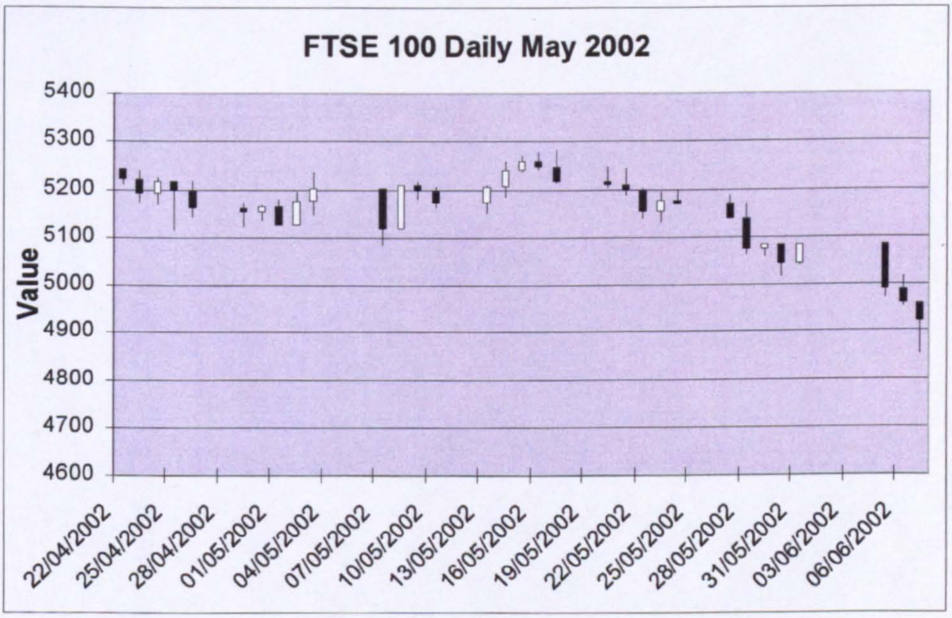


Figure 6.40 **FTSE 100 Performance – Daily, May 2002**

In the third week the market opened with three advanced white candles called 'Three Advanced Soldiers', showing that the buying pressure remained strong and produced a 1.7% increase in stock value. But two black shooting stars appeared. The first one signalled that the prior advance had come to an end while the second confirmed. The market began to crash with heavy selling on 15 May, opening lower and forming inverted hammers, shooting stars and long black candlesticks.

The relationship between the candlesticks and the market

Candlestick chart represents the market performance and sent signals to identify both upward and downward movement.

- Inverted hammer, shooting star appeared at the top, identifying a downward movement.
- Hammer at bottom of a down trend identified an upward movement.
- Three Advanced Soldiers, white long marubozu showed that the buying pressure was strong
- Long black and white candlesticks indicated strong selling and buying pressures.
- Shooting star and inverted hammer are indicators which identify the major fall.

May 2003

Stock performance

In general the month of May 2003 was a bull market. The FTSE 100 Index appeared to fluctuate indicating that the bulls were pushing prices up but the bears were fighting back trying to bring prices down.

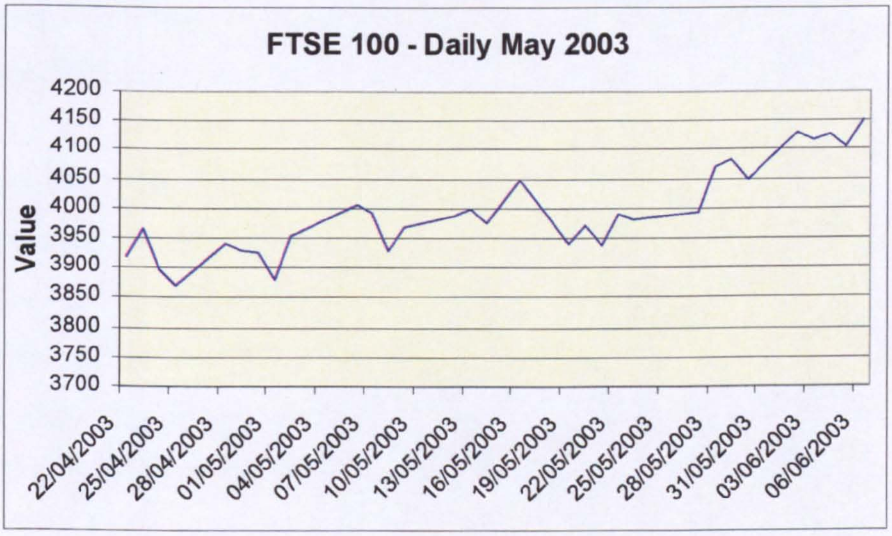


Figure 6.41 **FTSE 100 Performance – Daily, May 2003**

From the above graph it can be seen that the trend developed from its previous pattern. There were several falls but three obvious upward movements were accompanied by two obvious falls. The market advanced by 2.9% in value from 3880.1 on 1 May to 3992.9 on 7 May. Then the stock fell by 1.6% in one trading session and closed at 3928.9 on 8 May. Then the market rallied and saw an increase of 3.1% between 9 May and 16 May. After two advances, the stock then declined by 2.7%, from 4049 on 16 May to 3941.3 on 19 May. The market fluctuated on 20 and on 21 May then it rose gradually from 3963.4 on 21 May to 4083.6 on 29 May, resulting in a 3.6% increase in its value. The market fell on 31 May but the next day it returned to the prior upward trend and moved toward a new high.

Major falls

There two obvious falls in this month but neither was considered as a major fall.

Interpretation of candlesticks chart

Candlestick chart shows that the bullish and bearish were fighting each other but the market was under the bulls' control as more and more white candlesticks appeared, compared with black candlesticks. Also small candles formed in many trading sessions in this month, indicating small changes between the opening prices and the closing prices during that session.

After a long white candlestick formed on the 1 May, one inverted hammer and a doji star formed, indicating that the buying pressure was reducing and a decline would happen. The black candlestick which appeared on 4 May could be considered as confirmation of that decline but without warning the stock advanced suddenly in the following session, with strong buying pressure and formed a marubozu. This marubozu also formed an engulfing pattern with a previous black candlestick.

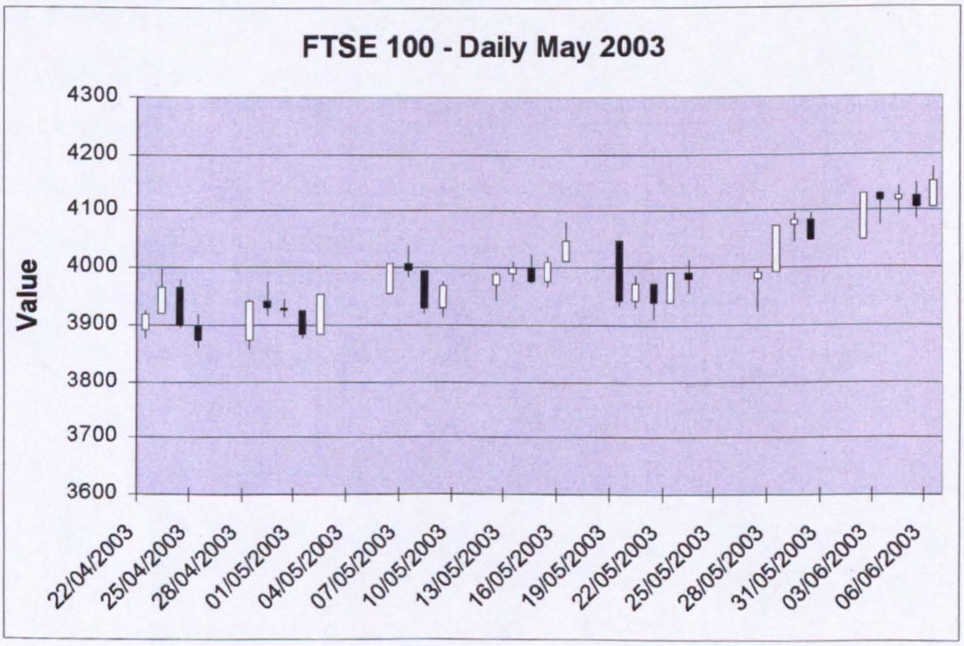


Figure 6.41 **FTSE 100 Performance – Daily, May 2003**

In the first trading session of the second week the bulls pushed prices higher and formed another white marubozu until an inverted hammer appeared on 7 May, indicating that buying pressure had reduced and the prior upward movement came to an end. On the next day 8 May, the market opened below its previous closing price and fell to close at 3928.9. But the bulls regained control on 9 May, forming a bullish harami together with the previous long black candlestick. The market continued to advance until a shooting star appeared on 16 May. This shooting star sent a signal to investors that the buying pressure had diminished.

On the first trading day of the fourth week the stock fell due to a heavy selling, and formed a very long black candlestick without upper shadow. But the next day the bulls again took over control again and the market moved on to a congestion period. A significant hammer with a white real body formed on 27 May, sending a signal to investors that the market would rally and this was confirmed in the following trading session, where a very long white marubozu was formed. The bulls pushed prices higher and developed a new upward trend.

The relationship between the candlesticks and the market

- Inverted hammer, shooting star appear at the top to identify a downward movement.
- Hammer at bottom of a down trend indicate an upward movement.
- White long marubozu shows that the buying pressure was strong.
- Long black and white candlesticks indicate strong selling and buying pressures.
- Shooting star and inverted hammer are indicators of a major fall.

May 2004

Stock performance

There had been a big fall before May 2004 which stopped on 30 April 2004. During the first trading session of May the FTSE 100 Index advanced by 1.8%, reaching the highest point of the month, at 4569.5, on 5 May. On the next day the market fell dramatically and lost 4% of its value and closing at 4395.2 on 10 May.

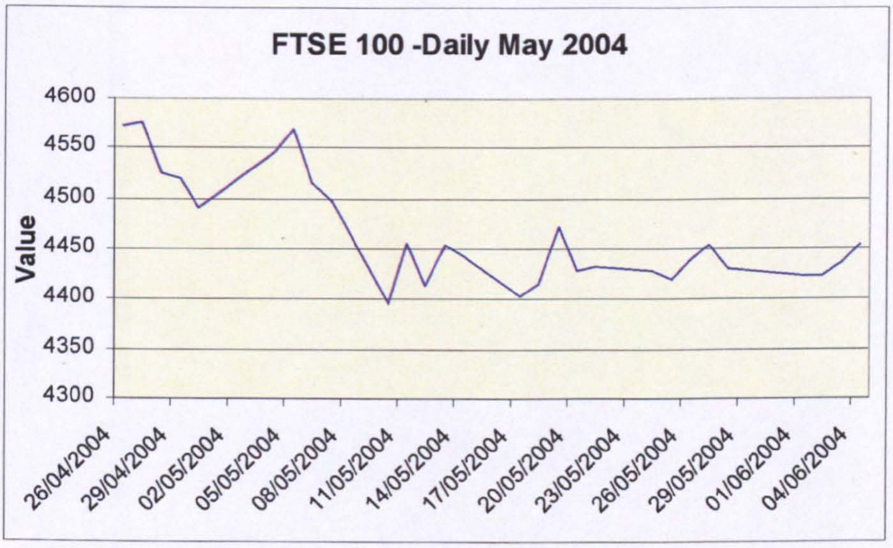


Figure 6.42 **FTSE 100 Performance – Daily, May 2004**

The above graph shows that after the sharp fall, the market moved into a horizontal pattern with a trading range between 4400 and 4570. There were small fluctuations but the changes in stock prices were about 1% each time.

Major falls

A major fall was identified which started at 4569.5 on 5 May, and fell to 4395.2 on 10 May. The market lost 10% of its value.

Interpretation of candlesticks chart

An inverted hammer and a hammer appeared at the top of the prior downward trend before May 2004, indicating the fall will occur. The doji formed on 29 April signalling that selling pressure was reduced and the market condition was changing. The bears pushed prices lower on 6 May. But the bulls regained control and the stock advanced for two trading days, with an increase in stock value of 1.8%. On 6 May a long black candlestick appeared and formed a dark cloud cover with the previous white candlestick, indicating the market condition was changing and a decline was on its way. This was confirmed by a hammer with black real body in the next session.

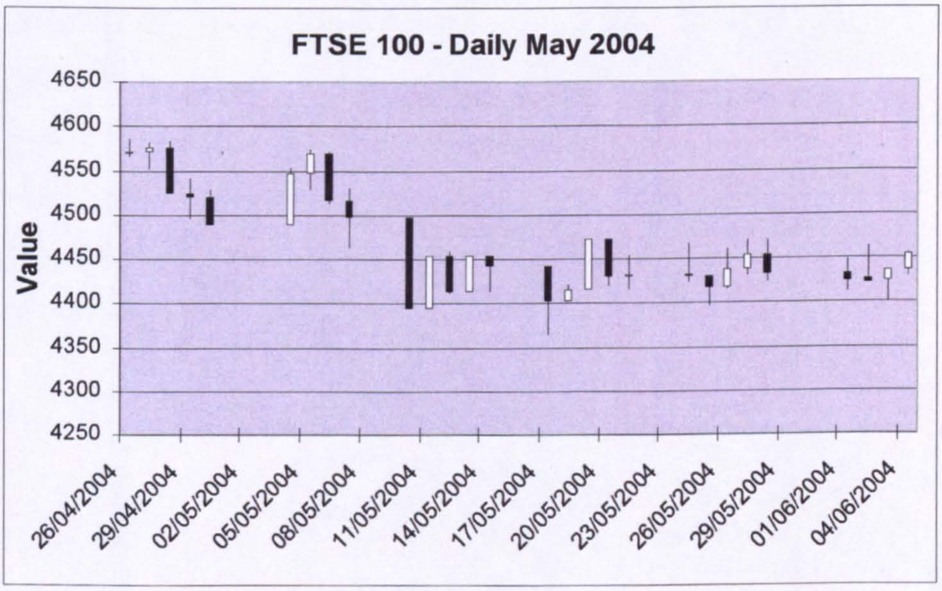


Figure 6.43 **FTSE 100 Performance – Daily, May 2004**

On 10 May the market opened at lower than the previous closing value and stock continued to decline, resulting in the formation of very long black marubozu. This showed investors that the selling force was very strong and the bears tried hard to push prices even lower. This caused a decline in the stock value at about 4% within three trading sessions. But without any indication the stock went up and formed a white marubozu. This white marubozu also formed a harami pattern with the previous black marubozu, showing investors that the selling pressures had come to an end and the bulls controlled the market.

The market then moved into a congestion band. Although many hammers, inverted hammer, doji, long leg doji, gravestone well formed, they were meaningless in the congestion period. The congestion developed after May 2004.

The relationship between the candlesticks and the market

- A white long marubozu shows that the buying pressure is strong and the long black marubozu indicates that selling force is strong.
- Long black and white candlesticks indicate the strong selling and buying pressures.
- Dark cloud cover and black hammer at the top of the rise indicate a major fall.
- A hammer at bottom of a downward trend identifies an upward movement.
- A bearish harami pattern indicated that the market condition was changing and that the decline would end.
- Hammers, inverted hammer, doji, long leg doji, gravestone all formed but were meaningless in the congestion period.

May 2005

Stock performance

The following graph shows that a bull market dominated May 2005. The upward movement was gradually developed with congestion Investors might have had a good trading time in this month.

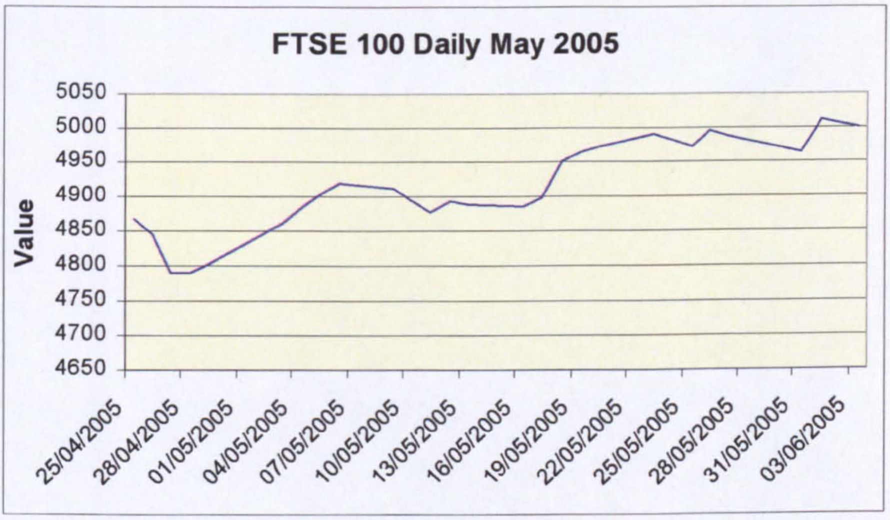


Figure 6.44 **FTSE 100 Performance – Daily, May 2005**

The FTSE 100 Index rose from 4790.2 on 28 April to 4918.9 on 6 May and the value of the stock increased by 2.7%. After that the stock fell slightly and moved into congestion until 16 May. It started a new rally, from 4884.2 on 17 May to 4994.9 on 26 May. The market declined slightly at the end of the May, but continued its rally after May 2005.

Major falls

No major falls occurred and only the only two falls were identified as slight adjustments.

Interpretation of candlesticks chart

Candlestick chart represents a bull market with detailed insights. After two spinning tops and a long black candlestick, a doji and a spinning bottom formed at the end of April, sending signals that the market was changing and a rally was under its way. On 3 May the market opened higher than its previous closing value and formed a long white candlestick which conformed the rally of the stock. The stock again opened higher in the following trading session and formed a candlestick pattern - "Three Advanced Soldiers". This pattern indicated the top of the prior trend and that the rally would come to an end.

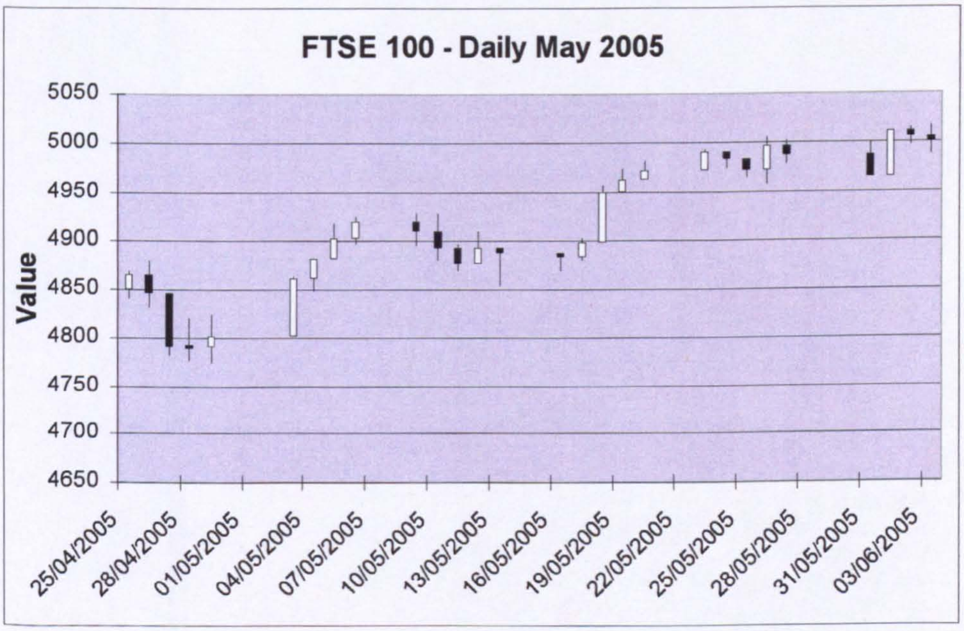


Figure 6.45 **FTSE 100 Performance – Daily, May 2005**

In the second week in the first trading session, a spinning top formed and the stock declined. It is clear from the chart that another spinning top appeared with a long upper shadow indicating that the bulls tried harder to push prices higher but the bears brought prices down to close at 4875. The market continued to open at lower until it formed a hammer. This was a reversal signal indicating that a new rally would appear.

In the third week the stock advanced steadily and this upward movement continued and formed an engulfing pattern on the last two trading days of May 2005.

The relationship between the candlesticks and the market

- White long marubozu shows that buying pressure is strong and long black marubozu indicates that selling pressure is also strong.
- Long black and white candlesticks indicate strong selling and buying pressures.
- Hammer at bottom of a down trend identifies an upward rally.
- Spinning top identifies a potential down trend and a bear market.

May 2006

Stock performance

The market conditions in this period appear to be similar to those that precipitated the "Black Monday" stock market crash of October 1987.

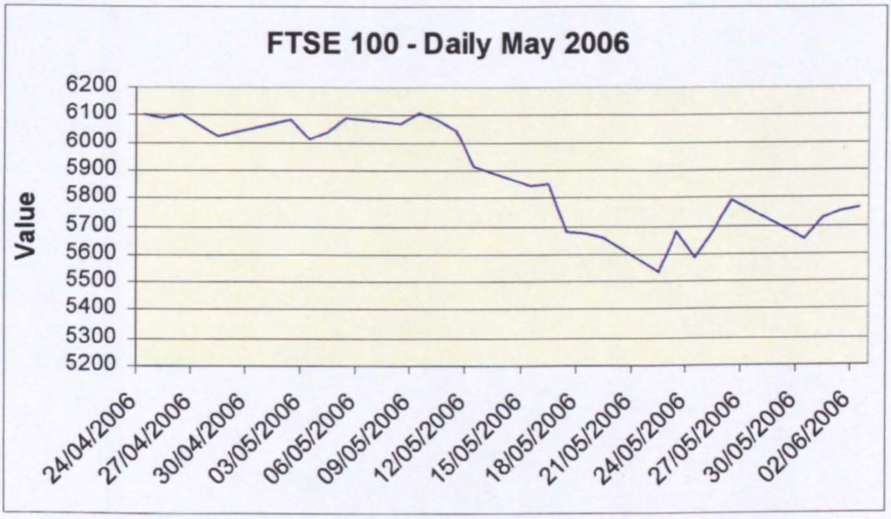


Figure 6.46 **FTSE 100 Performance – Daily, May 2006**

On 15th of May 2006, the FTSE 100 index finished lower by 70.8 at 5841.3, its weakest close since March 6. It had crashed 2.6 per cent in the opening hour, shedding as much as 156.7 points, to register its sharpest intraday fall since the London bombings, until a modest dollar rebound and a firmer tone on Wall Street helped gird buyers.

Since hitting a six-year closing high of 6132.7 just under a month before, in April 2006, the blue-chip measure tumbled by nearly 5%. Its latest two-day drop of 225 points -- the sharpest since September 2002 -- brought back memories of Black Monday, October 1987, when the FTSE's previous three-year bull run ended with a 20% drop within two sessions.

Major falls

There were four falls in May 2006. One of these four falls was identified as a stock market crash, which saw a 10% decrease in the stock market value.

Interpretation of candlesticks chart

The following chart represents that there was a congestion band from the last week of April until 12th of May, indicating that market was in a state of indecision. This congestion band also displays, the resistance level, at about 6130. The candle which appeared on 12 May is not significant, but then the index started to fall sharply, with a 10% decrease from 6130 to 5510 on 23rd May.

Three dojis can be identified on 17th, 19th, 20th May 2006 during the down trend. This shows that market was again in a state of indecision and the bears were still in control. All the signs are bearish continuation signals.

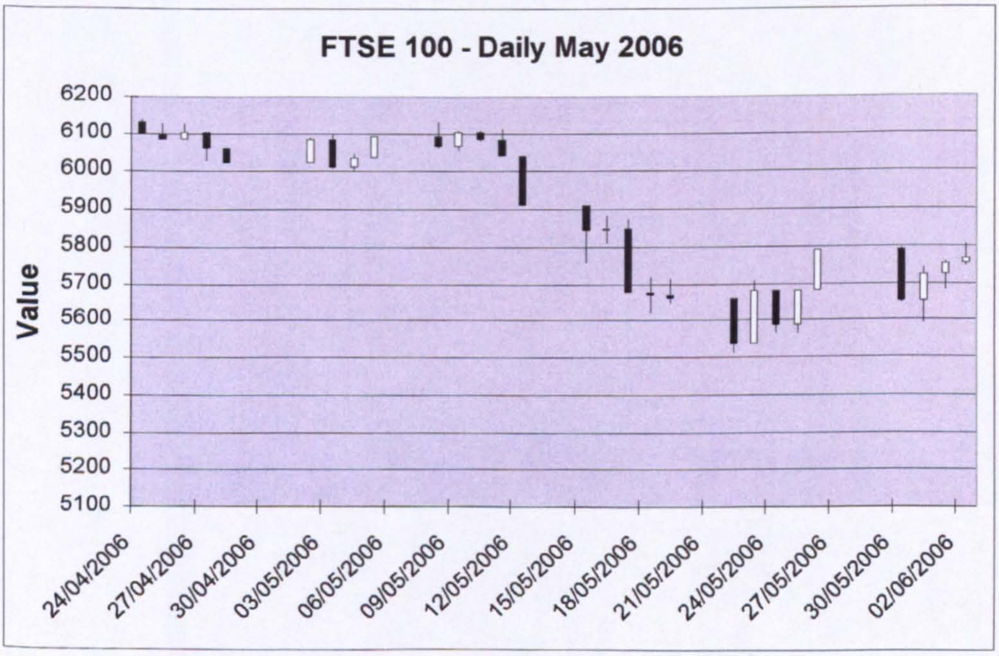


Figure 6.47 **FTSE 100 Performance – Daily, May 2006**

As no significant signals were sent by candlestick chart, prior to the major fall, investors, who studied the month's candlestick chart, would not be able to identify and predict the big crash.

The relationship between the candlesticks and the market

- White long marubozu and black long marubozu candlesticks show that buying or selling pressures were strong, and that big differences between opening and closing prices.
- Long black and white candlesticks indicate big differences between the opening and closing prices and also the strong selling and buying pressures.
- There are no clear candlesticks that identify or signal the market crash.

May 2007

Stock performance

There had been a fall at the end of April 2007, but the FTSE 100 Index suddenly advanced by 2.9%, from 6419.6 on 1 May to 6603.7 on 4 May 2007. Then the market fell by 1.2% and closed at 6524.1 on 10 May.

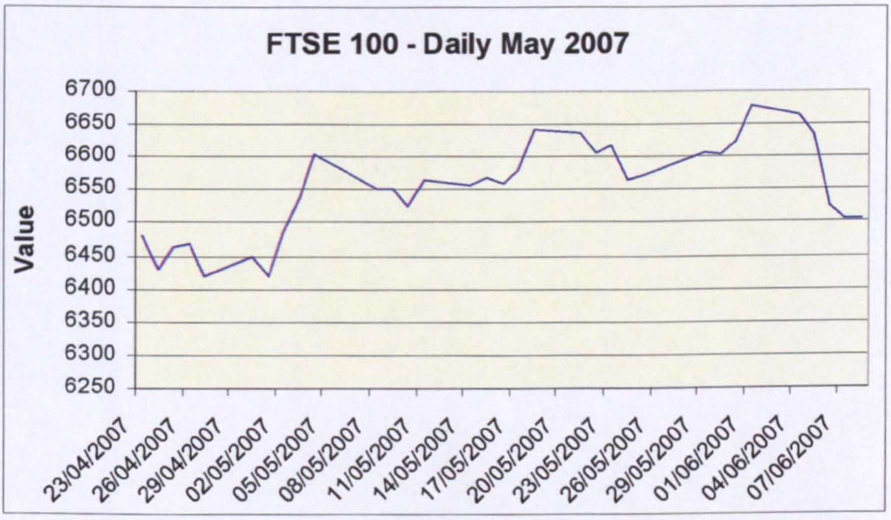


Figure 6.48 **FTSE 100 Performance – Daily, May 2007**

The market appeared to have a few days congestion from 11 May to 17 May when prices were stable and horizontally extended. Then it moved up by 1.8% to reach 6640.9 on 18 May. The market then declined by 1.1% from 6640.9 on 18 May to 6565.4 on 24 May.

At the end of May there was a short rally and the FTSE 100 advanced by 1.7% and reached 6676.7 on 1 June.

Major falls

There were two falls in May 2007 but neither was identified as a major fall.

Interpretation of candlesticks chart

The downward movement was clearly showed by two long black candlesticks. There two harami patterns formed before the sudden advance at the beginning of May 2007. These harami patterns are claimed to signal a rise in prices. In the first week of the trading session, the pattern of three advanced soldiers indicated that buying pressure was strong but also that the market might have peaked.

On the first trading day of the second week, a long black candlestick formed sending signals to investors that the selling pressure was strong and the bears controlled the market. But the next day a long leg doji appeared indicated that the selling pressure had reduced and the market condition was changing. On the 11 May there appears a hammer with white real body and long lower shadow, which indicated that the bears tried to bring prices down but the bulls had pushed prices higher. This sent a signal that an advance was on its way.

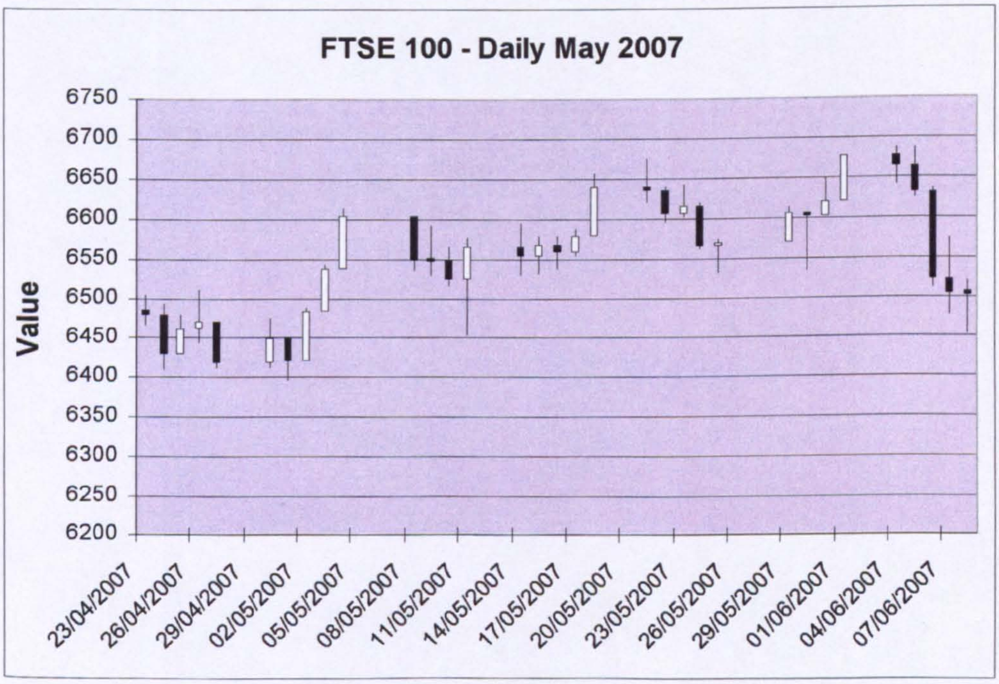


Figure 6.49 FTSE 100 Performance – Daily, May 2007

A doji formed on the first day of the fourth week. This doji appeared after a long white candlestick, indicating the end of the prior upward movement and this was confirmed immediately, on the following day by a black candlestick. The stock fell to 6570.5 where a hammer was formed.

In the next week the stock advanced. Then a hammer formed on the second trading day of this week, indicating that the bears had tried to push prices lower but had not been successful. The stock continued its advance and formed a marubozu at the top.

The stock was to fall, with heavy selling pressure after the end of May 2007.

The relationship between the candlesticks and the market

- Advanced three white soldiers indicate strong buying pressure and also an end to the upward trend.
- White long marubozu shows that buying pressure is strong
- Long black and white candlesticks indicate big differences between the opening and closing prices and as well as strong selling and buying pressures.
- Hammer at bottom of a down trend signals a new upward movement.
- Doji at the top of the up trend identifies the potential for a down trend and a bear market.

May 2008

Stock performance

The FTSE 100 Index appeared to have had an upward trend and a downward trend down trend in May 2008. The market had been stable but advanced suddenly on 2 May, from 6087.3 to close at 6215.2. The stock continued to rise when it opened in the following week on 6 May. Then it declined slightly and moved into a horizontal direction with stable prices just above 6200. The market started a new rally, from 6220.6 on 12 May to reach 6376.5, the highest point of the month, on 19 May.

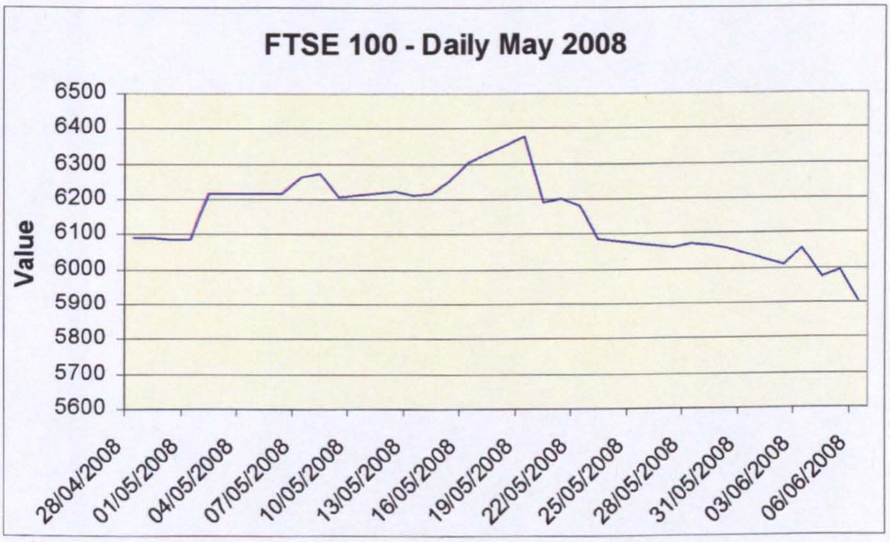


Figure 6.50 **FTSE 100 Performance – Daily, May 2008**

The FTSE 100 Index then fell sharply by 5.3% from 13 May and stopped at 6007.6 on 2 June. The market continued to fall after May 2008.

Major falls

There were only two falls in this month of the May, of which one was identified as a major fall starting on 13 May and stopping on the 2 June, with a 5.3% decline in the index value.

Interpretation of candlesticks chart

Before May 2008 there had been an inverted hammer, doji star, hammer, and spinning candlesticks, all indicating that the market condition was consolidated and little change between opening and closing prices. The stock suddenly advanced on 2 May and formed a long white candlestick without a lower shadow. The next week, although a hammer appeared after the long white candlestick, the stock continued to rise until a hammer with white real body appeared on 8 May indicating that the market condition was changing. Stock prices then fell in the following trading session.

In the second week, after a spinning bottom and two doji candlesticks had formed, there appeared an advanced three soldiers, sending signals that buying force had increased and but also that prices may have peaked. This was confirmed during the following trading session when a very long black marubozu formed. This was the point at which the stock market crashed, with a 5.3% decline in its market value.

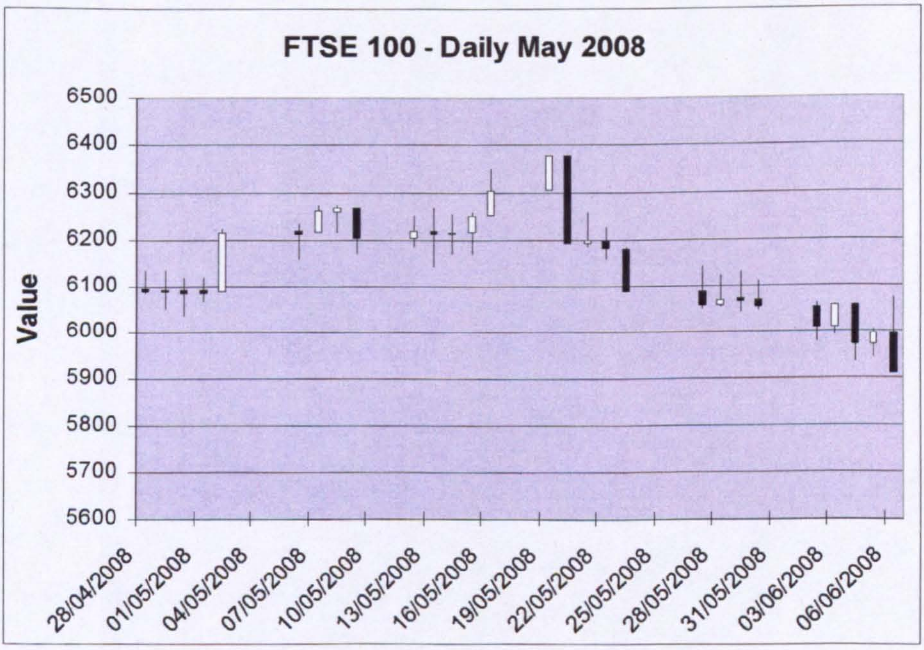


Figure 6.51 **FTSE 100 Performance – Daily, May 2008**

The stock continued its fall although many inverted hammers and spinning candlesticks formed. Long black candlesticks indicated that selling pressures were strong and the market was in the control of bears.

The relationship between the candlesticks and the market

- Long black and white candlesticks indicate big differences between the opening and closing prices, and also strong selling and buying pressures.
- Advanced three white soldiers indicate strong buying pressure, but also an end to the upward trend.
- A black long marubozu, shows that buying pressure is strong.
- Hammer at the top of upward trend identifies the start of a downward movement.
- Doji at the top of the upward trend identified the potential for a downward trend and a bear market.
- Inverted hammer, doji star, hammer, and spinning candlesticks form in congestion indicating that the market condition had consolidated with little change between opening and closing prices.

The above examination of the performance of the FTSE 100 Index for the given period shows that although candlestick charting sometimes works, most of the time it does not. But what about those people who are using candlestick charting? An understanding of why candlestick charting is used by some professionals can only be gained by interviewing them.

6.4 Interviews with financial professionals

Unstructured interviews have been carried out with a small number of financial professionals on the subject of candlesticks. The purpose of these interviews was not to determine how widespread the use of candlesticks was, but only to gain an insight into the attitudes of professionals towards them. It was found that only a small sample was required to reveal many interesting insights towards the use of candlesticks in practice.

It was difficult to find anyone who was willing to admit to using candlestick theory and although a broker was able to provide the names of dealers who had "dabbled" only five of them admitted it and later two others agreed to meetings away from their work premises. The broker himself offered some quite unique insights which will be shown later in Chapter 8. All of these meetings were face to face with the strict understanding that no recordings, apart from hand written notes, could be made and names were not to be mentioned. They shall therefore be referred to as Arthur, Bernard, Charles, Donald, Edward, Frank and George. All work or had worked as fund managers in the City of London. These interviews were conducted on 8th December 2008 (first 5 respondents) and 25th August 2009 (last two respondents).

All respondents were asked the following four main questions:

1. Where did you learn about candlestick theory?
2. Have you ever used it in your work?
3. What were the results?
4. Do you still use it?

Frank and George had many more insights than the others, because these two were most willing to discuss candlesticks. Both had worked in the same company in the City of London. They had both decided that they had had enough of the City and in particular commuting, and had decided to move out of London altogether. Both admitted that their moves had meant a drop in income but neither regretted the decision. (The writer acknowledges her debt to Mr. Matthew Chambers who agreed to conduct the interviews because the researcher was unable to attend a meeting.). Both remained in the financial services sector.

Details of views obtained from these interviews are presented in chapter 8.

6.5 Summary

In this chapter twenty five months of the stock market performance were analysed with the presentation of candlestick charting results to explain the relationship between the candlesticks and the stock market performance. The candlestick charts show reversals and provide early turning signals to investors. The frequently appeared and the most useful indicators are single candle lines. The candlestick charting appeared as magic signals to indicate the major falls and advances of stock market in the month of May for the given period from 1984 to 2008.

The performance of the FTSE 100 for 25 months of May has been taken as our base data. From this a representation of the base data in candlestick format has been concerted retrospectively. It is important to recognize that the candlestick representation has been done after the event rather than at the same time.

In a sense this means that the FTSE 100 Index is the independent variable as the candlestick chart is the dependent variable. This means that ideally there will be a perfect correlation between the two – but that is not quite true. Sometimes there are obvious inconsistencies that have been pointed out.

The problem is that this representation is back to front. To make candlestick-based predictions we have to treat the candlesticks data as the independent variable – that means we need to test the strength of candlestick predictive quality.

Chapter 7 Quantitative Evidence

An analysis of the relationship between candlesticks and the movements of stock prices

7.0 Introduction

Candlestick charting is commonly used to analyse stock market movements. People who apply this technique believe that candlesticks or candlestick patterns can unlock the future. Thus they believe that candlesticks and candlestick patterns have a close relationship with the movements of the stock market. My studies of candlestick charts for May of the FTSE 100 Index clearly show that some candlesticks and candlestick patterns do signal the upward and downward movements of the market. Does this indicate that candlesticks and candlestick patterns have particular relationship with these movements of the market? From the statistical point of view I have sought quantitative evidence to demonstrate the existence of this particular relationship.

In this chapter correlation analysis is used to investigate the possibility of a relationship between candlestick charts and the movements of the stock market, in order to quantify numerically the relationship between variables.

The study of candlestick charts has shown that some single candlesticks or candlestick patterns appear individually to indicate the upward or downward movements of stock prices. Thus simple correlation and regression analysis is carried out to analyse a relationship between candlesticks and the major falls /advances in May. As a result, only two variables are determined and they are the independent variable X, which denotes the candlestick or candlestick pattern, and dependent variable Y, which denotes the major falls or advances.

The relationship between the Total Falls in the FTSE 100 Index and the Total Number of candlestick indicators will be studied for each month of May over the period from 1984 to 2008. In addition, also for the month of May, the major falls in the FTSE 100 Index are studied in relation to particular Candlestick indicators. Similarly, the Total Advances in the FTSE 100 Index and their relationship to both the Total Number of candlestick indicators and, particular candlestick lines/patterns, have been examined for the given period from 1984 to 2008.

The presentation of correlation and regression analysis covers the graphical method (scatter diagram), and the calculation of summary statistics (Correlation and Statistical test of Correlation) for each of the relationships between candlesticks and the major falls /advances in each month of the May for the period from 1984 to 2008.

In interpreting these data coefficients of correlation have been used. Thus the crucial unit of data appears on a scale that runs from -1 to +1. The mid point, 0, indicates no correlation at all. However, beyond that point statistical proof of any relationship does not appear at 0.01 (+ or -). That a correlation might exist cannot be claimed unless a figure of 0.35 or more is achieved. The textbooks have minor differences over the value of the correlation coefficient which indicates a correlation with some choosing 0.355 while others maintain that any value below 0.395 is useless. In order to make this research as fair as statistically possible a value of 0.355 will be used as an indicator of some sort of a relationship.

The package SPSS16 was used to carry out the correlation and regression analysis. All the summary tables were produced using MS Excel 2003. The outputs of the SPSS calculations and graphs are presented in the Appendix.

7.1 The Relationship between Major Falls and Candlestick Signals

The FTSE 100 Index experienced 55 total falls in the 25 months of May from 1984 to 2008. Among these falls, 14 out 55 are major falls and crashes. The interpretation of signals released by candlestick charts shows that some candlesticks or candlestick patterns indicated these falls.

7.1.1 The correlation between Total May Falls and Total Number of candlestick Signals

Let X = Total Number of candlestick Signals and Y = Total Falls in May.

Scatter Diagram

The following scatter diagram shows that points are close to each other indicating that there has been some relationship between Total May Falls and Total Number of Signals.

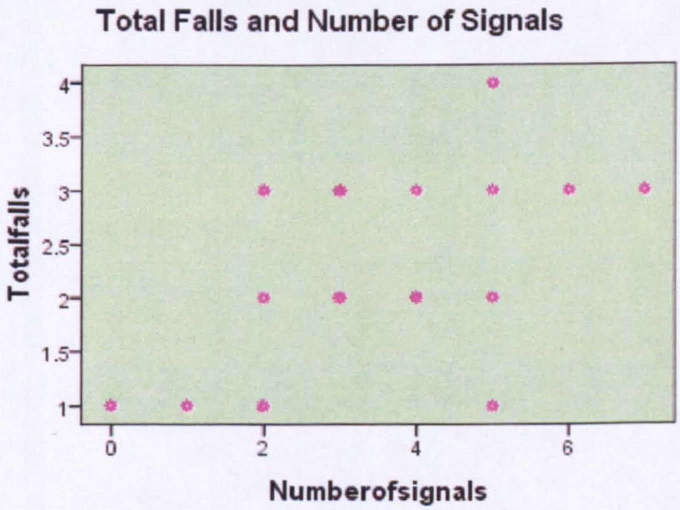


Figure 7.1. Relationship between total falls and candlestick signals

Correlation

Table 7.1. Correlation between total number of falls and total number of signals

		Total falls	Number of signals
Total falls	Pearson Correlation	1.000	.391*
	Sig. (1-tailed)		.027
	N	25	25
Number of signals	Pearson Correlation	.391*	1.000
	Sig. (1-tailed)	.027	
	N	25	25

From the above table it can be seen that the calculated value of r is 0.391 which indicates a positive relationship between the Total Number of May Falls and the Total Number of Signals. However, r = 0.391 indicates a very weak relationship between these variables.

The value of determination of coefficient r^2 is 0.153 which indicates that 15% of the changes in the Total Falls in May over the period from 1984 to 2008 can be explained by changes in the Total Number of Candlestick Signals, but it also indicates that 85% of the changes were due to other factors.

Statistical test of correlation

The OLS estimate b = 0.21875 and the 95% confidence interval for β is (-0.00315, 0.440651) which includes the value 0. This means that there is a possibility that $\beta = 0$.

Table 7.2 The regression of Number of Candlestick Signals on May Total Falls

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	1.45625	0.403077	3.612833	0.001463	0.622422	2.290078
X Variable 1	0.21875	0.107268	2.039282	0.053073	-0.00315	0.440651

From the above table it can be seen that the P-value of 0.053 is greater than 5%, indicating t is "small" and it could be concluded that β= 0. This means there is no correlation between the Total May Number of Falls and the Total Number of Signals.

This statistical analysis shows that changes in the total number of candlestick signals do not necessarily indicate changes in the total number of FTSE 100 market falls in the month of May, over the given period.

7.1.2 Correlation between Major Falls and Number of Candlestick Signals

If all the minor falls which occurred in May over the given period (1984 to 2008) are removed it is possible to analyse if there is any relationship between the remaining Major Falls and the Number of Candlestick Signals. Let the independent variable X = Number of Candlestick Signals and the dependent variable Y = Major Falls in the months of May.

Scatter Diagram

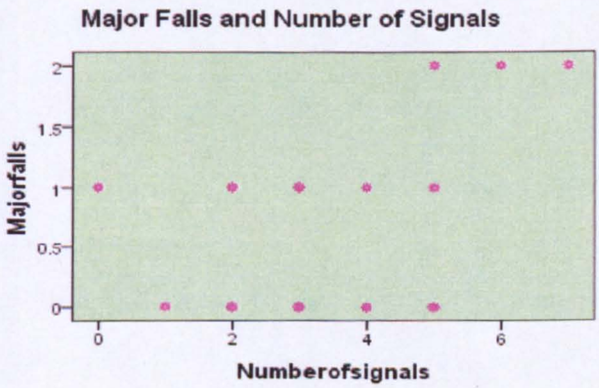


Figure 7.2 Relationship between total major falls and total number candlestick signals

The scatter diagram shows that there was some relationship between these two variables, as the points are close to each other, and to a certain extent, moved together in the same direction

Table 7.3 Correlation between total major falls and total number of signals

		Major falls	Number of signals
Major falls	Pearson Correlation	1.000	.373*
	Sig. (1-tailed)		.033
	N	25	25
Number of signals	Pearson Correlation	.373*	1.000
	Sig. (1-tailed)	.033	
	N	25	25

As in the case of the total falls, given above, the measurement of correlation is the value coefficient r which has been calculated as 0.373, indicating a weak positive relationship between Number of Candlestick Signals and the Major Falls in the months of May. However, as in the case of the total falls, the relationship is weak and therefore it is not really possible to claim that changes in total number of candlestick signals indicate subsequent changes in the number of major falls, in the period being studied.

The determination of coefficient r^2, in fact the figure is 0.139, indicating only 14% of the changes in major falls could be explained by changes in number of candlestick signals appearing in the months of May, 1984 - 2008.

Statistical test of correlation

The OLS estimate b = 0.1625 and the 95% confidence interval for β is (-0.01196, 0.336965) which includes the value 0. This means that there is a possibility that $\beta = 0$.

Table 7.4 The regression of Number of Candlestick Signals on Major Falls

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.0075	0.316911	0.023666	0.981323	-0.64808	0.66308
X Variable 1	0.1625	0.084337	1.926788	0.06645	-0.01196	0.336965

The P-value = 0.066 shown in the above table is greater than 5% indicating that t is "small" and it may be concluded that $\beta = 0$. This means there is no correlation between the Major Falls in May and the Total Number of candlestick Signals.

This statistical analysis indicates that changes in the total number of candlestick signals do not necessarily indicate changes in the total number of FTSE 100 market major falls in the month of May in the given period.

7.1.3 Correlation between May Major Falls and Particular Candlesticks

Doji and Doji Stars, Long Black Candlesticks, and Shooting Stars have been identified as the most frequently appearing candlesticks. It is therefore necessary to discover if there is any relationship between Major Falls and these candlesticks. Thus we shall treat individual candlesticks as the independent variables and Major Falls in May as the dependent variable.

Major Falls and Doji and Doji stars

Let the independent variable X = the number of Doji and Doji Stars and the dependent variable Y = the number of Major Falls.

Scatter diagram

The result of the testing the relationship between these two variables, shows that the points appear not to be close to each other. The calculation of $r^2 = 0.0008$, indicates that the

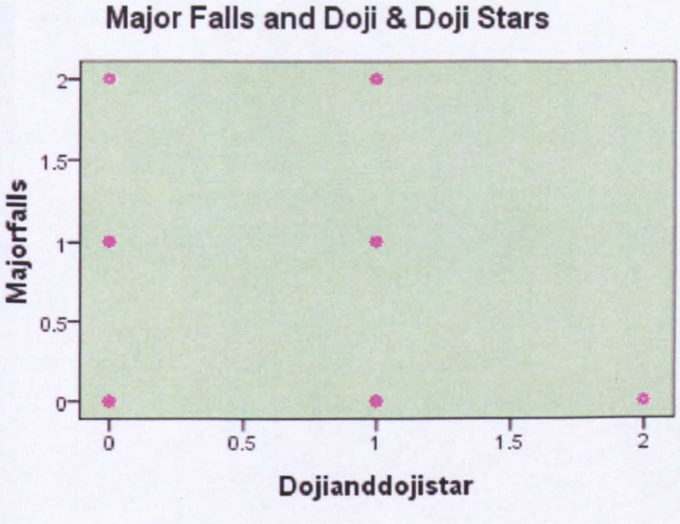


Figure 7.3 Relationship between major falls and doji

appearances of Doji and Doji Stars can not be not claimed to presage Major Falls of the stock market in the given period.

Correlation

Table 7.5 Correlation between total major falls and Doji & Doji Star

		Major falls	Doji and doji star
Major falls	Pearson Correlation	1.000	.028
	Sig. (1-tailed)		.447
	N	25	25
Doji and doji star	Pearson Correlation	.028	1.000
	Sig. (1-tailed)	.447	
	N	25	25

The summary statistic provides a value of coefficient R = 0.028 indicating a positive relationship but there is no linear relationship between Doji and Doji Stars and Major Falls of stock market in May in the given period and the appearance of Doji and Doji

Star candlesticks. The determination of coefficient r^2 is 0.01, indicating that changes the number of major falls can not be explained by changes in the appearances of Doji and Doji Star candlesticks. It can be concluded that there was no correlation between Major Falls of stock market and the appearance of Doji and Doji Star candlesticks.

Statistical test of correlation

The OLS estimate b = 0.034 and the 95% confidence interval for β is (-0.48981, 0.55771) which includes the value 0. This means that there is a possibility that $\beta = 0$.

Table 7.6 Regression of Doji & Doji Star on Major Falls

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.543689	0.18948	2.869376	0.008666	0.15172	0.935658
X Variable 1	0.033981	0.253203	0.134203	0.89441	-0.48981	0.557771

The P-value = 0.89441 given in the above table is greater than 5% indicating t is "small" and it may be concluded that $\beta = 0$. This means there is no correlation between the Major Falls in May and the Doji and Doji Star candlesticks.

This statistical analysis shows that the appearance of Doji &Doji Stars should not be used to indicate changes in the total number of the FTSE 100 market major falls.

Major Falls and Long Black Candlesticks

Scatter Diagram

The following scatter diagram shows that points are far away from each other indicating that there is no correlation between Major Falls and Long Black Candlesticks.

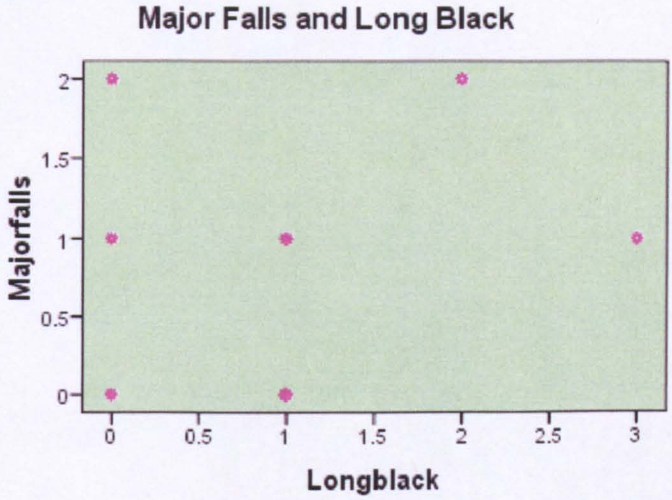


Figure 7.4 Relationship between major falls and long black candlestick

The calculated value of r = 0.02913 which indicates no relationship between Major Falls and Long Black Candlesticks.

Correlation

Table 7.7 Correlation between total major falls and long black candlestick

		Major falls	Long black
Major falls	Pearson Correlation	1.000	.029
	Sig. (1-tailed)		.445
	N	25	25
Long black	Pearson Correlation	.029	1.000
	Sig. (1-tailed)	.445	
	N	25	25

The determination of the coefficient $r^2 = 0.001$ makes clear that the fact that the occurrence of Major Falls is not influenced by the appearance of Long Black Candlesticks and therefore there is no correlation between these variables.

Statistical test of correlation

The OLS estimate b = 0.029 and the 95% confidence interval for β is (-0.39558, 0.452903) which includes the value 0. This means that there is a possibility that β= 0.

Table 7.8 Regression of Long Black Candlestick on Major Falls

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.538217	0.213126	2.525349	0.018905	0.097333	0.9791
X Variable 1	0.028662	0.20508	0.139762	0.890065	-0.39558	0.452903

From the above table it can be seen the P-value = 0.890 is greater than 5% indicating t is "small" and it may be concluded that β= 0. This means there is no correlation between the Major Falls in May and the Long Black candlestick Signals.

This analysis shows that the appearance of a Long Black Candlesticks do not necessarily indicate changes in the total number of FTSE 100 market major falls in the period being studied.

Major Falls and Spinning Top

Let the independent variable X = Spinning Top and the dependent variable Y = the number of Major Falls. A test of the relationship between these variables was carried out using the scatter diagram.

Scatter diagram

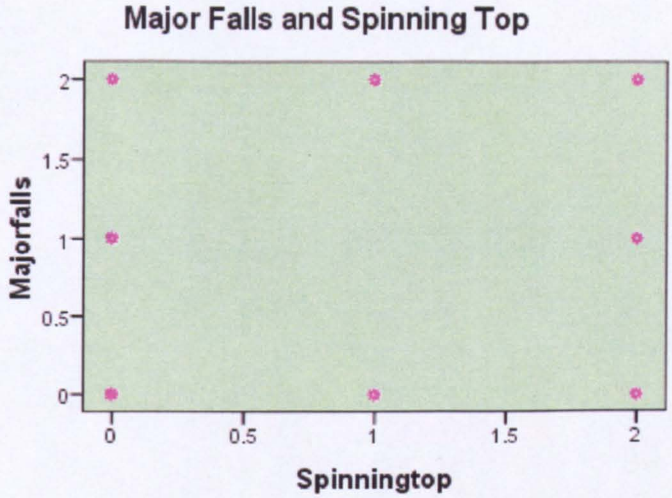


Figure 7.5 Relationship between major falls and spring top

The above scatter diagram indicates that there is no correlation exists between Major Falls and Spinning Top candlesticks.

Correlation

Table 7.9 Correlation between total major falls and Spinning Top

		Major falls	Spinning top
Major falls	Pearson Correlation	1.000	.298
	Sig. (1-tailed)		.074
	N	25	25
Spinning top	Pearson Correlation	.298	1.000
	Sig. (1-tailed)	.074	
	N	25	25

Summary statistics have been calculated as r = 0.298 indicating a minute positive relationship between Major Falls and Spinning Top candlestick. But $r^2 = 0.089$ only supports the view that only 9% of major falls of the stock market in May in the given period could be explained by the signal of a spinning top before the falls occurred.

Statistical test of correlation

The OLS estimate b = 0.307 and the 95% confidence interval for β is (-0.11675, 0.732137) which includes the value 0. This means that there is a possibility that $\beta = 0$.

Table 7.10 Regression of Spinning Top on Major Falls

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.461538	0.153542	3.005946	0.006302	0.143913	0.779164
X Variable 1	0.307692	0.205179	1.49963	0.147313	-0.11675	0.732137

From the above table it can be seen that the P-value = 0.147313 is greater than 5%, indicating t is "small", and it can be concluded that $\beta = 0$. This means there is no correlation between the Major Falls in May and the appearance of Spinning Top Signals.

This statistical analysis thus shows that the occurrence of a Spinning Top does not necessarily indicate changes in the total number of FTSE 100 market major falls, in the months of May, in the study period.

Major Falls and Shooting Stars

Let the independent variable X = Shooting Stars and the dependent variable Y = the number of Major Falls. The scatter diagram is used to test the relationship between these variables.

Scatter diagram

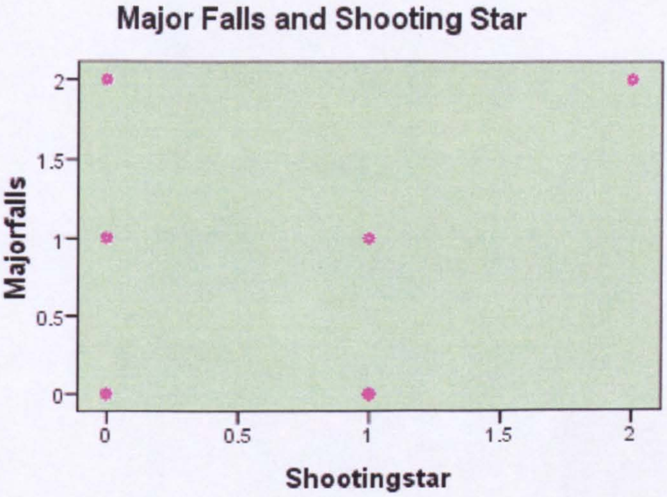


Figure 7.6 Relationship between major falls and shooting stars

The scatter diagram shows that points stay independently, indicating that there is no relationship between major falls of the FTSE100 Index and the shooting star candlesticks.

Correlation

Table 7.11 Correlation between total major falls and Shooting Star

		Major falls	Shooting star
Major falls	Pearson Correlation	1.000	-.004
	Sig. (1-tailed)		.492
	N	25	25
Shooting star	Pearson Correlation	-.004	1.000
	Sig. (1-tailed)	.492	
	N	25	25

The correlation coefficient was calculated as R = 0.004 which indicates that there is no correlation between these two variables.

Statistical test of correlation

The OLS estimate b = -0.00515 and the 95% confidence interval for β is (-0.54511, 0.5348) which includes the value 0. This means that there is a possibility that $\beta = 0$.

Table 7.12 Regression of Shooting Star on Major Falls

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.561856	0.173139	3.245115	0.003571	0.203691	0.920021
X Variable 1	-0.00515	0.261017	-0.01975	0.984414	-0.54511	0.5348

From above table it can be seen that the P-value = 0.984414 is greater than 5%, indicating t is "small", and it can be concluded that $\beta = 0$. This means there is no correlation between the Major Falls in May and the Shooting Star as trading information signals.

This statistical analysis shows that the appearance of a Shooting Star does not necessarily indicate changes in the total number of FTSE 100 market major falls, in the month of May, in the given period.

7.1.4 The correlation between Major Falls and Candlestick Patterns

The relationships between major falls of stock prices in May and candlestick patterns have been investigated. These candlesticks were most frequently appeared and indicated the falls of the FTSE 100 Index in May each year from 1984 to 2008.

Major Falls and Dark Cloud Cover

Let the independent variable X = Dark Cloud Cover and the dependent variable Y = the number of Major Falls.

Scatter diagram

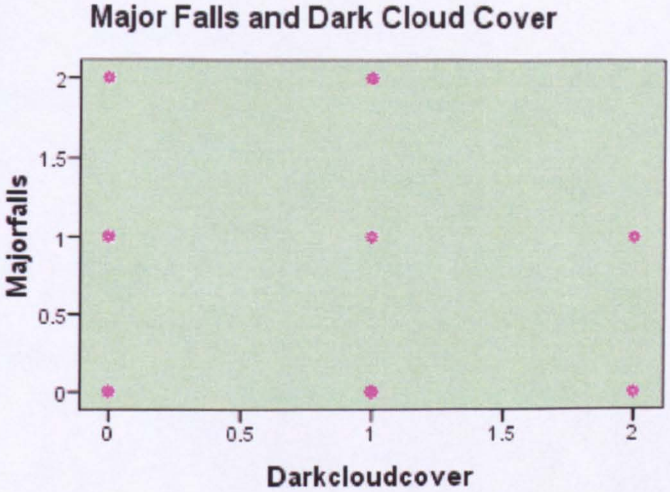


Figure 7.7 Relationship between major falls and dark cloud cover

The scatter diagram indicates that the relationship between Major Falls of the FTSE100 Index and Dark Cloud Cover candlesticks is not linear.

Correlation

Table 7.13 Correlation between total major falls and Dark Cloud Cover

		Major falls	Dark cloud cover
Major falls	Pearson Correlation	1.000	.025
	Sig. (1-tailed)		.453
	N	25	25
Dark cloud cover	Pearson Correlation	.025	1.000
	Sig. (1-tailed)	.453	
	N	25	25

The measurement of the correlation is r = 0.025, indicating a slight possible relationship. However the determination of a correlation $R^2 = 0.001$, makes it evident that there is no correlation between Major Falls in the FTSE100 Index and Dark

Cloud Cover candlesticks.

Statistical test of correlation

The OLS estimate b = 0.027 and the 95% confidence interval for β is (-0.44256, 0.497243) which includes the value 0. This means that there is a possibility that β = 0.

Table 7.14 Regression of Dark Cloud Cover on Major Falls

	Coefficients	Stand error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.546875	0.181721	3.009414	0.006251	0.170956	0.922794
X Variable 1	0.027344	0.227152	0.120377	0.90523	-0.44256	0.497243

From above table it can be seen the P-value = 0.90523 is greater than 5%, indicating t is "small", and it may be concluded that β= 0. This means there is no correlation between Major Falls in May and Dark Cloud Cover indicators.

This statistical analysis shows that changes in the appearance of Dark Cloud Cover do not necessarily indicate changes in the total number of FTSE 100 market major falls in the month of May in the given period.

Major Falls and Three Black Crows

Let the independent variable X = Three Black Crows and the dependent variable Y = the number of Major Falls.

Scatter diagram

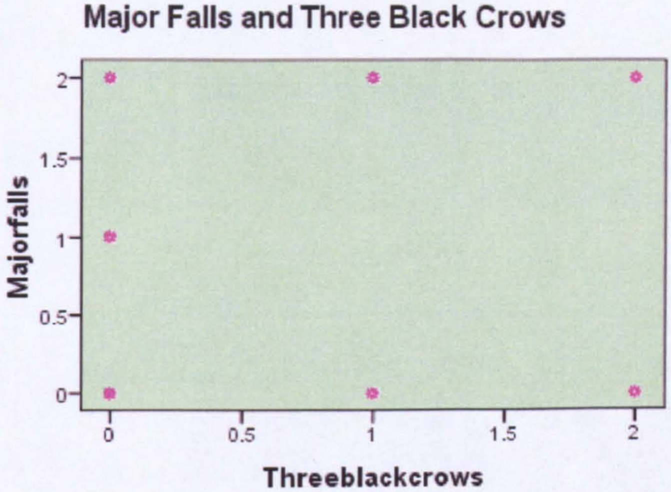


Figure 7.8 Relationship between major falls and three black crows

The scatter diagram shows that major falls and three black crows have some relationship but it does not appear to be linear.

Correlation

Table 7.15 Correlation between total major falls and Three Black Crows

		Major falls	Three black crows
Major falls	Pearson Correlation	1.000	.259
	Sig. (1-tailed)		.106
	N	25	25
Three black crows	Pearson Correlation	.259	1.000
	Sig. (1-tailed)	.106	
	N	25	25

The measurement of coefficient $r = 0.259$ indicates a slight possible positive relationship between these two variables. However the determination of a correlation $r^2 = 0.0669$, provides the evidence that only 7% of changes in the number of major falls in May in the given period can not be explained by changes in the number of appearances of three black crows.

We must therefore conclude that any correlation that might exist between these two variables is clearly very weak.

Statistical test of correlation

The OLS estimate b = 0.308 and the 95% confidence interval for β is (-0.18819, 0.80501) which includes the value 0. This means that there is a possibility that $\beta = 0$.

Table 7.16 Regression of Three Black Crows on Major Falls

	Coefficients	Stand error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.485981	0.151826	3.200906	0.00397	0.171905	0.800058
X Variable 1	0.308411	0.240058	1.284735	0.211674	-0.18819	0.80501

From the above table it can be seen that the P-value of 0.211674 is greater than 5%, indicating t is "small" and it may be concluded that $\beta = 0$. This means that there is no correlation between the Major Falls in May and Three Black Crows candlesticks pattern.

This statistical analysis shows that changes in the appearance of Three Black Crows is unlikely to indicate that changes in the total number of FTSE 100 market major falls in the month of May, in the study period.

7.2 The relationship between Major Advances and Candlesticks

7.2.1 Total May Advances and Total Number of Candlestick Signals

Let X = Total Number of Candlestick Signals and Y = Total May Advances, the relationship between these two variables can be evaluated as follows:

Scatter diagram

The scatter diagram suggests that there is some kind of relationship between the variables, as the points appear to be close to each other.

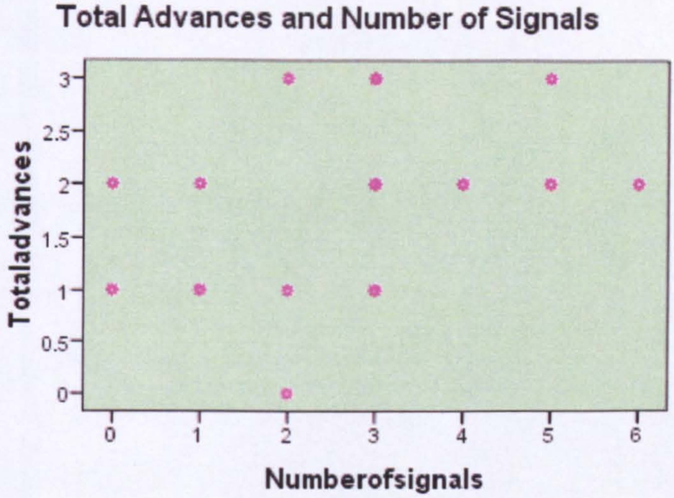


Figure 7.9 Relationship between total advances and candlestick signals

Correlation

Table 7.17 Correlation between total number of advances and number of signals

		Total advances	Number of signals
Total advances	Pearson Correlation	1.000	.408*
	Sig. (1-tailed)		.021
	N	25	25
Number of signals	Pearson Correlation	.408*	1.000
	Sig. (1-tailed)	.021	
	N	25	25

The calculated value of coefficient r is 0.408, indicates a positive correlation but it is weak.

The value of the determination of coefficient r^2 is 0.167. This indicates that 17% of the changes in the total number of Major Falls could be explained by the changes in the Total Number of Candlestick Signals.

Statistical test of correlation

The OLS estimate b = 0.194118 and the 95% confidence interval for β is (0.006991, 0.381244) which does not include the value 0.

Table 7.18 Regression of Total Number of Candlestick Signals on Total Number of Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	1.296471	0.293954	4.410461	0.000202	0.688381	1.90456
X Variable 1	0.194118	0.090458	2.145944	0.042661	0.006991	0.381244

From above table it can be seen the P-value = 0.42661 is less than 5% indicating t is "large" and it could be concluded that β≠ 0. This means that there is a correlation between the Major Advances in May and the Total Number of Candlestick Signals. (Which is one of the best results obtained in this research, but it is still only a 4 in 10 chance.)

This statistical analysis shows that changes in the appearance of Total Number of Candlestick Signals could indicate changes in the total number of FTSE 100 market Total Advances in the month of May in the given period.

7.2.2 Major Advances and Total Number of Signals

If all the minor advances that occurred in May, over the given period from 1984 to 2008, are removed it is possible to analyse the relationship between the remaining Major Advances and the Number of Candlestick Signals. Let the independent variable X = Total Number of Candlestick Signals and the dependent variable Y = Major Advances in the months of May.

Scatter diagram

Looking at the following scatter diagram plotted for the variables, shows that the points move in different directions. This shows it is unlikely these two variables have a relationship.

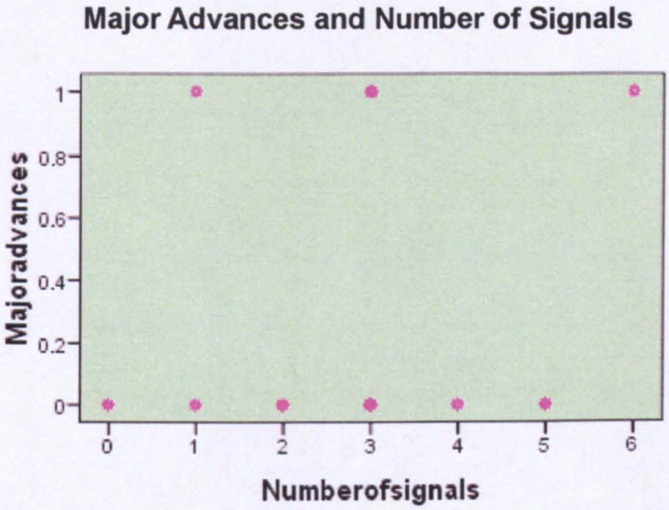


Figure 7.10 Relationship between Major advance and total number of signals

Correlation

Table 7.19 Correlation between total major advances and total number of signals

		Number of signals	Major advances
Number of signals	Pearson Correlation	1.000	.125
	Sig. (1-tailed)		.276
	N	25	25
Major advances	Pearson Correlation	.125	1.000
	Sig. (1-tailed)	.276	
	N	25	25

The calculated the coefficient is 0.125, indicating a marginal positive relationship, but this is likely a very weak relationship between variables. The value of determination of coefficient r^2 is 0.016. This indicates only about 2% possibility that changes in Major Advances were due to changes in the Total Number of Candlestick Signals.

Statistical test of correlation

The OLS estimate b = 0.032353 and the 95% confidence interval for β is (-0.07847, 0.143178) which includes the value 0. This means that there is possibility that $\beta = 0$.

Table 7.20 Regression of Total Number of Candlestick Signals on Major Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.149412	0.174092	0.858232	0.39962	-0.21073	0.509549
X Variable 1	0.032353	0.053573	0.603901	0.55182	-0.07847	0.143178

From above table it can be seen the P-value = 0.55182 is greater than 5% indicating t is "small" and it could be concluded that $\beta = 0$. This means there is no correlation between the incidence of the Major Advances in May and the Total Number of Candlestick Signals..

This statistical analysis shows that changes in the appearance of the Total Number of Candlestick Signals do not necessarily indicate changes in the total number of FTSE 100 market Major Advances in the month of May, in the given period.

7.2.3. Major Advances and Particular Candlesticks

Major Advances and Doji and Doji Stars

Now we test the independent variable X, Doji and Doji Star, has any relationship to the dependent variable Y = the number of Major Advances. It is necessary to test the relationship between the major advances in the month of May and the candlestick indicators, Doji.

Scatter diagram

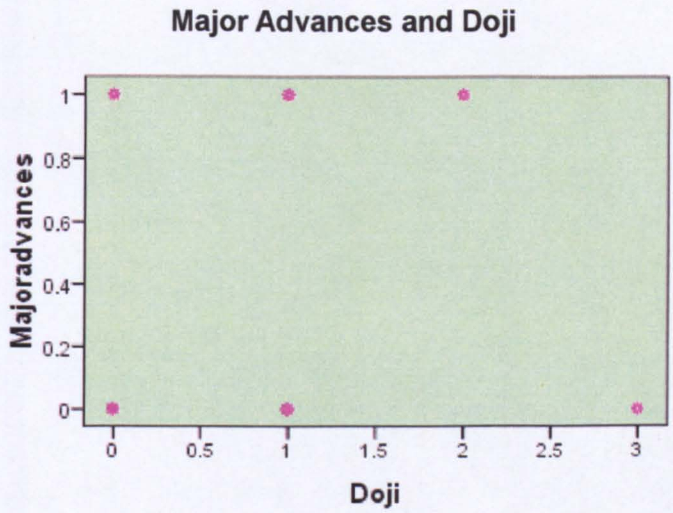


Figure 7.11 Relationship between major advances and doji

The above scatter diagram shows that points are not close to each other, indicating that there is no linear relationship between these two variables.

Correlation

Table 7.21 Correlation between major advances and Doji

		Major advances	Doji
Major advances	Pearson Correlation	1.000	.335
	Sig. (1-tailed)		.051
	N	25	25
Doji	Pearson Correlation	.335	1.000
	Sig. (1-tailed)	.051	
	N	25	25

The coefficient r = 0.335 indicates a possible positive relationship between two variables. But the determination of coefficient r^2 is o.112 meaning that 11% of changes in the number of major advances can be explained by changes in the appearances of Doji. It also indicates that 89% of changes in the number of major advances can be explained by the other factors.

Statistic test of correlation

The OLS estimate b = 0.17734 and the 95% confidence interval for β is (-0.03805, 0.392727) which includes the value 0. This means that there is possibility that $\beta = 0$.

Table 7.22 Regression of Doji and Doji Star on Major Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.147783	0.099868	1.479791	0.152497	-0.05881	0.354375
X Variable 1	0.17734	0.104119	1.703239	0.102001	-0.03805	0.392727

From above table it can be seen the P-value = 0.102001 is greater than 5%, indicating t is "small" and it may be concluded that $\beta = 0$. This means there is no correlation between the Major Advances in May and the candle lines of Doji.

This statistical analysis shows that changes in the appearance of Doji and Doji Star candle lines do not indicate changes in the total number of FTSE 100 market Major Advances in the given period.

Major Advances and Long White Candlesticks

Let independent variable X = Long White Candlesticks and dependent variable Y = Major Advances.

Scatter Diagram

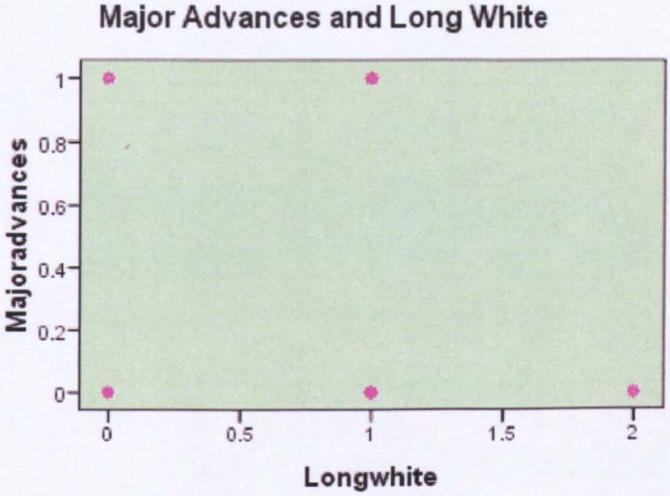


Figure 7.12 Relationship between major advances and long white candlesticks

Using graphical method the following scatter diagram shows that points are not close to each other. It appears no linear relationship exist between the two variables.

Correlation

A summary statistics table, presents a coefficient r = -0.1646, indicating a very weak possible relationship between Major Advances and Long White Candlesticks.

Table 7.23 Correlation between major advances and long white

		Major advances	Long white
Major advances	Pearson Correlation	1.000	-.165
	Sig. (1-tailed)		.216
	N	25	25
Long white	Pearson Correlation	-.165	1.000
	Sig. (1-tailed)	.216	
	N	25	25

From the above table it can be seen that the determination of coefficient is 027, indicating only a 2.7% of changes in number of Major Advances can be explained by changes in the number of the appearances of Long White Candlesticks

Statistical test of correlation

The OLS estimate b = -0.11441 and the 95% confidence interval for β is (-0.41011, 0.181296) which includes the value 0. This means that there is possibility that β = 0.

Table 7.24 Regression of Long White Candlestick on Major Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.317797	0.131011	2.425729	0.023531	0.04678	0.588813
X Variable 1	-0.11441	0.142944	-0.80036	0.431693	-0.41011	0.181296

From above table it can be seen the P-value = 0.431693 is greater than 5% indicating t is "small" and it may be concluded that β= 0. This means there is no correlation between the Major Advances in May and the Long White Candlesticks.

This statistical analysis shows that changes in the appearance of The Long White candle lines do not indicate changes in the total number of FTSE 100 market Major Advances in the given period.

Major Advances and Hammer candlesticks

Let the independent variable X = Hammer and the dependent variable Y = the number of Major Advances.

Scatter diagram

The following scatter diagram shows each point stays far away from the other. This means that there is no linear relationship exists between the two variables.

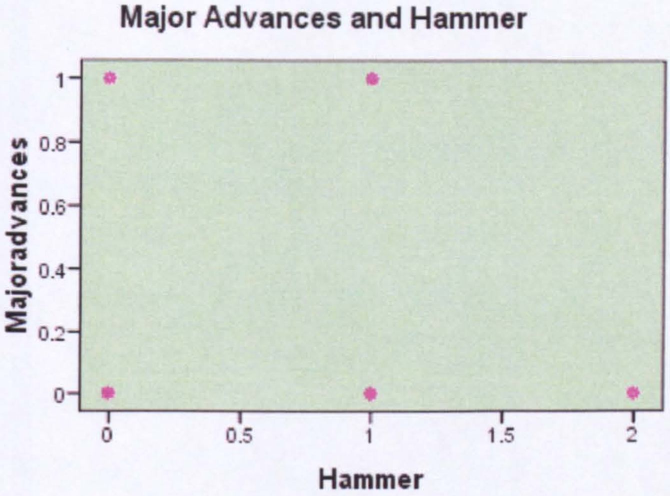


Figure 7.13 Relationship between major advances and hammer candlesticks

Correlation

Further evidence shows that the value of coefficient r is 0.089, indicating a possible positive relationship but it is not linear.

Table 7.25 Correlation between major advances and Hammer

		Major advances	Hammer
Major advances	Pearson Correlation	1.000	.089
	Sig. (1-tailed)		.336
	N	25	25
Hammer	Pearson Correlation	.089	1.000
	Sig. (1-tailed)	.336	
	N	25	25

The determination of coefficient $r^2 = 0.008$ suggesting that there is no correlation between these variables.

Statistical test of correlation

The OLS estimate b = 0.06 and the 95% confidence interval for β is (-0.23013, 0.350126) which includes the value 0. This means that there is possibility that $\beta = 0$.

Table 7.26 Regression of Hammer Candlestick on Major Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.216	0.104952	2.05808	0.051088	-0.00111	0.43311
X Variable 1	0.06	0.140248	0.427813	0.672767	-0.23013	0.350126

From above table it can be seen the P-value = 0.672767 is greater than 5% indicating t is "small" and it may be concluded that $\beta = 0$. This means there is no correlation between Major Advances in May and the Hammer Candle lines.

This statistical analysis shows that changes in the appearance of Hammer candle lines do not indicate changes in the total number of FTSE 100 market Major Advances in the given period.

7.2.4 Major Advances and Candlestick Patterns

Major Advances and Three Advanced Soldiers

Let independent variable X = Three Advanced Soldiers and the dependent variable Y = Major Advances.

Scatter diagram

The following scatter diagram shows that points are independent of each other and no linear relationship can be identified.

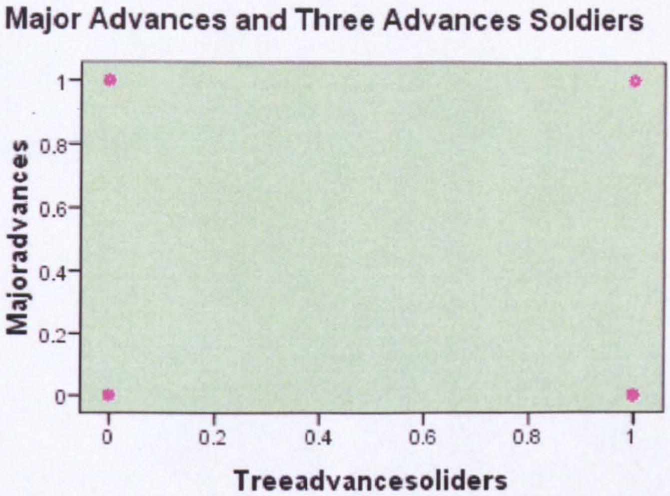


Figure 7.14 Relationship between major advances and three advanced soldiers

Correlation

Summary statistics show a value of coefficient r = - 0.142 indicating a possible negative relationship but it appears very weak.

Table 7.27 Correlation between major advances and Three Advanced Soldiers

		Major advances	Three Advanced soldiers
Major advances	Pearson Correlation	1.000	-.142
	Sig. (1-tailed)		.249
	N	25	25
Three advanced soldiers	Pearson Correlation	-.142	1.000
	Sig. (1-tailed)	.249	
	N	25	25

From above table it can be seen that the value of determination of coefficient $r^2 = 0.02$ meaning that only a 2% of the changes in the number of Major Advances can be explained by changes in number of Three Advanced Soldiers. This also indicates 98% of changes in Major Advances must be due to other factors.

Statistical test of correlation

The OLS estimate b = -0.13492 and the 95% confidence interval for β is (-0.54106, 0.271222) which includes the value 0. This means that there is possibility that β= 0.

Table 7.28 Regression of Three Advanced Soldiers on Major Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.277778	0.103889	2.673799	0.01356	0.062867	0.492688
X Variable 1	-0.13492	0.196331	-0.68721	0.498823	-0.54106	0.271222

From above table it can be seen the P-value = 0.498823 is greater than 5% indicating t is "small" and it may be concluded that β= 0. This means there is no correlation between the Major Advances in May and the appearances of Three Advanced Soldiers.

This statistical analysis shows that changes in the appearance of candlestick pattern of Three Advanced Soldiers do not indicate changes in the total number of FTSE 100 market Major Advances in the given period.

Major Advances and Bullish Harami

Let independent variable X = Bullish Harami and dependent variable Y = Major Advances.

Scatter diagram

The following scatter diagram also shows that points are independent of each other and no linear relationship can be identified.

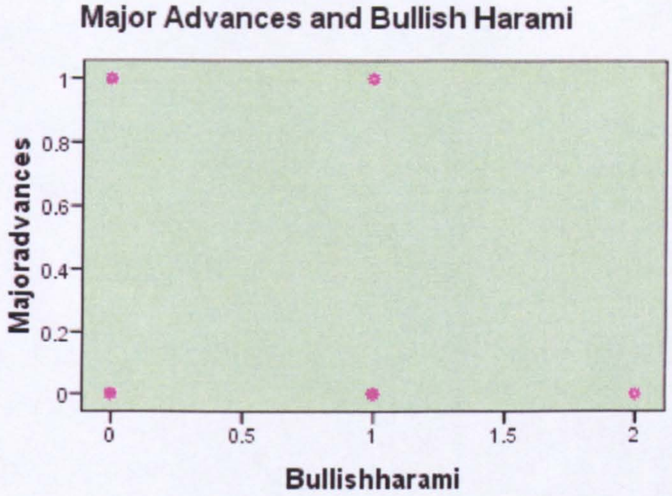


Figure 7.15 Relationship between major advances and bearish harami

Correlation

Table 7.29 Correlation between major advances and Bullish Harami

		Major advances	Bullish harami
Major advances	Pearson Correlation	1.000	-.080
	Sig. (1-tailed)		.351
	N	25	25
Bullish harami	Pearson Correlation	-.080	1.000
	Sig. (1-tailed)	.351	
	N	25	25

The above summary statistics with a value of r = -0.080 presents a possible negative relationship but the relationship is considered non-existent.

Statistical test of correlation

The OLS estimate b = -0.06707 and the 95% confidence interval for β is (-0.42554, 0.291391) which includes the value 0. This means that there is possibility that β= 0.

Table 7.30 Regression of Bullish Harami on Major Advances

	Coefficients	Standard error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.256098	0.098024	2.612605	0.015564	0.05332	0.458875
X Variable 1	-0.06707	0.173283	-0.38707	0.702261	-0.42554	0.291391

From above table it can be seen the P-value = 0.702261 is greater than 5% indicating t is "small" and it may be concluded that β= 0. This means there is no correlation between the Major Advances in May and the candlestick pattern of Bullish Harami. This statistical analysis shows that changes in the appearance of candlestick pattern of Bullish Harami do not necessarily indicate changes in the total number of FTSE 100 market Major Advances in the month of May in the given period.

7.3 Summary

In this chapter, all relationships between the total number of falls (major falls) and the total number of candlestick signals (individual candlesticks or candlestick patterns), and also all relationships between the total number of advances (major advances) and the total number of candlestick signals (individual candlestick or candlestick patterns) have been tested. A summary of these test results is given in the table below:

Table 7.31 Summary of tests of correlation

Test of Correlation Between		Coefficient of Correlation	Relationship	
			Yes	No
Total Number of Falls	Total Number of Signals	0.3913	√	
Major Falls	Total Number of Signals	0.3728	√	
Major Falls	Doji & Doji Star	0.028		√
Major Falls	Long Black	0.0291		√
Major Falls	Spinning Top	0.2984		√
Major Falls	Shooting Star	0.004		√
Major Falls	Dark Cloud Cover	0.025		√
Major Falls	Three Black Crows	0.259		√
Total Number of Advances	Total Number of Signals	0.4084	√	
Major Advances	Total Number of Signals	0.1249		
Major Advances	Doji & Doji Star	0.3350		√
Major Advances	Long White	0.165		√
Major Advances	Hammer	0.0888		√
Major Advances	Three Advanced Soldiers	0.1418		√
Major Advances	Bullish Harami	0.0804		√

From the above table it can be seen that the total number of candlesticks signals is weakly correlated with only the total number of May falls, the total number of major May falls, and the total number of May advances. The other candlesticks and candlestick patterns appear to have no correlation with May falls or advances.

Therefore it can be concluded that changes in the appearances of candlesticks do not allow changes in the number of May falls and advances to be predicted.

Chapter 8 Research Findings Discussion

An Analysis of the Reliability of Candlestick Charting

8.0 Introduction

For any stock market the key question for investors is whether past share movements can be used to predict the future. Those investors who believe in charting, place enormous faith in past prices as a guide to future prices. The performance of the FTSE 100 Index in the month of May for the last twenty five years has been scrutinised to find out whether or not candlestick charting can be used to predict future prices.

It appears that a case study of the FTSE 100 Index of the UK stock market, together with an interpretation of candlestick charts could provide evidence that candlestick charting can provide useful signalling information to investors to identify the movements of stock prices. However correlation and regression analyses provide quantitative evidence that candlesticks and candlestick patterns are not correlated with the major falls or advances of the FTSE 100 Index in May from 1984 to 2008

The findings of this study support the results obtained in other studies of stock markets, namely that candlestick charting can not help investors to earn abnormal returns.

This chapter presents a summary and analysis of research findings based on case studies and a critical literature review. Firstly, the market performance for the FTSE 100 Index in the month of May in each year for the given period will be evaluated. Secondly, the interpretation of candlestick charts focusing on the major falls will be summarised and the signals released by candlestick charting in relation to the major falls in the given period will be analysed. Thirdly, the correlation and regression relationship between candlestick charting and the major falls in the given period will be studied. In addition, key findings will be presented from a literature review of candlestick charting. Finally, the findings of the reliability of candlestick charting will be summarised.

8.1 Findings from the examination of the market performance

The UK stock market performance shows that there were 55 falls and 46 advances in the given period. The following table summarises the details of falls:

Table 8.1 UK stock market performance – May falls

May in year	Month Number	Total Falls	Major falls	Crashes about 10%	Number of Candlestick Signals
1984	1	4	2	0	5
1985	2	2	0	0	4
1986	3	3	1	0	3
1987	4	1	0	0	1
1988	5	3	0	0	4
1989	6	3	1	0	2
1990	7	1	0	0	2
1991	8	1	0	0	4
1992	9	2	0	0	5
1993	10	3	0	0	5
1994	11	1	1	0	5
1995	12	1	0	0	2
1996	13	2	0	0	3
1997	14	2	0	0	4
1998	15	3	0	0	3
1999	16	3	2	0	6
2000	17	3	2	0	6
2001	18	3	1	0	3
2002	19	2	1	0	4
2003	20	3	0	0	2
2004	21	3	1	0	3
2005	22	1	0	0	2
2006	23	1	1	1	0
2007	24	2	0	0	3
2008	25	2	1	0	2
Total	**25**	**55**	**14**	**1**	**83**

The above table shows there 14 falls are identified as "major falls" out of 55 of total falls in May from 1984 to 2008, including a stock market crash.

Table 8.2 UK stock market performance – May advances

May in year	Month Number	Total Advances in May	Major Advances	Increase above 10%	Number of Candlestick signals
1984	1	1	0	0	0
1985	2	2	0	0	3
1986	3	2	0	0	0
1987	4	1	1	1	1
1988	5	2	0	0	1
1989	6	2	1	0	6
1990	7	2	1	1	3
1991	8	2	0	0	5
1992	9	2	0	0	4
1993	10	3	0	0	3
1994	11	0	0	0	2
1995	12	3	1	0	3
1996	13	1	0	0	2
1997	14	2	1	0	3
1998	15	2	0	0	4
1999	16	1	0	0	1
2000	17	1	1	1	3
2001	18	2	0	0	3
2002	19	1	0	0	3
2003	20	3	0	0	3
2004	21	3	0	0	2
2005	22	2	0	0	5
2006	23	1	0	0	0
2007	24	3	0	0	5
2008	25	2	0	0	5
Total	**25**	**46**	**6**	**3**	**70**

The above table shows there 6 advances are identified as "major advances" out of 46 of total advances in May from 1984 to 2008, including 3 advances where share prices increased about 10%.

8.2 Findings from the interpretation of candlestick charting

8.2.1 The candlesticks signalling the major falls in May

Twenty five months were used for analysing stock market performance and the interpretation related of candlestick charting. The candlestick signals indicating major May falls of the FTSE-100 index are summarized in Figure. 8.1.

The candlestick signals indicating Major falls

There are 83 Candlestick signals which appear to indicate major falls in the FTSE 100 Index in the month of May in the given period from 1984 to 2008. The following chart clearly shows that 56 out of the 83 candlestick signals are single candlesticks and the rest are candlestick patterns. This provides quantitative evidence that single candle lines appear more frequently than candlestick patterns.

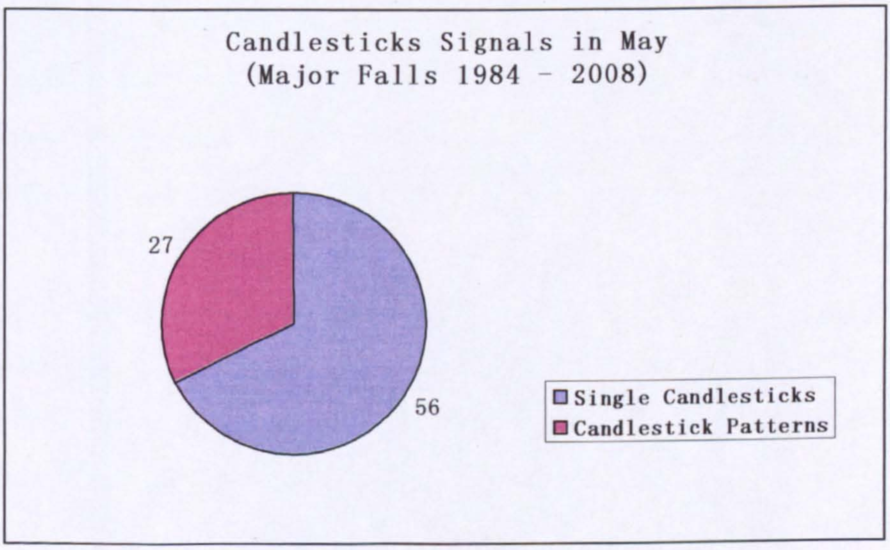
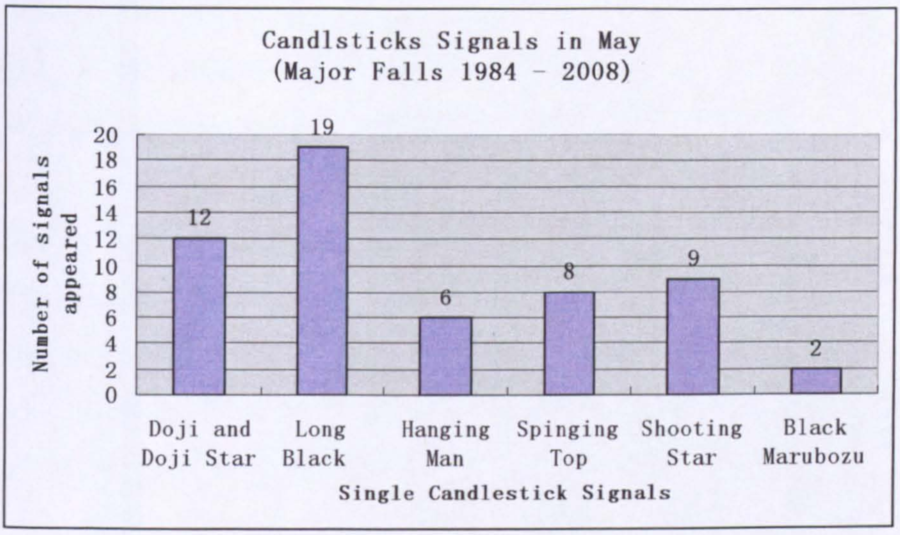


Figure 8.1 Summary of candlestick Signals indicating major falls in May

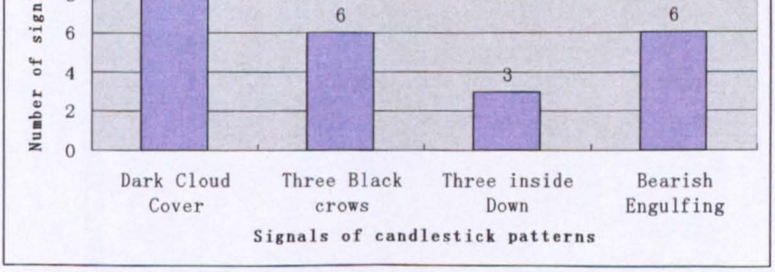
The single candle lines which appear to indicate these major falls are the Doji & Doji Star, Long Black Candlestick, Hanging Man, Spinning Top and Shooting star as shown in the following graph.



8.2 Summary of single candlestick Signals indicating major falls in May

It can be seen that the Long Black appeared 19 times to indicate the major falls while Doji and Doji Star appeared 12 times. They are the candlesticks most frequently used to help investors to identify the upward and downward movements of the stock prices.

Other frequently occurring candlesticks are the shooting star, spinning top, and hanging man. Shooting star appeared 9 times while spinning top and hanging man appeared 8 and 6 times respectively. The black marubozu appeared twice to indicate the major falls in May in the given period.



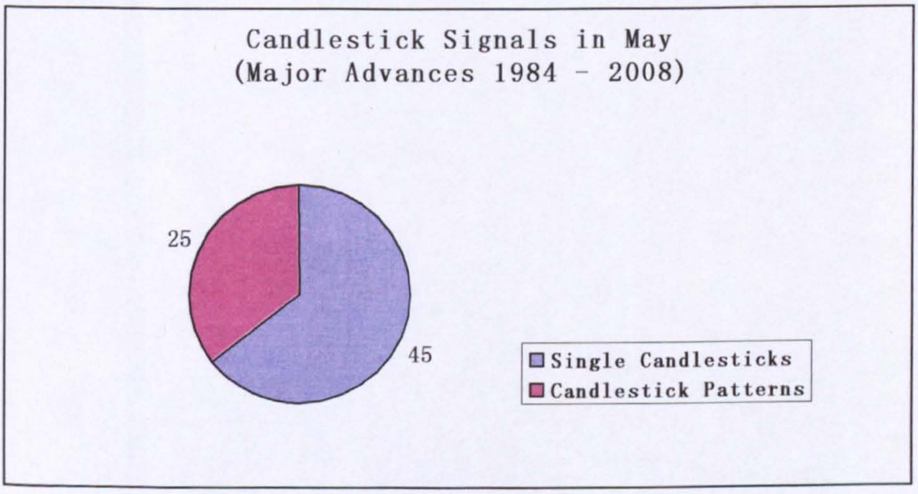
8.3 Summary of candlestick patterns indicating major falls in May

The most frequent candlestick patterns appearing to indicate a major fall are the Dark Cloud Cover which occurred 12 times out of 27. Both Three Black Crows and Bearish Engulfing patterns appeared 6 times while the Three Inside Down appeared 3 times.

8.2.2 The candlestick signals indicating Major advances

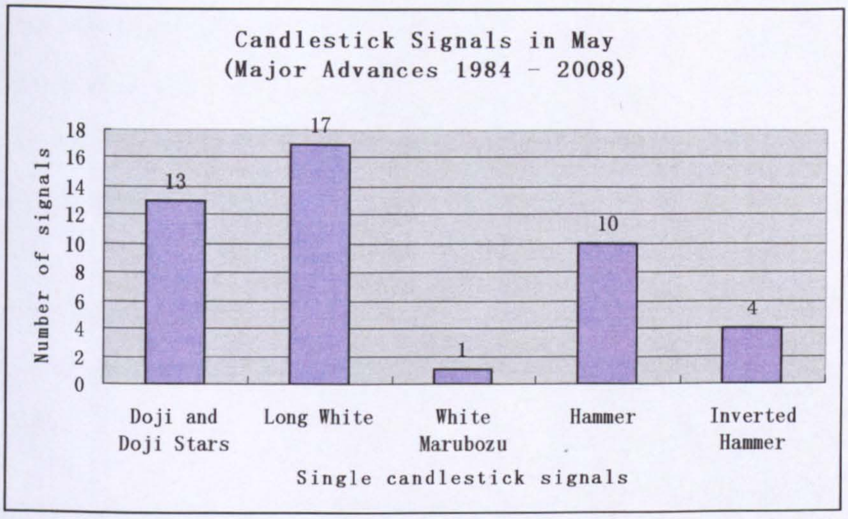
Candlestick signals indicating Major Advances

There were 70 candlestick signals to indicate the major advances in May in the given period from 1984 to 2008. 45 out of 70 candlestick signals were single candlesticks and 25 were candlestick patterns.



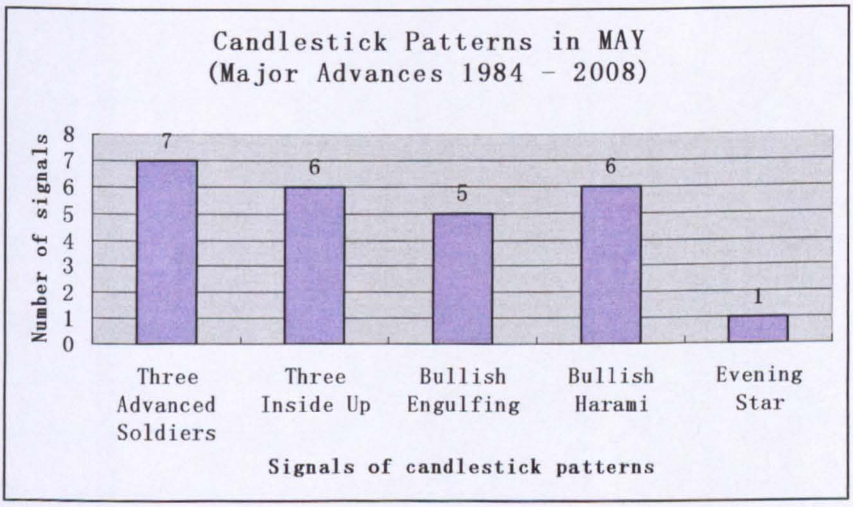
8.4 Summary of candlestick Signals indicating major advances in May

It can be seen from the above graph that single candlestick indicators were the majority of candlestick signals. The most frequently appearing candle lines were the Long White Candlestick with a total number of 17 times. Other frequently appearing candlesticks were the Doji and Doji Star and Hammer with 13 and 10 times respectively.



8.5 Summary of candlestick Signals indicating major advances in May

Among the candlestick patterns which have indicated the major advances in May the most frequently appearing were the Three Advanced Soldiers with a total number of 7 times.



8.6 Summary of candlestick patterns indicating major advances in May

Both the Three Inside Up and the Bullish Harami appeared 6 times and Bullish Engulfing occurred 5 times.

8.2.3 The reliability of candlestick charts.

Based on studies of the performance of the FTSE 100 Index in May for the last 25 years, 11 months out of the 25 had a total of 14 major falls. There were 2 major falls in May 1999 and May 2000.

The single candlesticks

The following table summarises the single candlesticks which appear to identify major falls

:

Table 8.3 Summary of single candlesticks appeared to identify major falls

May in year	Times of Major Falls and Crashes	Doji and Doji Star	Long Black Candlestick	Spinning Top	Inverted Hammer
1984	2	1	2	0	0
1986	1	0	1	0	0
1989	1	1	1	0	0
1994	1	1	1	0	1
1999	2	2	0	0	0
2000	2	0	2	3	0
2001	1	0	3	3	0
2002	1	0	1	0	2
2004	1	0	3	0	0
2006	1	0	0	0	0
2008	1	0	0	0	0

From above table it can be seen that 12 out 14 major falls were indicated by single candlesticks and there were 2 major falls without any signal indicators. These candlesticks, Dji or Doji star, Long Black Candlestick, Spinning Top and Inverted Hammer, are considered by investors to be signals of major falls and crashes.

Doji or Doji star: The Doji and Doji Star appeared to signal 5 major falls.

Long Black Candlestick: The Long Black Candlestick identified 10 out of 14 major falls. It was the most frequently appearing candlestick signalling a major fall.

Spinning Top: The Spinning Top signalled 2 major falls along with other reversal candlesticks.

Inverted Hammer: The Inverted Hammer appeared frequently but only identified 2 major falls along with other candlesticks.

The most frequently appearing candlestick was Long Black Candlestick which indicated 11 of the major falls.

Apart from these the Hanging Man and Shooting Star also appeared but very rarely.

The candlestick patterns

The following table summarizes the candlestick patterns which appear to identify major falls:

Table 8.4 Summary of single candlesticks appeared to identify major advances

May in year	Month Number	Times of Major Falls and Crashes	Dark Cloud Cover	Advanced Three Soldiers
1984	1	2	0	0
1986	2	1	1	0
1989	3	1	0	1
1994	4	1	2	0
1999	5	2	1	0
2000	6	2	1	1
2001	7	1	2	1
2002	8	1	0	1
2004	9	1	1	0
2006	10	1	0	0
2008	11	1	1	1

- **Dark Cloud Cover:** The Dark Cloud Cover appeared 9 times and appeared to identify 7 major falls.
- **Advanced Three Soldiers:** The Advanced Three Soldiers appeared 5 times and identified 5 major falls.

8.3 Findings from correlation and regression analysis

Correlation between candlestick signals and the FTSE 1OO Index are analysed for both May falls and May advances.

8.3.1 Total Number of candlestick signals and total falls

Table 8.5 Correlation of candlestick signals with the FTSE 1OO Index

	Coefficient	P- Value	Overall F	Significant F
Number of candlestick signals and Total Falls	0.3913	0.0531	4.158672	0.053073
Number of candlesticks signals and Major Falls	0.3728	0.0664	3.712512	0.06645

From above table, coefficients show that the total number of candlesticks signals, which appeared to indicate the total number of falls/major falls of stock market in May in each year from 1984 to 2008, have weak relationship with the total number of falls. However, both P-values are greater than 5%.

Table 8.6

Correlation of particular candlesticks with May Major Falls of the FTSE 100 Index

	Coefficient	P- Value	Overall F	Significant F
Doji and Doji Stars	0.028	0.8944	0.0180	0.8944
Long Black candlestick	0.0291	0.8901	0.0195	0.8900
Spinning Top	0.2984	0.1473	2.2489	0.1473
Shooting Stars	0.004	0.9844	0.0004	0.9844
Shooting Stars	0.025	0.9052	0.0145	0.9052
Three Black Crows	0.259	0.2117	1.6505	0.2117

From the above table, the coefficients of Spinning Top (0.2984) and Three Black Crows (0.2590) show that these particular candlesticks, which indicate the total number of major falls of the FEST 100 index in May in each year from 1984 to 2008, have weak relationships with the number of major falls. However, both P-values are greater than 5%, indicating variables are not correlated.

The values of the coefficients of Doji and Doji Stars, Long Black candlestick, Shooting Stars are very small, indicating that no correlation exists between the variables. Their P-values are greater than 5%, indicating variables are not correlated.

8.3.2 Correlation between candlestick signals and May Advances

Table 8.7 Correlation of number of candlesticks signals with Total May Major Advances of the FTSE 100 Index

	Coefficient	P- Value	Overall F	Significant F
Number of candlestick signals and Total Advances	0.4084	0.0427	4.6051	0.0427
Number of candlesticks signals and Major Advances	0.1249	0.5518	0.3647	0.5518

From the above table, the coefficients show that the total number of candlesticks signals, which appeared to indicate the total advances of stock market in May in each year from 1984 to 2008, have a weak relationships with the total number of advances. The P-value is 0.0427, which is less than 5%. indicating T statistic is large then $\beta \neq 0$. It can be concluded that these variables are correlated.

The coefficients show that the total number of candlesticks signals, which appeared to indicate the total major advances of stock market in May in each year from 1984 to 2008, have very weak relationship with the total number of major advances. However, the P-value is 0.5518, which is greater than 5%, indicating that these variables are not correlated.

Table 8.8 Correlation of particular candlesticks with Total Advances of the FTSE 100 Index

	Coefficient	P- Value	Overall F	Significant F
Long White candlesticks	0.143	0.4958	0.4790	0.4958

From the above table, the coefficient shows that the total number of Long White candlesticks, which appeared to indicate the total advances of stock market in May in each year from 1984 to 2008, have weak relationships with the total number of advances. The P-value is 0.4958, which is greater than 5%, indicating that these variables are not correlated.

Table 8.9 Correlation of particular candlesticks with Major Advances of the FTSE 100 Index

	Coefficient	P- Value	Overall F	Significant F
Single Candlesticks				
Doji and Doji Stars	0.3347	0.1020	2.9010	0.1020
Long White Candlestick	0.1646	0.4317	0.6406	0.4317
Hammer	0.0889	0.6728	0.1830	0.6728
Candlestick Patterns				
Three Advanced Soldiers	0.1418	0.4988	0.4723	0.4988
Bullish Harami	0.0804	0.7023	0.1498	0.7023

From the above table, the coefficients show that the total number of Doji & Doji Stars and Long White candlesticks, which appeared to indicate the major advances of stock market in May in each year from 1984 to 2008, have weak relationships with the total number of major advances. The P-value is 0.1020, which is greater than 5%. indicating variables are not correlated.

The coefficients of Hammer, Three Advanced Soldiers, and Bullish Harami are very small and their P-values are greater than 5%, also indicating no relationship exists between variables.

8.3.3 Test hypothesizes of the research – T statistics test the relationship between candlestick signals and movements of stock market.

For Number of candlestick signals and Total Falls/Major Falls

Table 8.10 Correlation of Number of candlestick signals and Total Falls/Major Falls

	Coefficient	T Stat	P- Value
Number of candlestick signals and Total Falls	0.3912	0.0531	0.0531
Number of candlesticks signals and Major Falls	0.3728	0.0664	0.0664

From above table, the coefficients show that the total number of candlesticks, which appeared to indicate the total falls / major falls of stock market in May in each year from 1984 to 2008, have weak relationships with the total number of falls and the total number of Major falls. However, both P-values (0.0531, 0.0664) are greater than 5%, indicating T statistic is small then $\beta=0$. It can be concluded that variables are not correlated.

For particular candlesticks and Major falls

Table 8.11 Test Correlation of particular candlesticks and Major falls

	Coefficient	T Stat	P- Value
Doji and Doji Stars	0.028	0.1342	0.8944
Long Black candlestick	0.0291	0.1398	0.8901
Spinning Top	0.2984	1.4996	0.1473
Shooting Stars	0.004	-0.0198	0.9844
Dark Cloud Cover	0.025	0.1204	0.9052
Three Black Crows	0.259	1.2847	0.2117

From above table, the coefficients show that the particular candlesticks, which appeared to indicate the major falls of stock market in May in each year from 1984 to 2008, have weak relationship with the total number of falls and the total number of Major falls. However, all P-values are greater than 5%, indicating T statistics are small then $\beta=0$. It can be concluded that variables are not correlated.

For Number of candlestick signals and Total Advances / Major Advances

Table 8.12 Test of correlation of Number of candlestick signals with Total Advances / Major Advances

	Coefficient	T Stat	P- Value
Number of candlestick signals and Total Advances	0.4084	2.1459	0.0427
Number of candlesticks signals and Major Advances	0.1249	0.6039	0.5518

From above table, the coefficients show that the total number of candlesticks, which appeared to indicate the total advances/major advances of stock market in May in each year from 1984 to 2008, have only a weak relationship with the total number of falls and the total number of Major falls. However, both P-values (0.0427,0.5518) are greater than 5%, indicating T statistics are small then β=0. It can be concluded that the variables are not correlated.

Table 8.13 Test of correlation of particular candlesticks and candlestick patterns with May Advances

	Coefficient	T Stat	P- Value
Single Candlesticks			
Doji and Doji Stars	0.3347	1.7032	0.102
Long White Candlestick	0.1646	-0.8004	0.4317
Hammer	0.0889	0.4278	0.6728
Candlestick Patterns			
Three Advanced Soldiers	0.1418	-0.6872	0.4988
Bullish Harami	0.0804	-0.3871	0.7023

From above table, the coefficients show that the particular candlesticks and candlestick patterns, which are supposed to indicate the total advances of the stock market in May in each year from 1984 to 2008, have a weak relationship with the major advances. However, both P-values are greater than 5%, indicating T statistic is small then $\beta=0$. It can be concluded that the variables are not correlated.

8.4 Findings from relevant literature review of Candlestick charting

There are very serious data-based studies of candlesticks although there are several articles that make claims, but which lack any corroborative data. The two main studies most frequently quoted are noted below but help us very little – because they draw quite different conclusions.

Caginalp and Laurent (1998) evaluate the Japanese method of "Candlestick Charting" for profiting from stocks and suggest that the method has value in forecasting turning points.

However, Horton (2007) analysed 349 stocks from Commodity Systems Inc. using "bull" or "bear" candlestick signals and found that candlestick Charting method has no value in trading individual stocks.

8.5 Findings obtained from interviews with professionals

It may come as a surprise to see the formal statistical score converted into something that is normally associated with gambling on horse racing, but the basic emotions and judgements involved are virtually the same.

Table 8.14 Summary of tests of correlation

Test of Correlation Between		Coefficient of Correlation
Total Number of Falls	Total Number of Signals	0.3913
Major Falls	Total Number of Signals	0.3728
Major Falls	Doji & Doji Star	0.028
Major Falls	Long Black	0.0291
Major Falls	Spinning Top	0.2984
Major Falls	Shooting Star	0.0040
Major Falls	Dark Cloud Cover	0.0250
Major Falls	Three Black Crows	0.2590
Total Number of Advances	Total Number of Signals	0.4084
Major Advances	Total Number of Signals	0.1249
Major Advances	Doji & Doji Star	0.3350
Major Advances	Long White	0.1650
Major Advances	Hammer	0.0888
Major Advances	Three Advanced Soldiers	0.1418
Major Advances	Bullish Harami	0.0804

A review of the hard evidence that gleaned from this study starts with a re-presentation of the coefficients obtained for each of the 25 months of May studied. From an examination of these data one feature stands out. The best correlation found was 0.408 which creates a very clear problem. In an earlier chapter the interpretation of data involving tests of correlation was discussed. Generally speaking a figure less than 0.375/0.350 is regarded as evidence of no correlation. The same interpretation applies even if a minus score is obtained, indicating a negative correlation. This means that from the statistical point of view, all these months produced only three scores that falls above 0.37, and then only marginally. Thus, every test has shown that there is very little evidence that candlestick charting offers any guidance for those seeking to make an abnormal gain on the market.

This is where the verbal evidence of a broker must be considered. In addition to being a very successful operator in his field he has a "hobby" which is betting on horse racing. This hobby involves reading several newspapers and other publications about current race horses as well as "bed-time" reading about the genealogy of horses. He also knows a lot about placing bets to his own advantage. However, his usefulness as an interviewee is greater because in a previous job he had to read several books and articles about candlesticks. He said that during that period when he was a fund manager, he discovered that two of his staff members were also using candlesticks. They were not allowed to use the ideas with clients' money but they did record what they would have done if they had been using the system. In the first six months they lost about 18% of their "imaginary fund value" during a period when the FTSE lost 9%. However in the eighth month they made one investment that recovered almost all their FTSE losses, leaving them with 99% of the money they started with. The FTSE all share index rose over the whole year by 3%.

It was this that caused him to reconsider the data presented in this thesis and he pointed out his view of what the system could do, except for the fact that he reduced it to horse betting language. The best result obtained in this thesis (0.408) can be seen as a bet slightly worse than 7 – 1. In horse racing terms this means a bet of 15 – 2. Then he showed what could happen to a serious gambler if his horse is priced at 15 – 2 and he has £10,000 to bet with that day. In scenario 1 he places a bet of £1,000 and the horse loses. He now has £9,000 and wants to recover his lost bet and make another attempt to win money. So he now bets £2,000 (£1,000 bet on the horse and another £1,000 to try to get his original bet back. The horse loses. He now has £7,000 and must bet £4,000 of that. If he loses he only has £3,000 and must bet all of it, again at 15 – 2. As the information points out, the bookmaker has four good chances of taking all of his customer's money – if you like a bet of 4- 1.

Scenario 2 is more interesting. The same gambler places his first £1,000 and wins. He now has £7,500, plus his returned bet of £1,000 and £9,000 remainder of his original sum. The broker made one telling comment "if that man does not put the money into his pocket and walk away he is going to lose everything he ever had! His problem is that he will begin to believe that he has found a system that will make him rich. There is the old proverb 'If you want to make the Gods laugh tell them about your plans for tomorrow.' "

The implications of the advice about walking away are quite obvious. Put very crudely, if fifteen brokers place their bets, based on the best result gained by candlestick theory, probably two of them are going to win. This means that thirteen of them will lose money. The rather hard truth is that there is more chance of the thirteen walking away penniless than one or two winners.

To make it even more clear consider the average of all the months studied. Depending on how this data is calculated the average chance of getting the right answer ranges between 20 – 1 and 35 – 1 and in a few cases you would get 100 – 1. Thus the question of why people become involved in charting candlesticks must be asked?

All five financial professionals had attended a seminar on candlestick charting in 2002 conducted by a new consultancy as a result of a personal invitation. They recalled that the seminar, held in a city hotel, was fairly expensive but the catering was superb, the wines expensive, the presentation brilliant and the take home "goody bag" contained a copy of Nison's first publication (1991). However there was a downside. Although the lead presentation was very well done there were two other presenters, both U.S. based consultants, who made claims about having used candlestick charting with astonishing success. Each of these five interviews was conducted separately and there was no attempt to establish group discussion. Curiously all five remembered these two presentations but also recalled one other incident. In the final session questions were addressed directly to the two back-up presenters. On every occasion, before they could answer, the lead presenter handled the question and appeared to say not too much but too little. On each occasion he also kept reminding his audience that the seminar had to finish in a few minutes because a second group was about to arrive. Despite this, all five did admit to being motivated to read the literature provided, and decided to try to apply the theories to their work.

In the following twelve months several of their colleagues received candlestick charting promotions and inside one well known investment house, where Arthur and Bernard were employed, a small group people interested in using candlesticks was formed. In 2005 they started to apply the ideas to their investment decisions but after six weeks they had produced no obvious benefit and the experiment was abandoned. Arthur provided a most interesting comment:

"I am sure if we had carried on we would have done better. We were religious in our converting real data into candlesticks but we never seemed to be able to agree on what the patterns actually meant and thus what actions we should take. In particular I remember the argument over what an 'inverted hammer' implied, and we started digging into our literature base only to become more confused." (Arthur, 8th December 2008)

Bernard, remembered the same meetings and confused arguments and offered a very different view. He started by pointing out the small team comprised seven or eight people but they had been influenced by three very different seminars and one member had "picked it all up from articles and a book". He felt that they ought to have started by clarifying what the "in-language" actually meant. However his next comment was rather more insightful.

"We were dealing in an international recovery area and it was simply too large. Had we dealt, for example, in something like 'new technology' in one or two countries it could have worked." (Bernard, 8th December 2008)

He described how, after the experiment was abandoned, he kept track of all shares they held at that time. As a result he noted that the sorts of shares they might have bought as a 'defensive component' were slightly less reliable data sources for candlesticks than anything else. He also added that in 2006 his particular group considered banks to be good sound defensive shares. However with new technology shares he believed that candlesticks could have worked, but on consideration of this he also admitted that he already knew what the candlesticks would show.

"When a newtech share starts a roll there is a better then even chance that it is going to rise quickly. It may fall, but getting out of a stock is as important as getting in." (Bernard, 8th December 2008)

Charles had a different experience. He had spent several months trying to convert the results of each day into candlestick data. His particular company did not encourage any real innovation and so he kept a "fantasy" portfolio based on whatever he was handling at time. For nine months he followed energy shares and offered a key insight. When the market was rising the candlesticks worked but they were totally unreliable on the issue of when to get out. He believed he had made ten or eleven such decisions but only got three right. When the market was falling candlesticks were completely useless and merely added to the difficulty of decision making.

Donald was no longer working as a fund manager and was one of the early City causalities of the current depression. He had been the manager of what is called a "general fund" which invested in at least six different markets. His problems had started with his U.S. holdings and he had been unable to "dump" them. The problems spread to the UK stocks, where he held nearly 60% of the fund.

He admitted that he returned to candlestick charting several times attempting to deal with what seemed to be a collapsing fund. Like Charles he was certain that candlesticks were useless in a falling market. Despite this near certainty he admitted that he was still looking for answers in the candlesticks because "they seemed to offer more certainty than anything else". He returned to this idea towards the end of the conversation and added a number of other insights:

"When a single stock is rising the candlesticks work well and all you have to worry about is when to get out. I am still trying to work out how the system tells you when to leave and I can't find anyone who has cracked this one." (Donald, 8th December 2008)

But the most telling insight of all came at the end of this short conversation.

"The trouble with candlesticks is that they are like a religion for some people. You can do without it until things get bad, and then you turn to prayer." (Donald, 8th December 2008)

Edward was a lot different. He had not tried to use it in his daily work but had kept a "fantasy" diary. He claimed that he was getting better and better at his decision making but the start of the market collapse had meant that he had to start learning his interpretation skills all over again. He believed that the system is designed to work best in a rising market and, in this situation it does work. At this point he was asked if he had found himself following a stock or stocks far beyond any normal expectation. He paused and then replied "I think I could out-perform the FTSE by three or four percentage points, in the right market conditions". However, when pressed he admitted that his results had not been that good. He was not very optimistic about his experiences in a falling market but put his poor results down to his lack of experience in using the system.

The horse race loving broker also had one more some interesting insight. He summed up his experiences in a most interesting way. Many years ago there was a very colourful African character known as "Price Monolulu" who made his living by working a swindle on race courses. Dressed in African robes he would walk around the public arrears of race courses shouting "I have got a horse". He meant that he had a "tip" that he would sell to anyone foolish enough to give his ten shillings (50p). What he actually did was to copy the names of all the horses in a race and sell them to people. Of course in every race he had a winner and he became an institution and everyone knew what he was doing, but he continued to get away with his little swindle.

He used this to explain why people were so reticent to talk about their experiences with candlesticks. He pointed out that candlesticks are not the only "get-rich-quick for certain" scheme in the City. There are literally dozens of schemes and they appear with some regularity. What they are, he explained, are schemes to help city managers to conquer their fears of failure. If this system really was effective, and this applies to any other system, there would be hundreds of extremely rich people, all of them would have made killings in the market. He then produced a newspaper and showed a page on which was printed details of the day's horse-racing. In the middle of the page was a box containing somebody's tips as to which horse was likely to win which race. He then made the most telling comment of all.

"If one of these racing tipsters was to get it right every time he would either be banned from horseracing or the entire industry would collapse."

Frank and George had many more insights than the others, because the two respondents were much more willing to discuss candlesticks. Both had worked in the same company in the City of London. They had both decided that they had had enough of the City and in particular commuting, and had decided to move out of London altogether. Both admitted that their moves had meant a drop in income but neither regretted the decision. (The researcher acknowledges her debt to Mr. Matthew Chambers who agreed to conduct these two interviews because she was unable to attend a meeting.). Both remained in the financial services sector.

Both had heard about candlesticks when they were working together in the same office and although some of their memories were very similar, their interpretations of events were different. In the office where they worked was a team of people who were part of the management team of what are known as Unit Trusts. One member of this group was responsible for introducing the candlestick theory and this is how he was described by Frank on 25 August 2009:

"He was a sort of walking encyclopedia of information, insight and opinion about companies in which we invested. He read everything, not just internal memos. He bought every possible journal we couldn't get at work, collected old newspapers so that he could scan the business and finance sections which really, I think, is a total waste of time. We had an annual competition in the office about finding the worst financial commentator of the year. You had to identify someone who gave the ten worst tips of the month in January and you followed them until December. The competition was staggering. However this chap came across candlesticks in a book and started messing about with it in the office.

He was, if you like playing fantasy investing, but at one meeting he made some suggestions about pharmaceutical stocks with turned out to be very good indeed. We used to call him 'analysis/paralysis' but we started to listen. This was where we started to listen to him and picked his brains.

We followed three or four companies and we did very well indeed. Then things went a bit flat and it all seemed to disappear, but six months later he came out with some more ideas, but this time in energy. This turned out to be a real winner, but in the event led to a minor disaster. One of the top men decided that we were all going to be exposed to candlesticks and he, with two others went off on some programme and come back totally converted.

So we all settled down to read the stuff and I must confess that at first it was quite convincing. Now, the market was rising and we all come to meeting with our pictures and things went very well. I don't think that this had anything to do with our candlesticks and although we did outperform the market so did several others. It was when things started to become a bit *unstable that we got into trouble. Several of our investments began to fall and would then stage some sort of recovery, largely created by late buying. This disguised the fact that something was going wrong, but we didn't see it. It was about two weeks later that it became apparent that we had lost quite a bit and so we sold. But we were much too late. I remember a meeting at which someone pointed out that he advised us to sell two weeks ago, based on his reading of the candlesticks. Several people challenged his statement but it had been recorded! He made the mistake of being right at the wrong time.*

Then the original candlestick man produced some ideas about one company that he felt was worth a big investment. He was sat on but again he was right. It all ended very badly with the three who had gone on the course distancing themselves from any responsibility and seeking scapegoats. It made the decision to quit very easy.

Do candlesticks work? Yes and No. When our man was dealing one single company and had amassed a huge amount of information, then it was as good as 50 – 50. But when it was applied say to something like the FTSE 250 it was a complete waste of time because you simply could not amass the sort of information base you need to make a valid interpretation."

His colleague, **George,** agreed with the account of how things were introduced but did not like the description of the individual concerned. i.e. analysis/paralysis. He took the view that the man in question was quite brilliant but lacked the ability to engage in heated debate. He was perhaps shy or lacked self-confidence but worked in an environment where such behaviour is not the norm.

"Candlestick charting was just an excuse for three guys to go off on a 'jolly'. Why did they have to go to the States when there were plenty of people available in London capable of explaining candlestick theory? I began to realise that these three were only involved in this because it was the flavour of the month. They did not understand either the theory or the practice. We did make a few good decisions and we did out-perform the market. The guy who started it all did have some very good ideas but they were confined to one company in one

sector in one country. So he would know a bundle about one pharmaceutical company in France but that was it. He had no real insight into the general state of that sector in that country. But others did have that and so when things went well we had little or no problem.

It all failed for one simple reason. We never tried to analyse our successes or failures. When things went well we all boasted that we had been the instrument of success, but when things went wrong we looked for someone to blame. Like so many other ideas we only got half of it and the rest was down to luck. It has happened time and again. Someone gets an idea, goes on a course, reads something or whatever and brings it to a meeting. If it looks like it can produce a winner we all backed it but if it goes wrong we claim never to have been involved. Everything is half baked, even when we get a visiting firemen (consultant) we only hear the bits we want to hear and every perception has to fit that pattern. Contradictory evidence was ignored.

I think that candlesticks can work as long as it is applied to a very limited number of investments. It cannot work with more than five because the variables that impact on organizations are not universal or standardized. It also works well in a bull market but nowhere else." (George, 25th August 2009)

The last piece of evidence came from records of a discussion between the three people involved in these last two studies. They were discussing why people are so ready to jump into these schemes and they concluded that everyone in this business is driven mainly by fear. They agreed that greed, personal prestige, publicity etc. were important, but the main factor was fear. Fear led to irrational behaviour. Candlesticks, like any other scheme for "beating the market" offer a way to manage fear by placing trust in something that you do not really understand. This is the same mechanism that leads to adherence to religious or political dogma. There is absolutely no evidence that these ideas work but we somehow need them to ease our fears about tomorrow.

8.6 The suspension of disbelief

A question has be raised that when and how the candlestick theories emerged and, most importantly, in what sort of environment. There seems to be general agreement that the ideas were the brainchild of a Japanese trader, farmer and rice dealer, possibly as early as 1860. This date gives us a clue.

Japan, up to about 1630 did have contact with the west and early Jesuit evangelism (1560ff) had produced thousands of converts to Christianity. At that time Japan was really in the grip of feuding war-lords and had become the prey of any pirates who happened to be near.

The Jesuits were masters of the principle of "divide and conquer" and rose to become enormously powerful in the life of the country.

It is probably the resentment of these, mainly Portuguese, outsiders that led to resistance but more significantly the rise of one man, Ieasu Tokugawa. Tokugawa was a soldier and functionary in the service of the Emperor and slowly he put together an organization, uniquely military, that owed more than a little to Rome.

To become a member of the "Samurai caste" one had to be expert in the use of three weapons (Roman Legionaries), take a vow of total obedience (Roman legionaries and Roman church) and a vow of celibacy (Roman Church).

Conflict with the Jesuits was inevitable because Tokugawa refused to accept any opposition to his rule and the Jesuits were just as intransigent.

In 1634 Tokugawa abolished Christianity and drove out the Jesuits. Those who refused to go were killed as were any surviving Christians. But, not only did he throw out the Christians he ensured that no outsiders should enter Japan by killing even shipwrecked sailors. His tools in all forms of enforcement were the Samurai.

This isolation continued well into the 19th century despite attempts by the British, the Americans and the trading nations to gain a foothold, Japan remained resolutely isolated.

But the Samurai were slowly driven into the arms of the arch conservatives who were losing touch with the growing awareness among educated Japanese that the country had slipped far behind the rest of the world. Japan was declared open to trade in the 1860s but continued opposition from the conservatives led to incidents of violence. This was only brought to an end when the central government was forced to confront the Samurai movement with military power which led to their virtual extermination. This was 1873.

Back to the rice farmer who evolved a system of watching the movements of the price of rice, identified patterns and converted them into symbols. The question is 'could it work?' In this context the answer could easily be 'yes' for the following reasons:

1) He is only concerned with a single commodity.
2) He was an experienced rice farmer, stockholder and trader.
3) The price of rice in any neighbouring area, i.e. China, Korea, Formosa, is of no concern to him.
4) At this stage, due to its isolation, there was no alternative and viable staple food to create any competition.
5) The variables he had to worry about were limited to:
    a. War and pestilence
    b. Drought and inundation
    c. Labour disputes (unlikely until rural depopulation)
    d. Speculation (difficult but a possible consequence of a and b)

Given that the man had grown up in such a world, with a likely influence sector of not more than 250 – 400 km – he might be able to develop some predictive skills – but in that he was just as successful as any other clever market trader or, for that matter, a bookmaker.

Thus it may be reasonably concluded that in these circumstances a single product trader could have good prediction skills, sufficient to predict market trends.

However, once you remove the isolation and allow other nations to enter your market with better resources and far better trading and negotiating skills it is also quite possible that the efficiency of the methodologies likely to suffer.

Whilst this explains the origins of candle stick charting it does not explain why people start to put their faith in such a system. All investors are governed by two primary human emotions when they invest. These are greed and fear. There are two powerful emotions. Investors are always worried that the gains which they have made might melt away or that they should have bought the stock before it suddenly began to rise. It is in such an environment that investors start to look for signs that can give them an advantage.

Mackay (1841) provides a wealth of evidence in his books Memoirs of Extraordinary Popular Delusions, and Extraordinary Popular Delusions and Madness of Crowds (edition published in 1995 by Wordsworth Editions Limited), showing how investors have throughout history behaved in a strange way, believing that values could constantly rise and that they would become rich. From the Mississipppi Scheme to the South Sea Bubble to the Tulipomania scandal and today's collateralized financial crisis, people have made and lost money.

Charts seem to offer a way of understanding market movements. With hindsight one can see how prices are moving. The chartists still place enormous emphasis on the signs such as the Head and Shoulder pattern but my research shows that at best the chances of being correct are in betting terms no better than 15/2 or 7 to one. This means that if you invest you are only likely to be lucky once and to lose on the other occasions.

Economists and finance specialists who believe that markets are efficient and that prices move in a random way do not believe the charts with the exception that any available information can alter market prices. To them the charts always let you down. This research shows that the charts are incapable of predicting sudden crashes.

The problem is that the charts always seem to hold some truth. Monique (1998) whilst researching investment appraisal techniques referred to the traditional methods of pay back as being similar to the pagan gods before Europe became Christian. She expressed the view that Business schools throughout the western world put all their faith in discounted cash flow techniques at the expense of pay back. Even though pay back sometimes suggested that the investment could make a good return it was still to be rejected as a method. One can apply this thinking to charting and the Efficient Market Hypothesis. From a Christian perspective they can be seen as also as pagan gods. To those who believe in horoscopes, tarot cards and all signs of the ocult appears to be an element of truth. To Christians this cannot be so and so the Church has continually preached against them. In a way the proponents of the Efficient Market Hypothesis are similar to the devout Christians who believe that all of the above fail you and that one must put one's faith in Christ alone (John Bible) Markets according to the EMH move in random ways with no discernable patterns making it impossible for investors in the long term to earn abnormal returns and my research supports this proposition

Why do they survive?

1) Traders would love to be able to control all the events that influence their market but they cannot. Thus they will turn to something that offers hope.
2) All that the sources of hope need to offer is some sort of certainty, a small but well

developed esoteric language and the occasional "priest" – a simple problem for a good marketing company.

8.7 The myth of market memory

There is a saying often seen or heard in the media that runs roughly follows. A butterfly flaps its wings in Beijing and a week later a tornado hits Australia. The saying is variously attributed to the Buddha, Confucius and even Mao Tse Dong, and seems to depend on its source. There is a lesson in this. Our original rice merchant introduced in Chapter 4 had little concern outside a radius of possibly 250 – 500 km.

There are several parallels in the modern world. A populist President in Venezuela seeking to increase his vote starts to threaten a complete nationalization of his oil services. The immediate effect (apart from political flatulence) is that the oil suppliers in the USA start stockpiling fuel supplies thus distorting the market.

The Organization of The Petroleum Exporting Countries (OPEC) realizes that a slight reduction in supply will cause the price of a barrel of oil to soar which means that eventually the price of oil shares on the FTSE will also soar.

A smart Kurd in Iraq notices what is going on and turns on his taps, as does a Russian in Siberia and an Iranian. The price of oil should fall but it does not. Somebody else puts out a story (later proven to be untrue) that the price hike was due to China importing more and more oil to feed its economic boom. It took a terrible economic banking crisis to put a stop to this but whilst the price of oil collapsed the share price of the oil companies was not greatly affected.

The banking crisis may well have been given some impetus by the oil price hike because it caused the collapse of several airlines, holiday companies and, as a further ripple, a great deal of the vacation tourism infrastructure around the world. As tourism also accounts for an estimated 15% of small car sales, another ripple forms.

Behind all this butterfly wing to tornado theatre lies an even more perplexing question: Even if the Venezuelan president had nationalized his oil wells much of the oil they produce has been contracted to the USA for the next ten years.

The point of all this is that the crises described above did contribute to the price of leading oil shares, but why was there no real collapse of share prices at the end?

8.8 Summary

In this chapter twenty five months of the FTSE 100 Index were analysed in terms of candlestick charting to explore the relationship between the candlesticks and the stock market performance. The candlestick charts show reversals and provide early turning signals to investors. The most frequently appearing and the most useful indicators are single candle lines. Candlestick charting appeared as magic signals to but did not indicate the major falls and advances of the stock market in the month of May for the given period from 1984 to 2008. Views of applicability of candlestick charting also have been discussed. A myth of market memory has been further discussed.

Chapter 9 Conclusions

9.0 Introduction

The month of May was deliberately chosen for my research as it is an important month in the stock exchange year. There is an old saying that one should sell in May and go away and also over the years there have been a number of stock market falls during this month. Of course it could be argued that June or another month would have been better but on balance each month represents the same opportunities and threats for any investor. There are a series of arguments for excluding the other months and these are now summarized. September and October are called the hurricane months and they are also a half way house for companies reporting their financial year based on the tax year end. This is why April and December were also rejected for the research as they are months which can signal the end of a financial year. This leaves eight more months. March, July and August tend to be holiday months. During the summer markets are generally quiet. January can be influenced because it is the start of a new year and February and November in the northern hemisphere are bleak winter months where generally there is little market activity. The only other month that might have been used in this research is June which does not have any specific reputation for investor behaviour.

This research builds on the month of May by looking at twenty five years of trading activity with the aim of seeing whether candlestick charting can give the investor an advantage in being able to predict future prices. All of the charts show that there is a randomness to stock movements and that past prices are not a good guide to future movements. There are occasions when an investor using the charts could benefit but the probability of the investor being correct is very low and unsuitable for taking major risky investment decisions.

This leads to the question why does candlestick charting attract so much interest within the financial community when it offers no guarantee of being correct. Enormous amounts of time are spent constructing the charts and investors analyse them in great detail but to little avail. One explanation for their continued attraction is that they have magical properties which appeal to investors in situations where the future is unclear. As Shackle (1972) states, expectation time itself is devoid of reason except in the world of pure mathematics where time is a "perfect variable and not the enigmatic unarguable reality". It is in these types of situations that magic can flourish.

In this study a comprehensive examination of the reactions of stock markets to information signals has been carried out, using specifically the well-known method of Japanese "candlestick charts", to determine whether or not stock market changes can be predicted.

Candlestick Charting is commonly used by investors trying to make profits by trading financial assets. Using the opening, closing, high, and low prices Candlestick Charting posits the existence of rules-of-thumb for timing the changes in the market. This study includes the results of an investigation into the FTSE 100 Index which was selected to represent the UK Stock Market as a whole in order to investigate the magic and reliability of candlestick charting.

This chapter presents the conclusions of this research. Some interesting questions for further studies are also discussed.

9.1 Summary of this research

Reviewing what has been done in this research, a list of key areas is as follows:

a. Stock market analyses and candlestick charting are described in detail in a literature review.

b. The month of May was chosen as the basis for the case study and a period of 25 years selected for the longitudinal study.

c. The FTSE 100 Index was selected as the data source for the 25 months studied.

e. The performance of the FTSE 100 Index was studied for the period defined above. It was then charted and commented upon. This produced the data set for the thesis.

f. The raw data was then converted into the symbolic data used in candlestick charting.

It should be noted that the charting process was conducted under ideal conditions. The data for each day's trading was recorded and available which meant that the researcher had sufficient time to ensure that the correct symbols were used in the correct sequence. If one were doing this under normal conditions, possibly with some degree of pressure, the task would be much more difficult. It is to be noted that this issue will be raised later in this discussion.

g. Statistical procedures were then applied to determine if there existed any correlation between what was happening according to the raw data and what the candlestick symbols represented. This was then placed in context to see if the claims made about the results of candlestick charting could be substantiated.

h. Unstructured interviews were conducted with seven financial professionals familiar with candlestick charting, based in the City of London. These interviewees provided qualitative insights into professionals' attitudes towards candlestick charting.

9.2 Summary of key findings and conclusions

To recap: three hypotheses were posited at the start of the study which have been tested with the following results:

1) There is no relationship between candlesticks and major falls in stock prices. Candlestick charting appears to be unreliable as a means of predicting the future movements of stock prices.

2) Although there are signals which do give clues to investors allowing them to identify the turning points of stock prices, they do not lead to abnormal profitability.

3) Studying the movements of past stock prices will not help investors predict their future movements (and earn abnormal returns) because the market is pretty efficient and therefore all the relevant information is already contained in the share price. It is very difficult to use signaling as a way of seeking to find the optimum time to invest.

A series of statistical tests produced a series of coefficients of correlation that simply do not justify the claims made for candlestick charting. In a few cases there was less than one chance in fifty that the candlestick interpretation would lead to success (or the avoidance of a failure) and at the very best it produced the insight that the data and its interpretation had a slightly worse than a one in seven chance of success. Assuming that investors are rational they should reject the method of candle stick charting but there is clear evidence of its use in financial markets. The question now is why it is that a method that is so unreliable is still so popular with the financial community. The answer seems to lie in Brooker's explanation of magic where people engage in ritual activity when they are uncertain as to what action they should take and when the future is unknown (Brooker, 1967).

The interviews which have been carried out bear witness to this phenomenon and led to the following findings

4) Although it proved to be very difficult to find people who would agree to be interviewed about candlestick charting in the UK, none of those who were interviewed could point to any clear unequivocal successes. They were all aware of the method and confirmed that they tended to use it during periods of great uncertainty such as when markets are in "free fall" or are rising sharply.

5) Those who believe in candlestick charting find it difficult to use in practice. Even in the case in which professional investors had attended courses and read books and articles about the method they often could not agree about the meanings of the patterns. This would further increase the difficulty of applying candlesticks in 'real time'

6) The professionals generally agreed that candlesticks might be useful when applied to a particular company but for large numbers of companies in a particular sector, or for the FTSE as a whole, the complexity of the situation was too great for candlesticks to manage.

7) Candlesticks do not provide the professionals with any way to decide on the key issue of when to sell and get out of the market and appeared to offer hope only when the market was rising.

In order to better understand this last point it is necessary to go outside the field of finance into other areas such as anthropology and sociology to be able to explain why a particular activity continues to be used despite evidence to the contrary that it does not work.

Anthropologists have written about shamans who predict rainfall. They have a bag of bones which they shake and then throw on the ground. They then predict rain. If it does not rain they repeat the process until it does. Once it rains faith in the shaman increased because he was finally proven right. The fact that he already failed fifty or more times is forgotten or even explained away as some fault with the bones.

Candlesticks and candlestick patterns have no relationship with the movements of stock prices and candlestick charting cannot be used as a trading system to predict the future movements of stock prices thus making investment decisions. From the rational point of view investors should give up using this method as they will not be able to gain advantages and earn abnormal returns – but they don't.

Moreover, candlestick charting has all the ingredients of magical activity. There must be spells such as words and phrases which are used and understood only by those initiated into the practice. Candle stick charting uses its own special language such as "Dark Cloud Cover", and "Three Advanced Soldiers". Secondly there must be rites and rituals. The drawings and the charting becomes a ritual activity and finally there must be some sort of performance by the leaders or standards of behaviour which are consistent with the claim of being able to see better than others. Those who prepare the charts claim they can interpret them and predict the future.

Candlestick charting does appear to be used largely for psychological reasons. The finance professionals admitted that in an industry where there was a great deal of fear and uncertainty, candlesticks worked to help them conquer their fears and give them the illusion of control. The treasurer who admitted that on the really bad days when the market continues to crash, candlestick charting seems to offer a means of understanding where the market is and how it may move. Whilst none of the interviewees spoke about magic directly or even acknowledged its existence, their actions clearly demonstrated the components of magic.

However, surprisingly there seems to have been a shortage of magicians. Although several professionals had attended a seminar, let by a magician and a couple of near silent acolytes, consultants (magicians) do not appear in the process of problem solving.

Secrets that are written in a book are not good for magic. Even the ancient inhabitants of these islands who were quite capable of writing to each other using the ancient Greek alphabet (Caesar J. De Bello Gallico Book 1) never committed any of the Druidical knowledge to a written form. Thus when the Romans exterminated the Druids, everything they knew and believed died with them. Entertainers who practice "magic" do not, as a rule commit their secrets to paper and those who do tend to be disowned by their fellow professionals.

This research shows that candlestick charting is widely used in banks and investment houses in Japan and that it has been used by some fund managers in this country. The evidence from the case study in this research shows that abnormal returns cannot be made by using candlestick charting and yet despite this evidence it continues to be used by the financial community. Its magical properties clearly appeal to finance experts who need to be able to predict the future movement of stocks and this is why it is likely that as long as we have financial markets we will have candlestick charting. Financial professionals would not like to see themselves as modern day magicians but this is still the best explanation for candlestick chartings continued popularity and use.

Back to history, eighty years after the great Wall Street crash, scientists, fund managers and city traders increasingly believed that they could profit from the psychology that prompted investors to run for the exit during that fateful October of 1929. After that, subsequent slumps, notably the dramatic events of October 1987, the Asian financial crisis, encouraged official and academic studies into their causes. But most of the results show that these cataclysms are caused by the strange herd mentality that occasionally overtakes human beings.

However, from the literature, the importance of people's herd mentality in such cases or events was recognised long time ago by Charles Mackay (1841). In his book Memories of Extraordinary Popular Delusion and the Madness of Crowds, he showed exactly where it was coming from. This explains why we had the South Sea Bubble and also why investors paid so much for tulipbulbs. This power of imitation is vital in preventing investors from being rational. Thus people such as our investors in a stock market need to gain new skills. One way to achieve this is simply to follow other investors because imitation is often the first step to greater knowledge. Before a crash, when a bubble occurs in any market, prices become unsustainable. Financial professionals can get caught in a "positive feedback loop", as a result of imitating other investors (Grimond 2004). This causes people to behave irrationally. In modern society, investors who use candlestick charting to try to predict the future are behaving irrationally. When they are facing problems, such as financial crises or a stock market crash, they need to do something to overcome their fears, and they use candlestick charting and rely on it. For them, candlestick charting is magic, just like people praying at home or in church, they see the lighted candlesticks, they see their hopes. Investors are using candlestick charting as prayers for a good future. The widespread use of candlesticks is also a result of imitation.

9.3 Consistency with other studies

Ever since Bachelier (1900) discovered that bond prices on the Paris Bourse moved in a random way many academics have taken the view that prices move according to new information. The Efficient Market Hypothesis states that all publicly available information must be reflected in stock prices that past movements are not a guide for future movements. Indeed prices will resemble a "random walk" and the concept of market having a memory is completely inconsistent with the efficient market hypothesis. The empirical results of this research support this view. Although proponents of candlestick charting would argue that the method provides signals to investors which help then to identify earlier turning points. But this has no value in trading financial assets with abnormal profitability.

This research provides an intensive investigation into the movements of share prices in relation to information signalling, especially the signals released by candlestick charting. The further study of this issue contributes to the field of financial market research by filling the gap of signals effect analysis in relation to the events of major falls and crashes of stock markets. This research adds quantitative evidence to further support the theory of market efficiency.

The research suggests that candlestick charting only shows reversals and provides early turning signals but cannot be used as a system because it does not give price targets. However, this research provides quantitative and qualitative evidence that candlestick charting is believed to be a form of magic for some investors who have evidently adopted the system for psychological reasons.

The study rejects the reliability of candlestick charting and concludes that investors who apply candlestick charting cannot earn abnormal returns by investing in the stock market; and yet the method probably has value as an important attitudinal device when investors are unsure as to how the market may respond in the future. It is in these cases that its magical properties may work best for investors.

9.4 Limitations of this study

There are two main limitations to this work which concern the choice of case study. The first is the limitation to the month of May and the second is to the choice of the FTSE 100 index. These limitations were self imposed for practical purposes, in order to reduce the problem to the analysis of a manageable data set for the case study.

However, as has been explained above, the limitation to May was chosen with the deliberate intention of choosing the month most likely to give a positive result in the case that any correlation exists between candlesticks and stock prices. If there is a correlation it should be revealed most clearly in this month. The limitation to the FTSE 100 is less significant because there is no reason to believe that if candlesticks do not work with the FTSE 100 they should work with the Dow Jones, for example, instead.

9.5 Suggestions for further research

This research has indicated some interesting questions for further researches may be done and they are as follows:

1. **Can candlesticks be used to identify the major falls or advances in other months apart from in the month of May?** In this research the month of May was deliberately chosen for my research as it is an important month in the stock exchange year. It was believed that if candlestick charting works in this month it should work in any of other month during the year. Choosing other months as samples for further research can prove this.

2. **Does candlestick charting work on predicting the future movements of individual stocks?** This research used the historical daily prices of the FTSE 100 Index to represent the UK stock market as a whole. However this has limitations. Considering every individual stock has different fundamental value and risks attached to the investment it is necessary to carry out further research to find out whether or not candlestick charting can predict the future movements of individual stocks. As a result, using a cross-sectional data which means selecting data at the same point of time for a sample of individual stocks, for example, using daily prices of 50 top UK companies for the month of June, to identify whether or not candlestick charting can predict the future.

3. **Other methods could be designed to further explore the deeper reasons for investors' belief in candlestick charting.** For example, a structured interview or a survey in a form of questionnaire.

4. **Are there candlestick patterns, apart from the standard ones outlined above, that are more reliable in predicting the stock market?** Answers to this question could be found out while further researches have been done for in question 1 and 2 above.

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Appendices

1. Table of original data – daily prices of the FEST 100 Index from 1984 – 2008 May1984 for Case studies in Chapter Six:

May 1984

Date	Open	High	Low	Close
1984-4-23	1108.4	1108.4	1108.4	1108.4
1984-4-24	1105.4	1105.4	1105.4	1105.4
1984-4-25	1119.8	1119.8	1119.8	1119.8
1984-4-26	1130.9	1130.9	1130.9	1130.9
1984-4-30	1138.3	1138.3	1138.3	1138.3
1984-5-1	1136.8	1136.8	1136.8	1136.8
1984-5-3	1137.7	1142.8	1137.4	1142.2
1984-5-4	1135.4	1135.8	1133.5	1134.7
1984-5-8	1126.9	1126.9	1115.9	1117.8
1984-5-9	1119.7	1120.5	1111	1111.3
1984-5-10	1101.3	1101.3	1093.5	1094.6
1984-5-11	1088.7	1089	1075.8	1076.1
1984-5-14	1073.3	1083	1073.3	1082.5
1984-5-15	1083.6	1093.5	1083.6	1093.5
1984-5-16	1101.9	1104.2	1101.8	1104.1
1984-5-17	1116.4	1120.3	1115.3	1116.9
1984-5-18	1108.8	1108.8	1105.1	1105.2
1984-5-21	1106	1107.3	1105.9	1107.2
1984-5-22	1105.7	1105.7	1085.3	1087.9
1984-5-23	1087.6	1089.3	1072	1074.1
1984-5-24	1074.3	1074.6	1057.7	1057.7
1984-5-25	1044.7	1057.1	1042.9	1053.3
1984-5-30	1051.9	1052.3	1027.7	1027.7
1984-5-31	1034.2	1037.8	1008.2	1016.6
1984-6-1	1026.8	1043.8	1026.8	1043.8
1984-6-4	1067.4	1076.8	1067.4	1076.8
1984-6-5	1079.4	1079.9	1069.5	1078.8
1984-6-6	1080.1	1088.2	1080	1087.9
1984-6-7	1090.4	1090.5	1075.4	1075.4
1984-6-8	1072.8	1072.8	1062.3	1068

May 1985

Date	Open	High	Low	Close
1985-4-22	1299.5	1299.8	1294.9	1294.9
1985-4-23	1287.2	1287.2	1282.7	1284.9
1985-4-24	1284.5	1285.8	1282.8	1285.7
1985-4-25	1286.9	1289.8	1286	1289.5
1985-4-26	1294.5	1296.6	1292.9	1295.3
1985-4-29	1292.8	1293.4	1290.1	1292.9
1985-4-30	1284.7	1292.2	1284.1	1291
1985-5-1	1293.7	1301.5	1293.7	1301.5
1985-5-2	1300.3	1310	1300.1	1309.1
1985-5-3	1309.8	1311.6	1309.1	1310.9
1985-5-7	1314.1	1315.3	1305.5	1305.5
1985-5-8	1304.7	1312	1304.7	1307.9
1985-5-9	1304.1	1308.9	1304.1	1306.3
1985-5-10	1308.4	1315.8	1308.1	1315.8
1985-5-13	1317.2	1333	1317.1	1333
1985-5-14	1334	1335.7	1322.7	1326.5
1985-5-15	1327.4	1342.4	1327.4	1342.4
1985-5-16	1343.1	1344.2	1334.8	1336.1
1985-5-17	1335.9	1335.9	1327.1	1327.4
1985-5-20	1322	1330.8	1321.1	1330.8
1985-5-21	1337.4	1337.8	1330.7	1334.1
1985-5-22	1332.7	1337.3	1332.7	1333.8
1985-5-23	1331.3	1332.1	1325.3	1325.3
1985-5-24	1323.5	1323.5	1308.3	1313.8
1985-5-28	1318.7	1318.8	1313.9	1317.4
1985-5-29	1317.4	1317.4	1305.9	1312
1985-5-30	1311.8	1315.8	1311.1	1314.7
1985-5-31	1315.7	1315.8	1309.6	1313
1985-6-3	1315.8	1325	1315.5	1324.6
1985-6-4	1324.5	1336.7	1324.5	1336.6
1985-6-5	1335.8	1336.2	1331.3	1335.9
1985-6-6	1331.8	1333.6	1322	1322
1985-6-7	1322.2	1323.1	1305	1310.6

May 1986

Date	Open	High	Low	Close
1986-4-28	1620.2	1629.5	1619.7	1628.8
1986-4-29	1635.2	1656.3	1635	1656.3
1986-4-30	1652.5	1664.4	1652.2	1660.5
1986-5-1	1631.6	1645.4	1628.1	1640.1
1986-5-2	1645.7	1652.5	1645.7	1652.5
1986-5-6	1657.1	1657.7	1636.1	1636.2
1986-5-7	1634.8	1634.8	1610.1	1610.1
1986-5-8	1609.7	1613	1588.8	1602.6
1986-5-9	1604	1605.9	1593	1601.6
1986-5-12	1603	1605.8	1602.3	1603.8
1986-5-13	1612.5	1626.2	1612.5	1623.3
1986-5-14	1605.2	1606.9	1592.7	1594.3
1986-5-15	1598.6	1600.2	1575.1	1575.7
1986-5-16	1558.2	1565.7	1554	1564.9
1986-5-19	1568.7	1573.1	1566.3	1573.1
1986-5-20	1579.8	1585.7	1579.8	1585.7
1986-5-21	1594.2	1594.8	1585.9	1591.9
1986-5-22	1589.5	1601.4	1589	1598.8
1986-5-23	1612.1	1617.4	1606.8	1617.4
1986-5-27	1615.5	1616.3	1607.1	1612.1
1986-5-28	1616.8	1626.4	1616.8	1624.8
1986-5-29	1622.1	1622.8	1606.7	1609
1986-5-30	1608.6	1611	1598.2	1602.8
1986-6-2	1604.4	1604.4	1594	1596.5
1986-6-3	1599.2	1607.3	1599.2	1602.2
1986-6-4	1599	1602.2	1597.9	1601.4
1986-6-5	1599.8	1612.6	1599.8	1612.6
1986-6-6	1617.3	1617.3	1605.6	1611.9

May 1987

Date	Open	High	Low	Close
1987-4-27	1994.9	2002.3	1979.8	1986.6
1987-4-28	1997.3	2025.7	1997.3	2022.1
1987-4-29	2028.4	2040.4	2028.4	2038.6
1987-4-30	2036	2050.9	2035.5	2050.5
1987-5-1	2064.4	2074.9	2061.7	2068.5
1987-5-5	2073.8	2073.9	2058.8	2065.1
1987-5-6	2076.3	2096.6	2075.5	2086.5
1987-5-7	2082.8	2103	2077.5	2077.9
1987-5-8	2098.5	2136.3	2098.5	2126.5
1987-5-11	2156.4	2183.9	2156.2	2163.3
1987-5-12	2142.7	2145.6	2132.4	2143.3
1987-5-13	2164.3	2168.9	2161.5	2163.4
1987-5-14	2166.4	2185.4	2163.2	2180
1987-5-15	2187.6	2202.4	2182.9	2189.7
1987-5-18	2179.4	2195.9	2173.4	2192.1
1987-5-19	2197.5	2216.6	2197.5	2214.3
1987-5-20	2190.8	2191.4	2170	2174
1987-5-21	2180.5	2180.6	2153.2	2153.7
1987-5-22	2166.7	2175.6	2163.9	2167.2
1987-5-26	2169.3	2169.3	2143.4	2153.4
1987-5-27	2155.3	2158.1	2140.2	2145.7
1987-5-28	2150.4	2164.4	2146.1	2157.4
1987-5-29	2177.5	2206.3	2177.5	2203
1987-6-1	2210	2238.2	2209.7	2228.2
1987-6-2	2230.9	2248.8	2214.5	2219.6
1987-6-3	2204.7	2236.2	2200.9	2235.4
1987-6-4	2233.3	2239.3	2202.2	2214.2
1987-6-5	2233.6	2234	2221.6	2228.7

May 1988

Date	Open	High	Low	Close
1988-4-25	1771.2	1777.9	1769.1	1777.6
1988-4-26	1791.5	1801.3	1786	1800.8
1988-4-27	1810.4	1813.9	1806	1806.7
1988-4-28	1803.4	1809.5	1795.8	1804.4
1988-4-29	1807.7	1810.7	1796	1802.2
1988-5-3	1806.2	1809.7	1801	1807.2
1988-5-4	1801.5	1809.2	1794.7	1794.7
1988-5-5	1797.1	1797.2	1788.7	1789.5
1988-5-6	1801.7	1801.7	1793.7	1801.1
1988-5-9	1802.7	1804.2	1793.3	1794.9
1988-5-10	1787.2	1792.6	1782.4	1792.6
1988-5-11	1769.5	1786.8	1749.3	1756.8
1988-5-12	1766.2	1772.4	1759.8	1772.3
1988-5-13	1774.7	1782.8	1774.7	1781.8
1988-5-16	1785.8	1789	1776.6	1776.6
1988-5-17	1786	1800.5	1782.3	1789.2
1988-5-18	1772.5	1781	1772.2	1777.6
1988-5-19	1753.7	1764.4	1753.3	1760.6
1988-5-20	1774.4	1774.7	1769.9	1770.2
1988-5-23	1768.7	1771.2	1761.1	1761.3
1988-5-24	1767.5	1783.6	1764.4	1782.9
1988-5-25	1791.4	1796.7	1785	1787.9
1988-5-26	1783	1788.1	1782.5	1785.3
1988-5-27	1781.3	1786	1779.2	1783.7
1988-5-31	1785.3	1785.6	1777.8	1784.4
1988-6-1	1802.5	1806.9	1798.9	1805.7
1988-6-2	1803.1	1813.6	1802.6	1810.3
1988-6-3	1818.6	1822	1814.1	1819.2

May 1989

Date	Open	High	Low	Close
1989-4-24	2071.1	2071.5	2061.8	2062
1989-4-25	2065.2	2076.3	2062.6	2071.2
1989-4-26	2080	2101.9	2072.2	2093.4
1989-4-27	2098.3	2119.8	2094	2115.7
1989-4-28	2129.4	2134.9	2116.2	2118
1989-5-2	2109.5	2110.1	2103.1	2103.1
1989-5-3	2099	2105.7	2093.5	2105.7
1989-5-4	2118.1	2126.3	2116.3	2119
1989-5-5	2117.7	2132.8	2117.3	2132.8
1989-5-8	2130.4	2132.5	2119.6	2119.6
1989-5-9	2128.4	2134.4	2124.3	2125.4
1989-5-10	2121	2123.1	2112.1	2117
1989-5-11	2109.2	2118.3	2107.1	2110.6
1989-5-12	2120.6	2136.9	2114	2135.7
1989-5-15	2149.9	2153.6	2145.2	2149.9
1989-5-16	2143.1	2147.7	2136	2136.7
1989-5-17	2144.9	2166.3	2142.2	2155.8
1989-5-18	2159.3	2179.5	2158.6	2177.3
1989-5-19	2189.8	2204.7	2180.5	2204.7
1989-5-22	2187.7	2209.7	2163.6	2169
1989-5-23	2157.4	2162.5	2151	2151.6
1989-5-24	2118.3	2133.7	2118.3	2132.7
1989-5-25	2128.6	2142	2126.7	2136.6
1989-5-26	2138.3	2145.7	2137.6	2140.3
1989-5-30	2137.9	2139.7	2127.3	2130
1989-5-31	2110.9	2114.8	2107.7	2114.4
1989-6-1	2118.6	2123.1	2094.8	2103.4
1989-6-2	2082.9	2102.7	2080.5	2102.6
1989-6-5	2081	2089.1	2076.5	2088.5
1989-6-6	2080.3	2107.4	2077.6	2107.4
1989-6-7	2110.9	2118.1	2103.9	2117.9
1989-6-8	2141.3	2154.5	2130.3	2143.2
1989-6-9	2146.5	2154.3	2133.2	2142.1

May 1990

Date	Open	High	Low	Close
1990-4-23	2184.6	2185.1	2159.1	2159.2
1990-4-24	2156.7	2168.7	2150.4	2159.9
1990-4-25	2157.4	2167.6	2142.9	2143.1
1990-4-26	2143.5	2145.8	2132.5	2133.6
1990-4-27	2137.3	2140.2	2105	2106.6
1990-4-30	2109.8	2109.8	2084.4	2103.4
1990-5-1	2111.8	2126	2111.4	2117.9
1990-5-2	2121.7	2145.1	2121.7	2137.6
1990-5-3	2141.6	2145.2	2130.2	2134.9
1990-5-4	2146.4	2168	2146.4	2162.2
1990-5-8	2173.3	2192.3	2173.3	2182
1990-5-9	2179.4	2179.7	2160.6	2162.7
1990-5-10	2162.9	2169.2	2157	2157
1990-5-11	2155.6	2182.3	2155.6	2175.9
1990-5-14	2203.9	2214.5	2202	2214.5
1990-5-15	2213.9	2216.1	2204.1	2212.2
1990-5-16	2213.2	2237.1	2213.2	2221.1
1990-5-17	2227.7	2284.4	2227.7	2284.4
1990-5-18	2290.2	2321.4	2268.5	2269.1
1990-5-21	2263.6	2282.1	2261.3	2282.1
1990-5-22	2303.5	2332.7	2293.3	2311.3
1990-5-23	2303.9	2335.1	2287.3	2287.4
1990-5-24	2287.9	2295.4	2269.3	2277.1
1990-5-25	2275.9	2276.3	2258.4	2265.6
1990-5-29	2259.1	2295.6	2258.7	2295.6
1990-5-30	2327.8	2347.2	2327.4	2346.2
1990-5-31	2347.1	2357.2	2333.7	2345.1
1990-6-1	2345.3	2371.4	2332.7	2371.4
1990-6-4	2383.9	2387.8	2376.4	2379
1990-6-5	2390.7	2398.9	2362.5	2380.1
1990-6-6	2365.8	2367.4	2354.5	2358.5
1990-6-7	2352	2390.3	2349.9	2378.4
1990-6-8	2373.8	2383	2363.9	2366.6

May 1991

Date	Open	High	Low	Close
1991-4-22	2507.5	2509.3	2490.8	2490.8
1991-4-23	2489.3	2509.3	2489.3	2503.8
1991-4-24	2504	2509.4	2483.5	2488.6
1991-4-25	2492.8	2494.9	2480.1	2482.1
1991-4-26	2480.6	2487.5	2470.9	2471.3
1991-4-29	2468.7	2499.9	2468.7	2498.2
1991-4-30	2487.4	2492.3	2475.6	2486.2
1991-5-1	2487.4	2508.5	2480	2508.4
1991-5-2	2522.3	2539.3	2517	2530.7
1991-5-3	2523.9	2530.4	2520.8	2522.7
1991-5-7	2521.8	2540.5	2521.5	2540.5
1991-5-8	2536.5	2540.4	2521.8	2523.4
1991-5-9	2530.4	2541.9	2530.2	2541.8
1991-5-10	2552.8	2554.9	2522.4	2524.3
1991-5-13	2500.8	2501.6	2486.4	2486.6
1991-5-14	2490.7	2492.1	2462.2	2463.7
1991-5-15	2456.3	2466.2	2449.7	2459.4
1991-5-16	2464.1	2481.1	2454.6	2471.9
1991-5-17	2473.5	2473.5	2444.6	2453.9
1991-5-20	2453	2467.1	2452.9	2466.6
1991-5-21	2471.5	2482.7	2471.5	2482.7
1991-5-22	2488.1	2492.9	2464.6	2465.9
1991-5-23	2468.6	2484.6	2468.6	2482.8
1991-5-24	2482	2482	2460.1	2471.1
1991-5-28	2476.9	2482.5	2475.6	2479.7
1991-5-29	2489.8	2493.5	2483	2492.9
1991-5-30	2494.7	2495.2	2484.1	2491.2
1991-5-31	2495.4	2507.7	2494.9	2499.5
1991-6-3	2497.7	2523	2497.7	2515.8
1991-6-4	2514.8	2521	2502.9	2506
1991-6-5	2514.3	2524.4	2507.9	2521.5
1991-6-6	2518.2	2527.7	2518.2	2525.3
1991-6-7	2521.9	2524.9	2505.4	2506.3

May 1992

Date	Open	High	Low	Close
1992-4-27	2640.9	2659.8	2640.9	2658.2
1992-4-28	2659.5	2659.5	2635.6	2651
1992-4-29	2654.4	2673.5	2650.4	2664.9
1992-4-30	2668.5	2668.5	2641	2654.1
1992-5-1	2660.1	2672.7	2650.5	2659.8
1992-5-5	2679.8	2683	2658.4	2662.2
1992-5-6	2657.1	2698.7	2652.7	2698.7
1992-5-7	2703.3	2714.1	2697.8	2701.9
1992-5-8	2695.8	2734.8	2695.3	2725.7
1992-5-11	2731.3	2744.5	2730.2	2737.8
1992-5-12	2741.5	2741.5	2718.9	2722.4
1992-5-13	2717.5	2728.1	2717.5	2720.5
1992-5-14	2721.3	2734.9	2692.5	2694.7
1992-5-15	2674.1	2684.6	2673.9	2682.6
1992-5-18	2679.8	2704.5	2678.6	2703.6
1992-5-19	2707.2	2707.5	2693.7	2700.6
1992-5-20	2713.3	2725	2707.4	2711.9
1992-5-21	2708.8	2710.1	2697.8	2702
1992-5-22	2704.2	2715.5	2697.5	2715
1992-5-26	2722	2727.1	2704.6	2704.6
1992-5-27	2696.6	2698.6	2688.4	2698.6
1992-5-28	2697.5	2707	2689.4	2694.2
1992-5-29	2703.8	2707.7	2695.3	2707.6
1992-6-1	2697.7	2703.6	2692.7	2697.6
1992-6-2	2710.5	2717.4	2705.5	2705.9
1992-6-3	2695	2708.4	2675.3	2680.9
1992-6-4	2683.6	2683.6	2663.6	2681.9
1992-6-5	2679.6	2682	2664.7	2668.5

May 1993

Date	Open	High	Low	Close
1993-4-26	2841.8	2844.3	2822	2822.3
1993-4-27	2813.5	2832.7	2811.8	2832.7
1993-4-28	2843.4	2844.2	2787.1	2797.3
1993-4-29	2794.3	2794.3	2773.7	2786.8
1993-4-30	2793.8	2813.6	2793.6	2813.1
1993-5-4	2820.3	2822.9	2812	2812.6
1993-5-5	2808.9	2809.7	2786.4	2796.5
1993-5-6	2801.2	2806	2783.9	2786.3
1993-5-7	2780.7	2793.7	2772.2	2793.7
1993-5-10	2793.5	2829.7	2793.5	2829.7
1993-5-11	2827.5	2836.1	2823.6	2836.1
1993-5-12	2844.4	2861.8	2844.4	2860.8
1993-5-13	2863.9	2867.4	2849.3	2849.3
1993-5-14	2841.9	2848.9	2838.1	2847
1993-5-17	2847	2858.7	2840.5	2858.1
1993-5-18	2863.7	2869.2	2845.9	2847.3
1993-5-19	2846	2848	2817.7	2819.7
1993-5-20	2831.7	2832.8	2814.6	2816.8
1993-5-21	2822.8	2823.5	2801.1	2812.2
1993-5-24	2812.4	2825.6	2804.3	2825.6
1993-5-25	2828.2	2837.7	2828.2	2837.7
1993-5-26	2838.9	2846.9	2832.5	2846.9
1993-5-27	2850.3	2860.5	2844.1	2855.3
1993-5-28	2854.6	2855.5	2838.9	2840.7
1993-6-1	2836.1	2849.2	2836.1	2849.2
1993-6-2	2858.4	2868.7	2858.4	2863
1993-6-3	2857.3	2857.8	2844.9	2852.8
1993-6-4	2851.6	2854.6	2829.8	2829.9

May 1994

Date	Open	High	Low	Close
1994-4-25	3134.4	3134.4	3106.1	3106.1
1994-4-26	3125.2	3137.7	3118.9	3125.3
1994-4-27	3125.2	3150	3125.2	3150
1994-4-28	3154.9	3167.3	3129.2	3129.9
1994-4-29	3118.1	3130	3105.6	3125.3
1994-5-3	3131.9	3133	3095.8	3100
1994-5-4	3094.4	3094.4	3067.6	3070.5
1994-5-5	3067.9	3106.3	3056.2	3106
1994-5-6	3110.9	3121.6	3092.3	3106
1994-5-9	3097.1	3099.7	3080.7	3097.8
1994-5-10	3097.4	3138.7	3097.4	3136.3
1994-5-11	3147.7	3147.7	3122.1	3130.5
1994-5-12	3107	3138.8	3105.3	3137.8
1994-5-13	3141.5	3141.9	3116.2	3119.2
1994-5-16	3112.9	3133.6	3112.5	3115.6
1994-5-17	3109.3	3125.2	3106.8	3123.5
1994-5-18	3155	3157.5	3115.8	3116.5
1994-5-19	3120.8	3131.1	3118.2	3122.8
1994-5-20	3139.5	3139.7	3125	3127.3
1994-5-23	3129.5	3129.9	3106.4	3108.4
1994-5-24	3103.9	3105.7	3086.1	3089.1
1994-5-25	3091.3	3091.9	3011.3	3020.7
1994-5-26	3031.2	3031.2	3004.7	3019.7
1994-5-27	3029.5	3033.7	2959.5	2966.4
1994-5-31	2976.4	2976.4	2925	2970.5
1994-6-1	2984.2	2985.9	2931.5	2931.9
1994-6-2	2943	2980.8	2942.2	2980.8
1994-6-3	2985.4	3004.4	2968.4	2997.8

May 1995

Date	Open	High	Low	Close
1995-4-24	3199.8	3209.3	3176.3	3209.3
1995-4-25	3224.8	3234.1	3211.9	3214.9
1995-4-26	3204.6	3231.3	3204.4	3226.2
1995-4-27	3241.5	3241.5	3216.2	3217.6
1995-4-28	3220.3	3232.3	3209.3	3216.7
1995-5-1	3212.8	3228.3	3211.2	3220.4
1995-5-2	3221.3	3251.6	3221	3248.2
1995-5-3	3259.6	3267.3	3254.1	3262.6
1995-5-4	3283.5	3288.2	3260.6	3264.3
1995-5-5	3254	3265.5	3250	3251.7
1995-5-9	3259.1	3267.1	3248.9	3261.2
1995-5-10	3267.3	3294.5	3267.3	3290.1
1995-5-11	3293.1	3320.6	3290.2	3317.9
1995-5-12	3325.1	3326.2	3304.2	3310.3
1995-5-15	3310.5	3324.8	3307	3310.7
1995-5-16	3308	3309.2	3295.3	3300.8
1995-5-17	3301.4	3318.2	3297.2	3297.4
1995-5-18	3290.7	3315.4	3284	3285.8
1995-5-19	3258.7	3273.7	3253.9	3261
1995-5-22	3265.1	3284.5	3264.7	3284.5
1995-5-23	3296.3	3296.3	3276.7	3291.8
1995-5-24	3306.3	3334.3	3306.3	3327.3
1995-5-25	3330.4	3360.8	3328.2	3328.2
1995-5-26	3325.8	3332.1	3305.1	3311.1
1995-5-30	3307.1	3320	3307	3309.9
1995-5-31	3317.6	3319.4	3301.4	3319.4
1995-6-1	3352.3	3353.2	3340.2	3340.6
1995-6-2	3339	3349.3	3328.6	3345
1995-6-5	3338.6	3376.6	3338.4	3376.6
1995-6-6	3384.5	3384.6	3368.8	3380
1995-6-7	3372	3380.6	3361.2	3370.8
1995-6-8	3361.3	3395	3361.3	3380.8
1995-6-9	3368.9	3370.5	3335.6	3337.7

May 1996

Date	Open	High	Low	Close
1996-4-22	3854.2	3858.9	3847.3	3852.7
1996-4-23	3839.8	3844.8	3827.6	3833
1996-4-24	3840.7	3843.8	3817.6	3817.6
1996-4-25	3804.2	3820.8	3802.9	3819.3
1996-4-26	3826.1	3837.2	3826	3832.8
1996-4-29	3834.5	3834.5	3802.8	3809.2
1996-4-30	3816.9	3820.1	3810	3817.9
1996-5-1	3816.9	3817.2	3803.4	3806
1996-5-2	3810.8	3829.4	3773.4	3776.4
1996-5-3	3753.1	3758.2	3734.6	3751.6
1996-5-7	3744.3	3755.4	3721.2	3723
1996-5-8	3718.6	3733.7	3707.3	3707.3
1996-5-9	3723.5	3732.6	3721.2	3728.3
1996-5-10	3727.2	3757.2	3727.1	3754.4
1996-5-13	3751.8	3760.9	3738	3739.2
1996-5-14	3750.9	3761.9	3746.6	3759.7
1996-5-15	3770.7	3776.4	3765.7	3776.2
1996-5-16	3767.8	3770.9	3740.2	3753.6
1996-5-17	3760.2	3791.4	3751	3789.6
1996-5-20	3795.2	3799.3	3775.8	3778.2
1996-5-21	3795.6	3795.7	3782	3789.4
1996-5-22	3783.6	3783.6	3763.1	3764.2
1996-5-23	3776.9	3780.1	3741	3747
1996-5-24	3746.8	3752.2	3733	3752.1
1996-5-28	3755	3770.6	3755	3760.2
1996-5-29	3752.3	3775.8	3751.7	3775.7
1996-5-30	3767	3770.7	3741	3746.7
1996-5-31	3753.9	3766.5	3745	3747.8
1996-6-3	3737	3747.8	3730.1	3739.2
1996-6-4	3743.9	3755.2	3735.2	3755.2
1996-6-5	3759.2	3760	3745.4	3753.4
1996-6-6	3757	3774.7	3756.5	3760.3
1996-6-7	3755.3	3755.5	3694.8	3706.8

May 1997

Date	Open	High	Low	Close
1997-4-28	4361.6	4389.7	4361.2	4389.7
1997-4-29	4402.3	4433.7	4395.4	4433.2
1997-4-30	4465.9	4466.5	4414.3	4436
1997-5-1	4435.9	4454.4	4435.9	4445
1997-5-2	4430	4468.4	4423.6	4455.6
1997-5-6	4501.1	4525.6	4472.9	4519.3
1997-5-7	4524.4	4562	4522.5	4537.5
1997-5-8	4521.8	4580.4	4517.6	4580.4
1997-5-9	4597.2	4646	4595.2	4630.9
1997-5-12	4641.8	4669.6	4622.9	4669.6
1997-5-13	4685.5	4720.3	4676.8	4691
1997-5-14	4684	4715.2	4660.4	4686.9
1997-5-15	4664.7	4681.2	4654.4	4681.2
1997-5-16	4688.9	4723.7	4686.7	4693.9
1997-5-19	4669.4	4687.7	4640.7	4645.2
1997-5-20	4646	4646.2	4600.4	4607.5
1997-5-21	4616.8	4653.8	4616.7	4642
1997-5-22	4635.7	4661.7	4626.9	4651.8
1997-5-23	4653.7	4672.7	4652.1	4661.8
1997-5-27	4661.2	4692.4	4661.2	4681.6
1997-5-28	4681.6	4705.2	4670.7	4677.5
1997-5-29	4657.8	4688.3	4656.3	4672.3
1997-5-30	4677	4684.2	4595.9	4621.3
1997-6-2	4644.7	4645.7	4549.5	4562.8
1997-6-3	4564	4565.6	4524.2	4557.8
1997-6-4	4563.8	4585.9	4553.3	4557.1
1997-6-5	4551.3	4576.3	4534.9	4576.2
1997-6-6	4588	4645	4577.5	4645

May 1998

Date	Open	High	Low	Close
1998-4-27	5861.8	5863.9	5699.9	5722.4
1998-4-28	5726.3	5823.4	5726.3	5806.6
1998-4-29	5807.3	5838.7	5774.4	5833.1
1998-4-30	5833.9	5954.9	5818.6	5928.3
1998-5-1	5932.7	6025.1	5932.7	6010.3
1998-5-5	6017.6	6064.6	5972.6	5986.5
1998-5-6	5986.9	6000	5947.4	5992.4
1998-5-7	5990.5	5990.5	5899.4	5938
1998-5-8	5941.4	5977.7	5898.5	5969.8
1998-5-11	5968.5	6030.9	5957.4	6028.3
1998-5-12	6017.7	6017.8	5955.3	5956.7
1998-5-13	5961	6000.2	5949.5	5972.9
1998-5-14	5972.5	5981.3	5898.6	5948.5
1998-5-15	5950.4	5953.2	5866.5	5917.8
1998-5-18	5916.7	5917.8	5794.5	5826.2
1998-5-19	5827.3	5895.6	5827.3	5877.8
1998-5-20	5880.7	5941.2	5880.7	5907.4
1998-5-21	5904.6	5991.1	5904.3	5935.6
1998-5-22	5931.8	5957.7	5908.8	5955.6
1998-5-26	5972.6	6023.9	5964.7	5970.7
1998-5-27	5951.9	5951.9	5836.9	5870.2
1998-5-28	5880	5905.6	5816.5	5862.3
1998-5-29	5867.6	5915.1	5865.4	5870.7
1998-6-1	5870.7	5870.7	5777.7	5837.9
1998-6-2	5839.9	5847.7	5809.9	5837.9
1998-6-3	5840	5913.6	5840	5898.4
1998-6-4	5895	5895	5820.8	5860.8
1998-6-5	5874.7	5947.3	5873.4	5947.3

May 1999

Date	Open	High	Low	Close
1999-4-26	6434.9	6521.9	6434.9	6503.6
1999-4-27	6527.5	6635.9	6522.8	6593.6
1999-4-28	6595.5	6613	6577.8	6598.8
1999-4-29	6592	6592	6493.6	6497.6
1999-4-30	6520.5	6585	6520.5	6552.2
1999-5-4	6593.5	6663.8	6515.7	6533.1
1999-5-5	6527.4	6527.4	6401.7	6401.7
1999-5-6	6427.7	6485.7	6351.8	6406.6
1999-5-7	6411.6	6411.6	6336.2	6356
1999-5-10	6374	6390.3	6280.4	6348.8
1999-5-11	6350.5	6390.4	6349.7	6378.3
1999-5-12	6385.6	6389.6	6283.1	6343.1
1999-5-13	6352.6	6466	6352.6	6456.6
1999-5-14	6460	6465.5	6261.4	6300.4
1999-5-17	6285.4	6285.4	6160.5	6165.8
1999-5-18	6191.5	6225.7	6147.6	6206.4
1999-5-19	6229.9	6268.2	6193	6266.7
1999-5-20	6285.1	6371.3	6285.1	6368.2
1999-5-21	6368.8	6391.9	6345.1	6353.1
1999-5-24	6362.8	6462.3	6322.1	6322.1
1999-5-25	6280.8	6280.8	6184.8	6249.3
1999-5-26	6244.2	6292	6178.1	6236.8
1999-5-27	6246.8	6279.8	6155.2	6199.5
1999-5-28	6193.5	6229.1	6110.1	6226.2
1999-6-1	6231	6354.3	6227.5	6250
1999-6-2	6248	6313.8	6243.1	6302.2
1999-6-3	6315.9	6359.7	6302.2	6348.6
1999-6-4	6348.2	6365.8	6274.1	6361.5

May 2000

Date	Open	High	Low	Close
2000-4-25	6241.2	6313.8	6155.7	6283
2000-4-26	6283	6342.2	6247	6256.5
2000-4-27	6256.5	6306.2	6127.9	6179.3
2000-4-28	6179.3	6341.9	6179.3	6327.4
2000-5-2	6327.4	6412.6	6311.9	6373.4
2000-5-3	6373.4	6373.4	6176.1	6184.8
2000-5-4	6184.8	6231.4	6162.5	6199.6
2000-5-5	6199.6	6267.9	6190.5	6238.8
2000-5-8	6238.8	6299.4	6174.3	6216.3
2000-5-9	6216.3	6243.1	6112.9	6123.8
2000-5-10	6123.8	6182.9	6090.2	6100.6
2000-5-11	6100.6	6263.6	6051.5	6245.9
2000-5-12	6245.9	6304.2	6220.6	6283.5
2000-5-15	6283.5	6290.5	6218.2	6247.7
2000-5-16	6247.7	6349.1	6247.7	6318.4
2000-5-17	6318.4	6321.6	6189.2	6196.2
2000-5-18	6196.2	6256	6196.2	6232.9
2000-5-19	6232.9	6237.6	6039.1	6045.4
2000-5-22	6045.4	6130.1	5991.9	6035.5
2000-5-23	6035.5	6128.5	6026.1	6086.8
2000-5-24	6086.8	6127.1	5997.6	6118.6
2000-5-25	6118.6	6234.6	6118.6	6231.1
2000-5-26	6231.1	6252.2	6153.2	6216.9
2000-5-30	6216.9	6379.7	6216.9	6359.6
2000-5-31	6359.6	6419.9	6325.5	6359.3
2000-6-1	6359.3	6476.9	6344.4	6470.5
2000-6-2	6470.5	6634.9	6445.5	6626.4
2000-6-5	6626.4	6635.7	6540.4	6546.7
2000-6-6	6546.7	6619.6	6490	6546.8
2000-6-7	6546.8	6546.8	6476.4	6503.8
2000-6-8	6503.8	6592.7	6469.8	6496.6
2000-6-9	6496.6	6512.4	6438.1	6443.8

May 2001

Date	Open	High	Low	Close
2001-4-23	5879.8	5889.1	5834.5	5871.3
2001-4-24	5871.3	5910.6	5824.3	5840.3
2001-4-25	5840.3	5840.3	5788.2	5827.5
2001-4-26	5827.5	5868.3	5777.6	5868.3
2001-4-27	5868.3	5976.9	5837.6	5951.4
2001-4-30	5951.4	5995.4	5948	5966.9
2001-5-1	5966.9	5966.9	5917	5928
2001-5-2	5928	5963.8	5896.4	5904.2
2001-5-3	5904.2	5904.2	5755.7	5765.8
2001-5-4	5765.8	5871.7	5753.9	5870.3
2001-5-8	5870.3	5893.7	5842.6	5886.4
2001-5-9	5886.4	5905.3	5826.8	5893.7
2001-5-10	5893.7	5987.5	5874.5	5964
2001-5-11	5964	5977.5	5890.4	5896.8
2001-5-14	5896.8	5896.8	5690.5	5690.5
2001-5-15	5690.5	5858.2	5690.5	5842.9
2001-5-16	5842.9	5884.7	5767.7	5884
2001-5-17	5884	5968.4	5884	5904.5
2001-5-18	5904.5	5942.2	5888.9	5915
2001-5-21	5915	5978.3	5897.8	5941.6
2001-5-22	5941.6	5993.7	5936.8	5976.6
2001-5-23	5976.6	5976.6	5897.4	5897.4
2001-5-24	5897.4	5950	5889.3	5915.9
2001-5-25	5915.9	5929.8	5859.8	5889.8
2001-5-29	5889.8	5906.6	5840.8	5863.9
2001-5-30	5863.9	5863.9	5788.9	5796.9
2001-5-31	5796.9	5829.8	5733.8	5796.1
2001-6-1	5796.1	5833.4	5766.6	5809.6
2001-6-4	5809.6	5861.8	5809.1	5856.5
2001-6-5	5856.5	5923.9	5842.2	5922.5
2001-6-6	5922.5	5959.7	5891.9	5901.5
2001-6-7	5901.5	5948.3	5887.4	5948.3
2001-6-8	5948.3	5981.8	5934.8	5950.6

May 2002

Date	Open	High	Low	Close
2002-4-22	5243.6	5243.6	5209.5	5221.5
2002-4-23	5221.5	5241.6	5171.5	5191
2002-4-24	5191	5225.3	5169	5218.2
2002-4-25	5218.2	5218.2	5116	5197.5
2002-4-26	5197.5	5218	5141.9	5159
2002-4-29	5159	5171.4	5123.7	5153.9
2002-4-30	5153.9	5168.8	5131.9	5165.6
2002-5-1	5165.6	5177.7	5125	5125.5
2002-5-2	5125.5	5192.7	5125.5	5174.1
2002-5-3	5174.1	5236	5146.5	5203.1
2002-5-7	5203.1	5203.1	5082.7	5119.9
2002-5-8	5119.9	5209.1	5119.9	5209.1
2002-5-9	5209.1	5216.6	5178.3	5197.6
2002-5-10	5197.6	5204.3	5160.2	5171.2
2002-5-13	5171.2	5208.2	5147.5	5204.8
2002-5-14	5204.8	5260.9	5181.9	5239.5
2002-5-15	5239.5	5272.2	5236.7	5259.1
2002-5-16	5259.1	5278.9	5241.9	5248.5
2002-5-17	5248.5	5282.2	5211.9	5218
2002-5-20	5218	5246.5	5200.3	5208.1
2002-5-21	5208.1	5242.4	5187.6	5197.2
2002-5-22	5197.2	5200.5	5137	5151.9
2002-5-23	5151.9	5195.9	5129.4	5175.3
2002-5-24	5175.3	5197.1	5166.8	5169.1
2002-5-27	5169.1	5187.9	5136	5136.3
2002-5-28	5136.3	5169.1	5062.4	5074.2
2002-5-29	5074.2	5085.1	5056.4	5083
2002-5-30	5083	5083	5016.9	5040.8
2002-5-31	5040.8	5085.1	5036.3	5085.1
2002-6-5	5085.1	5085.1	4971.4	4989.1
2002-6-6	4989.1	5016.7	4951.4	4957.6
2002-6-7	4957.6	4957.6	4851.2	4920.4

May 2003

Date	Open	High	Low	Close
2003-4-22	3889.2	3924.2	3873.9	3917.7
2003-4-23	3917.7	3997.3	3917.7	3966.5
2003-4-24	3966.5	3977.8	3892.2	3899
2003-4-25	3899	3919.4	3859.9	3870.2
2003-4-28	3870.2	3943	3855.5	3940.3
2003-4-29	3940.3	3976.2	3915	3927.8
2003-4-30	3927.8	3943	3912.3	3926
2003-5-1	3926	3926	3875.3	3880.1
2003-5-2	3880.1	3952.6	3880.1	3952.6
2003-5-6	3952.6	4007	3952.6	4006.4
2003-5-7	4006.4	4038.5	3981.7	3992.9
2003-5-8	3992.9	3992.9	3919.5	3928.9
2003-5-9	3928.9	3974.5	3912.8	3969.4
2003-5-12	3969.4	3991	3941.1	3987.4
2003-5-13	3987.4	4008.8	3976.1	3999.9
2003-5-14	3999.9	4023.2	3971.7	3975
2003-5-15	3975	4020.3	3965.6	4011.1
2003-5-16	4011.1	4080.8	4011.1	4049
2003-5-19	4049	4049	3932.5	3941.3
2003-5-20	3941.3	3985	3928.4	3971.6
2003-5-21	3971.6	3971.6	3907.8	3936.4
2003-5-22	3936.4	3990.4	3936.4	3990.4
2003-5-23	3990.4	4012	3954	3979.8
2003-5-27	3979.8	4000.7	3920.2	3992.4
2003-5-28	3992.4	4073.1	3992.4	4071.9
2003-5-29	4071.9	4095.5	4044.4	4083.6
2003-5-30	4083.6	4096	4048.1	4048.1
2003-6-2	4048.1	4129.3	4048.1	4129.3
2003-6-3	4129.3	4129.3	4074.4	4115.7
2003-6-4	4115.7	4143.5	4093.1	4126.6
2003-6-5	4126.6	4148.4	4083.1	4104.3
2003-6-6	4104.3	4178.5	4104.3	4150.8

May 2004

Date	Open	High	Low	Close
2004-4-26	4570	4586.9	4566.3	4571.8
2004-4-27	4571.8	4582.3	4550.2	4575.7
2004-4-28	4575.7	4584.5	4524.5	4524.5
2004-4-29	4524.5	4540.8	4494.6	4519.5
2004-4-30	4519.5	4529	4489.7	4489.7
2004-5-4	4489.7	4553.8	4489.7	4547.2
2004-5-5	4547.2	4573.7	4528.6	4569.5
2004-5-6	4569.5	4571.1	4511.7	4516.2
2004-5-7	4516.2	4531.2	4463.2	4498.4
2004-5-10	4498.4	4498.4	4395.2	4395.2
2004-5-11	4395.2	4454.7	4395.2	4454.7
2004-5-12	4454.7	4457.7	4410	4412.9
2004-5-13	4412.9	4454.1	4412.9	4453.8
2004-5-14	4453.8	4453.8	4412.3	4441.8
2004-5-17	4441.8	4441.8	4363	4403
2004-5-18	4403	4422.1	4403	4414.4
2004-5-19	4414.4	4471.8	4414.4	4471.8
2004-5-20	4471.8	4471.8	4418.8	4428.7
2004-5-21	4428.7	4453.5	4414.4	4431.4
2004-5-24	4431.4	4466.5	4422.8	4428.9
2004-5-25	4428.9	4428.9	4396.6	4418
2004-5-26	4418	4460.6	4415.3	4438.3
2004-5-27	4438.3	4470.3	4429	4453.6
2004-5-28	4453.6	4471.3	4423.1	4430.7
2004-6-1	4430.7	4448.4	4411.4	4422.7
2004-6-2	4422.7	4462.1	4422.7	4422.8
2004-6-3	4422.8	4435.4	4400.7	4435.4
2004-6-4	4435.4	4457	4428.3	4454.4

May 2005

Date	Open	High	Low	Close
2005-4-25	4849.3	4867.8	4841.3	4864.9
2005-4-26	4864.9	4879.6	4831.5	4845.5
2005-4-27	4845.5	4845.5	4780.6	4789.4
2005-4-28	4789.4	4820.7	4775.5	4790.2
2005-4-29	4790.2	4824.4	4773.7	4801.7
2005-5-3	4801.7	4862.9	4801.7	4861.2
2005-5-4	4861.2	4882.5	4847.9	4882.5
2005-5-5	4882.5	4917.6	4882.5	4902.3
2005-5-6	4902.3	4924.6	4897.6	4918.9
2005-5-9	4918.9	4928.7	4895.1	4910.3
2005-5-10	4910.3	4929.1	4880.2	4892.4
2005-5-11	4892.4	4896.6	4868.2	4875.4
2005-5-12	4875.4	4909.8	4875.4	4893.2
2005-5-13	4893.2	4893.2	4854.2	4886.5
2005-5-16	4886.5	4887.7	4869	4884.2
2005-5-17	4884.2	4902	4880.7	4898.5
2005-5-18	4898.5	4956.9	4898.5	4949.4
2005-5-19	4949.4	4972.9	4949.4	4962.7
2005-5-20	4962.7	4981.1	4962.7	4971.8
2005-5-23	4971.8	4991.6	4971.8	4989.8
2005-5-24	4989.8	4990.2	4974.2	4982.5
2005-5-25	4982.5	4983.6	4964.1	4971.5
2005-5-26	4971.5	5004.3	4956.8	4994.9
2005-5-27	4994.9	5002	4976.6	4986.3
2005-5-31	4986.3	4999.7	4964	4964
2005-6-1	4964	5011	4964	5011
2005-6-2	5011	5014.9	4996.5	5005
2005-6-3	5005	5016.6	4987.2	4999.4

May 2006

Date	Open	High	Low	Close
2006-4-24	6132.7	6136.5	6098.7	6098.7
2006-4-25	6098.7	6128.8	6084.6	6086.6
2006-4-26	6086.6	6126.5	6086.6	6104.3
2006-4-27	6104.3	6104.6	6026.2	6060
2006-4-28	6060	6060	6023.1	6023.1
2006-5-2	6023.1	6090.7	6022.3	6082.1
2006-5-3	6082.1	6100	6008.7	6010
2006-5-4	6010	6045.8	6001.1	6036.9
2006-5-5	6036.9	6093.1	6033.9	6091.7
2006-5-8	6091.7	6133.5	6058.8	6067.1
2006-5-9	6067.1	6109.7	6054.6	6105.6
2006-5-10	6105.6	6110	6079.6	6083.4
2006-5-11	6083.4	6114.5	6039.9	6042
2006-5-12	6042	6042	5912.1	5912.1
2006-5-15	5912.1	5912.1	5755.4	5841.3
2006-5-16	5841.3	5883.2	5807.1	5846.2
2006-5-17	5846.2	5871.6	5675.5	5675.5
2006-5-18	5675.5	5719.7	5618.7	5671.6
2006-5-19	5671.6	5715	5645.4	5657.4
2006-5-22	5657.4	5657.4	5510.5	5532.7
2006-5-23	5532.7	5705.9	5532.7	5678.7
2006-5-24	5678.7	5678.7	5563.5	5587.1
2006-5-25	5587.1	5677.7	5562	5677.7
2006-5-26	5677.7	5791	5677.7	5791
2006-5-30	5791	5793.6	5643.3	5652
2006-5-31	5652	5743.8	5591.5	5723.8
2006-6-1	5723.8	5754.8	5680.6	5749.7
2006-6-2	5749.7	5802.9	5745.7	5764.6

May 2007

Date	Open	High	Low	Close
2007-4-23	6486.8	6504.5	6466.1	6479.7
2007-4-24	6479.7	6493.1	6408.4	6429.5
2007-4-25	6429.5	6479	6429.5	6461.9
2007-4-26	6461.9	6511.1	6443.7	6469.4
2007-4-27	6469.4	6469.4	6410.6	6418.7
2007-4-30	6418.7	6474.7	6410.5	6449.2
2007-5-1	6449.2	6449.2	6395.5	6419.6
2007-5-2	6419.6	6489	6419.6	6484.5
2007-5-3	6484.5	6542.5	6484.5	6537.8
2007-5-4	6537.8	6614.7	6537.8	6603.7
2007-5-8	6603.7	6603.7	6537.5	6550.4
2007-5-9	6550.4	6592.4	6529	6549.6
2007-5-10	6549.6	6565.1	6515	6524.1
2007-5-11	6524.1	6577	6451.9	6565.7
2007-5-14	6565.7	6596.3	6530.3	6555.5
2007-5-15	6555.5	6579	6532.9	6568.6
2007-5-16	6568.6	6578.6	6539.4	6559.5
2007-5-17	6559.5	6588.7	6553.6	6579.3
2007-5-18	6579.3	6656.3	6579.1	6640.9
2007-5-21	6640.9	6675	6619.4	6636.8
2007-5-22	6636.8	6641.9	6594.6	6606.6
2007-5-23	6606.6	6643.8	6602.5	6616.4
2007-5-24	6616.4	6619.5	6560.5	6565.4
2007-5-25	6565.4	6575.2	6532.5	6570.5
2007-5-29	6570.5	6613.4	6570.5	6606.5
2007-5-30	6606.5	6606.5	6533.5	6602.1
2007-5-31	6602.1	6650.2	6602.1	6621.4
2007-6-1	6621.4	6676.7	6621.3	6676.7
2007-6-4	6676.7	6686.1	6641.2	6664.1
2007-6-5	6664.1	6686.6	6625.7	6632.8
2007-6-6	6632.8	6636.9	6511.7	6522.7
2007-6-7	6522.7	6574.9	6478	6505.1
2007-6-8	6505.1	6519.4	6451.4	6505.1

May 2008

Date	Open	High	Low	Close
2008-4-28	6091.4	6134.5	6083.5	6090.4
2008-4-29	6090.4	6133.5	6051.6	6089.4
2008-4-30	6089.4	6120.3	6035.8	6087.3
2008-5-1	6087.3	6118.2	6066	6087.3
2008-5-2	6087.3	6223.9	6087.3	6215.5
2008-5-6	6215.5	6233.7	6155.9	6215.2
2008-5-7	6215.2	6275	6214.1	6261
2008-5-8	6256.5	6273.3	6217	6270.8
2008-5-9	6270.8	6270.8	6167.6	6204.7
2008-5-12	6204.7	6251.9	6184.8	6220.6
2008-5-13	6220.6	6268.1	6142.3	6211.9
2008-5-14	6211.9	6253.1	6167.9	6216
2008-5-15	6216	6258.5	6168.8	6251.8
2008-5-16	6251.8	6348.6	6251.8	6304.3
2008-5-19	6304.3	6377	6302.8	6376.5
2008-5-20	6376.5	6376.5	6191.6	6191.6
2008-5-21	6191.6	6257.3	6183.5	6198.1
2008-5-22	6198.1	6226.2	6159.4	6181.6
2008-5-23	6181.6	6182.9	6087.3	6087.3
2008-5-27	6087.3	6141.7	6048.7	6058.5
2008-5-28	6058.5	6122.2	6052.5	6069.6
2008-5-29	6069.6	6130.5	6041.1	6068.1
2008-5-30	6068.1	6111.6	6044.7	6053.5
2008-6-2	6053.5	6060.8	5978.4	6007.6
2008-6-3	6007.6	6059	5993.3	6057.7
2008-6-4	6057.7	6057.7	5933.3	5970.1
2008-6-5	5970.1	6005.1	5941	5995.3
2008-6-6	5995.3	6074.5	5906.5	5906.8

2. Summary tables for the results of case studies in Chapter Six:

May Falls

May in year	Month Number	Total Falls	Major falls	Crashes about 10%	Number of Candlestick Signals
1984	1	4	2	0	5
1985	2	2	0	0	4
1986	3	3	1	0	3
1987	4	1	0	0	1
1988	5	3	0	0	4
1989	6	3	1	0	2
1990	7	1	0	0	2
1991	8	1	0	0	4
1992	9	2	0	0	5
1993	10	3	0	0	5
1994	11	1	1	0	5
1995	12	1	0	0	2
1996	13	2	0	0	3
1997	14	2	0	0	4
1998	15	3	0	0	3
1999	16	3	2	0	6
2000	17	3	2	0	6
2001	18	3	1	0	3
2002	19	2	1	0	4
2003	20	3	0	0	2
2004	21	3	1	0	3
2005	22	1	0	0	2
2006	23	1	1	1	0
2007	24	2	0	0	3
2008	25	2	1	0	2
Total	25	55	14	1	83

Major Falls	
Candlestick Signals	Number of Signals
Doji and Doji Star	12
Long Black	19
Hanging Man	6
Spinning Top	8
Shooting Star	9
Black Marubozu	2
Total	56
Candlestick Patterns	Number of Signals
Dark Cloud Cover	12
Three Black crows	6
Three inside Down	3
Bearish Engulfing	6
Total	27
Total signals	
Candlestick Signals	Number of Signals
Single Candlesticks	56
Candlestick Patterns	27
Total signals	83

May advances

May in year	Month Number	Total Advances in May	Major Advances	Increase above 10%	Number of Candlestick signals
1984	1	1	0	0	0
1985	2	2	0	0	3
1986	3	2	0	0	0
1987	4	1	1	1	1
1988	5	2	0	0	1
1989	6	2	1	0	6
1990	7	2	1	1	3
1991	8	2	0	0	5
1992	9	2	0	0	4
1993	10	3	0	0	3
1994	11	0	0	0	2
1995	12	3	1	0	3
1996	13	1	0	0	2
1997	14	2	1	0	3
1998	15	2	0	0	4
1999	16	1	0	0	1
2000	17	1	1	1	3
2001	18	2	0	0	3
2002	19	1	0	0	3
2003	20	3	0	0	3
2004	21	3	0	0	2
2005	22	2	0	0	5
2006	23	1	0	0	0
2007	24	3	0	0	5
2008	25	2	0	0	5
Total	25	46	6	3	70

Major Advances	
Candlestick Signals	Number of Signals
Doji and Doji Stars	13
Long White	17
White Marubozu	1
Hammer	10
Inverted Hammer	4
Total	45
Candlestick Patterns	
Three Advanced Soldiers	7
Three Inside Up	6
Bullish Engulfing	5
Bullish Harami	6
Evening Star	1
Total	25

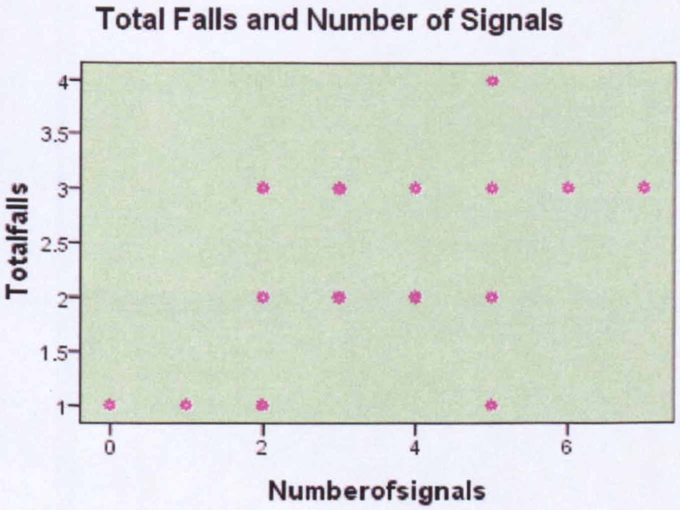
Major Advances	
Candlestick Signals	Number of Signals
Single Candlesticks	45
Candlestick Patterns	25
Total	70

3. Computing outputs of correlation and regression analysis:

For May Falls

Total Number of May Falls and Total Number of Candlestick Signals

Scatter Diagram



Correlation

Correlations

		Total falls	Number of signals
Total falls	Pearson Correlation	1.000	.391*
	Sig. (1-tailed)		.027
	N	25	25
Number of signals	Pearson Correlation	.391*	1.000
	Sig. (1-tailed)	.027	
	N	25	25

*. Correlation is significant at the 0.05 level (1-tailed).

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Number of signals	.	Enter

a. All requested variables entered.

b. Dependent Variable: Totalfalls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.153	.116	.858

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Total falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.062	1	3.062	4.159	.053[a]
	Residual	16.938	23	.736		
	Total	20.000	24			

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Total falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.456	.403		3.613	.001
	Number of signals	.219	.107	.391	2.039	.053

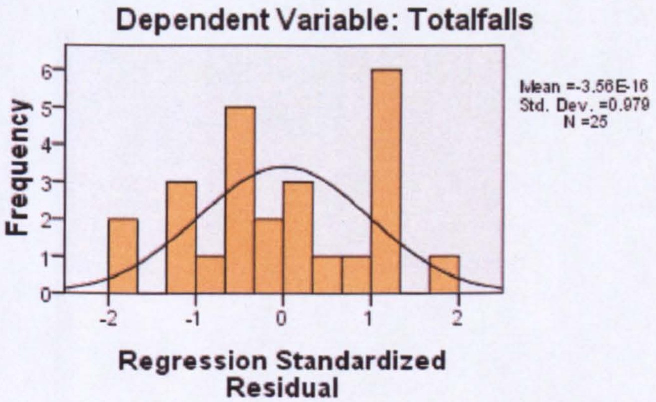
a. Dependent Variable: Total falls

Residuals Statistics[a]

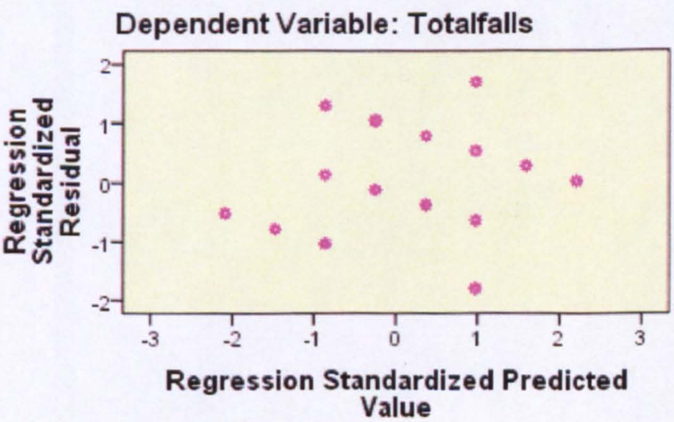
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.46	2.99	2.20	.357	25
Residual	-1.550	1.450	.000	.840	25
Std. Predicted Value	-2.082	2.205	.000	1.000	25
Std. Residual	-1.806	1.690	.000	.979	25

a. Dependent Variable: Total falls

Histogram

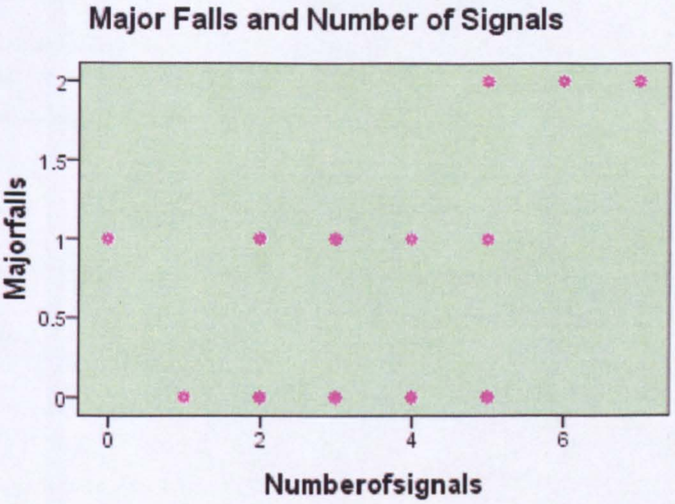


Scatterplot



Major Falls and Total Number of signals

Scatter Diagram



Correlation

Correlations

		Major falls	Number of signals
Major falls	Pearson Correlation	1.000	.373*
	Sig. (1-tailed)		.033
	N	25	25
Number of signals	Pearson Correlation	.373*	1.000
	Sig. (1-tailed)	.033	
	N	25	25

*. Correlation is significant at the 0.05 level (1-tailed).

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Number of signals[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.373[a]	.139	.102	.675

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.690	1	1.690	3.713	.066[a]
	Residual	10.470	23	.455		
	Total	12.160	24			

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Major falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.007	.317		.024	.981
	Number of signals	.163	.084	.373	1.927	.066

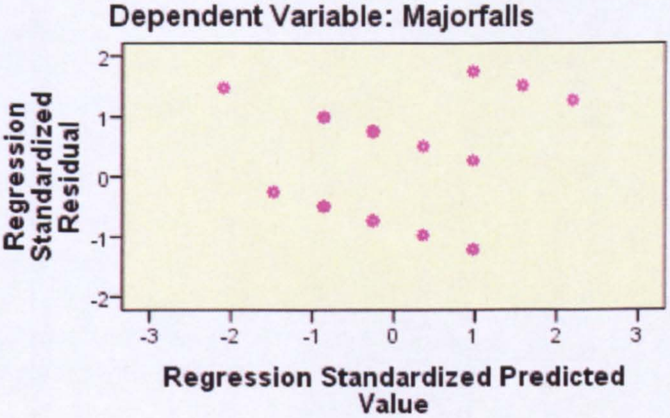
a. Dependent Variable: Major falls

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.01	1.14	.56	.265	25
Residual	-.820	1.180	.000	.660	25
Std. Predicted Value	-2.082	2.205	.000	1.000	25
Std. Residual	-1.215	1.749	.000	.979	25

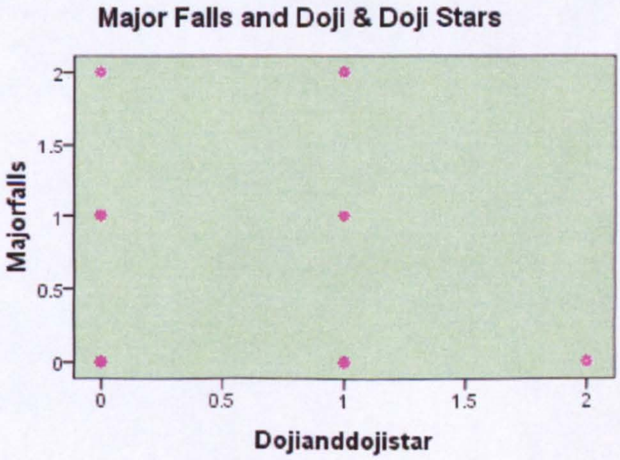
a. Dependent Variable: Major falls

Scatterplot



Major Falls and Doji & Doji Stars

Scatter Diagram



Correlation

Correlations

		Major falls	Doji and doji star
Major falls	Pearson Correlation	1.000	.028
	Sig. (1-tailed)		.447
	N	25	25
Doji and doji star	Pearson Correlation	.028	1.000
	Sig. (1-tailed)	.447	
	N	25	25

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Major falls
  /METHOD=ENTER Doji and doji star
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS HIST(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Doji and doji star[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.028[a]	.001	-.043	.727

a. Predictors: (Constant), Doji and doji star

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.010	1	.010	.018	.894[a]
	Residual	12.150	23	.528		
	Total	12.160	24			

a. Predictors: (Constant), Doji and doji star

b. Dependent Variable: Major falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.544	.189		2.869	.009
	Doji and doji star	.034	.253	.028	.134	.894

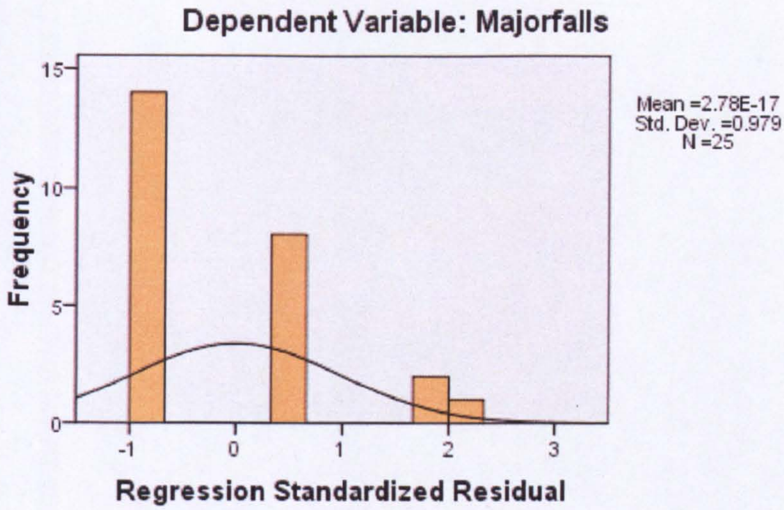
a. Dependent Variable: Major falls

Residuals Statistics[a]

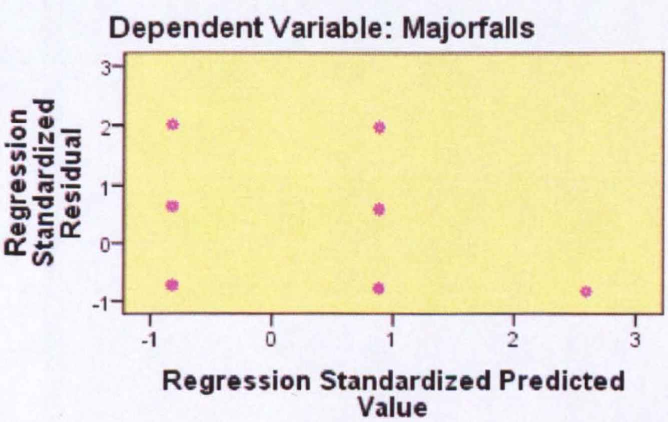
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.54	.61	.56	.020	25
Residual	-.612	1.456	.000	.712	25
Std. Predicted Value	-.819	2.594	.000	1.000	25
Std. Residual	-.842	2.004	.000	.979	25

a. Dependent Variable: Major falls

Histogram

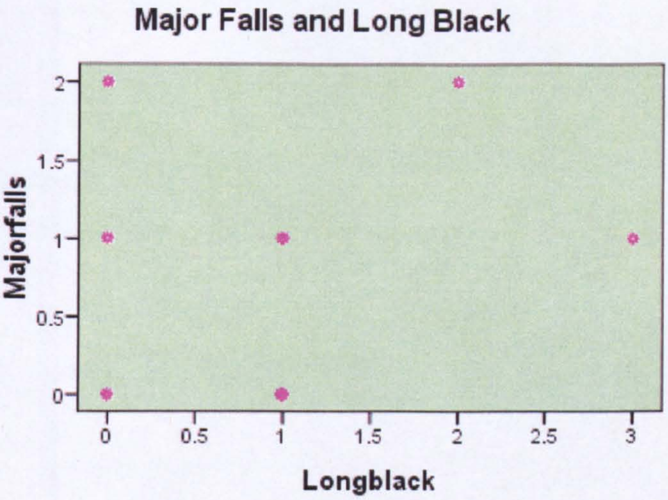


Scatterplot



Major falls and Long Black

Scatter Diagram



Correlation

Correlations

		Major falls	Long black
Major falls	Pearson Correlation	1.000	.029
	Sig. (1-tailed)		.445
	N	25	25
Long black	Pearson Correlation	.029	1.000
	Sig. (1-tailed)	.445	
	N	25	25

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Major falls
  /METHOD=ENTER Long black
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
```

```
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Long black[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.029[a]	.001	-.043	.727

a. Predictors: (Constant), Long black

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.010	1	.010	.020	.890[a]
	Residual	12.150	23	.528		
	Total	12.160	24			

a. Predictors: (Constant), Long black

b. Dependent Variable: Major falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.538	.213		2.525	.019
	Long black	.029	.205	.029	.140	.890

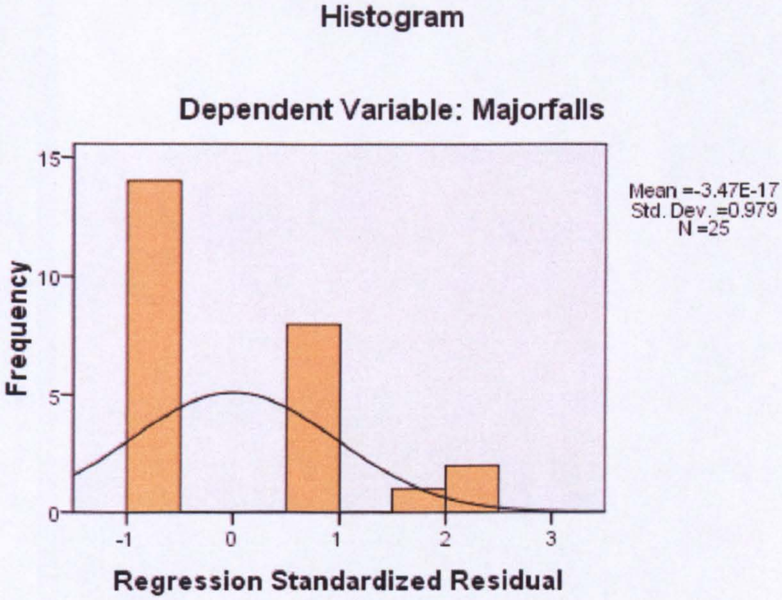
a. Dependent Variable: Major falls

Residuals Statistics[a]

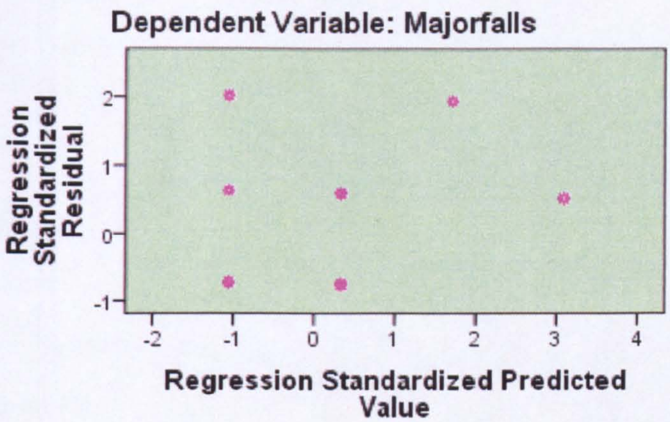
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.54	.62	.56	.021	25
Residual	-.567	1.462	.000	.712	25
Std. Predicted Value	-1.051	3.096	.000	1.000	25
Std. Residual	-.780	2.011	.000	.979	25

a. Dependent Variable: Major falls

Regression Charts

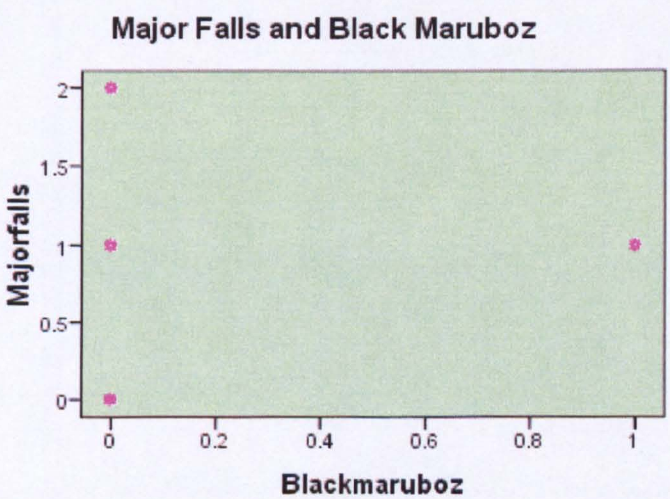


Scatterplot



<u>Major Falls and Black Maruboz</u>

Scatter Diagram



Correlations

Correlations

		Major falls	Black maruboz
Major falls	Pearson Correlation	1.000	.186
	Sig. (1-tailed)		.187
	N	25	25
Black maruboz	Pearson Correlation	.186	1.000
	Sig. (1-tailed)	.187	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Black maruboz
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Black maruboz[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.421	1	.421	.825	.373[a]
	Residual	11.739	23	.510		
	Total	12.160	24			

a. Predictors: (Constant), Black maruboz

b. Dependent Variable: Major falls

Coefficients[a]

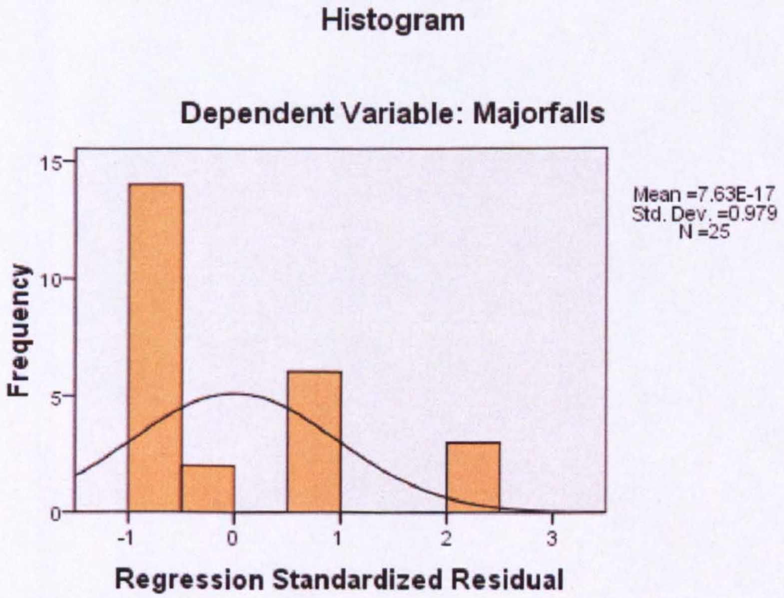
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.522	.149		3.502	.002
	Black maruboz	.478	.527	.186	.908	.373

a. Dependent Variable: Major falls

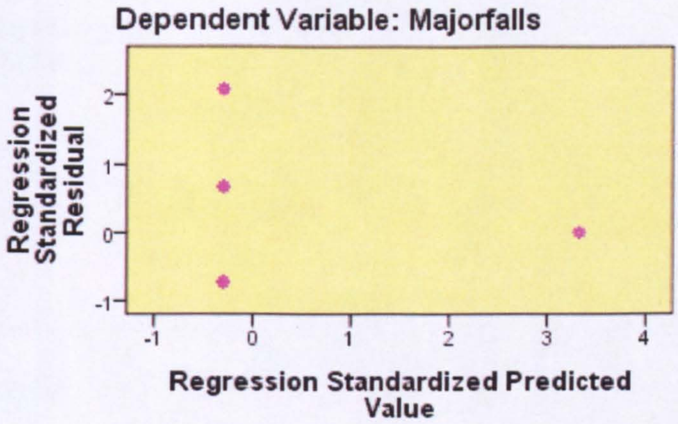
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.52	1.00	.56	.132	25
Residual	-.522	1.478	.000	.699	25
Std. Predicted Value	-.289	3.323	.000	1.000	25
Std. Residual	-.730	2.069	.000	.979	25

a. Dependent Variable: Major falls

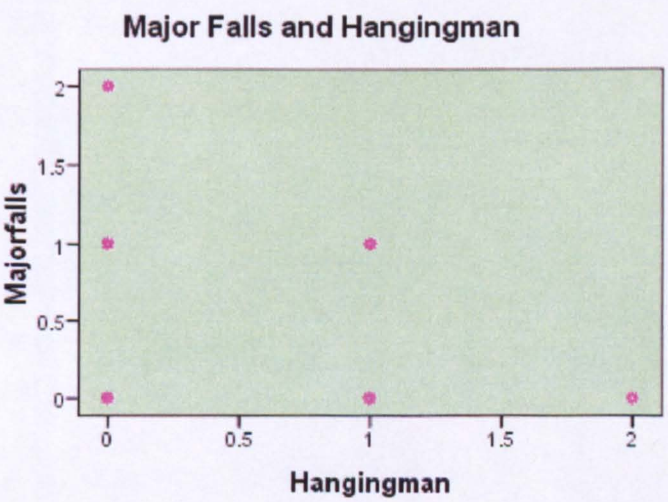


Scatterplot



<u>**Major Falls and Hanging Man**</u>

Scatter Diagram



Correlation

Correlations

		Major falls	Hanging man
Major falls	Pearson Correlation	1.000	-.152
	Sig. (1-tailed)		.234
	N	25	25
Hanging man	Pearson Correlation	-.152	1.000
	Sig. (1-tailed)	.234	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Hanging man
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Hanging man[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.152[a]	.023	-.019	.719

a. Predictors: (Constant), Hanging man

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.282	1	.282	.546	.467[a]
	Residual	11.878	23	.516		
	Total	12.160	24			

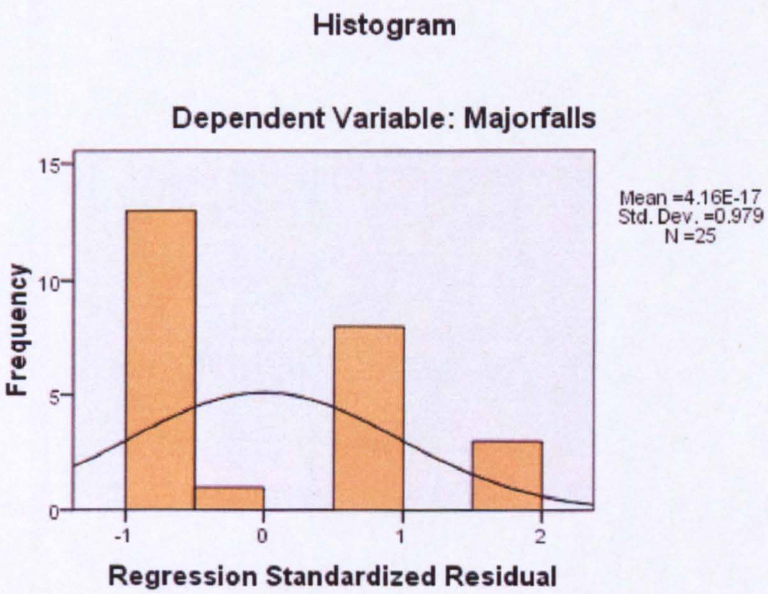
a. Predictors: (Constant), Hanging man

b. Dependent Variable: Major falls

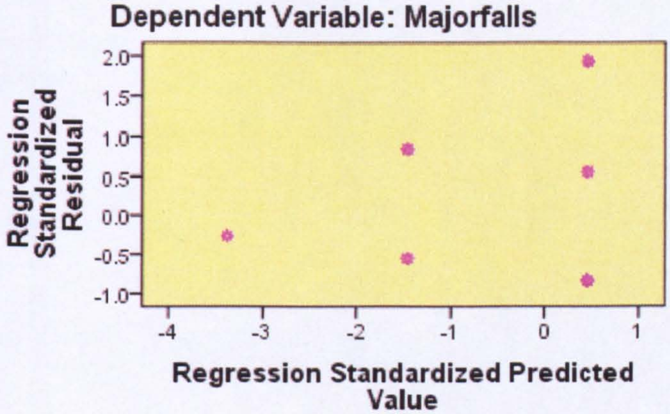
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.20	.61	.56	.108	25
Residual	-.610	1.390	.000	.704	25
Std. Predicted Value	-3.366	.459	.000	1.000	25
Std. Residual	-.848	1.935	.000	.979	25

a. Dependent Variable: Major falls

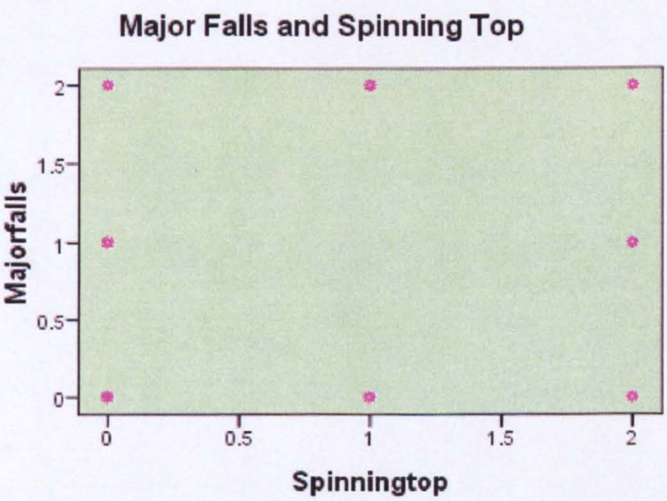


Scatterplot



Major Falls and Spinning Top

Scatter Diagram



Correlation

Correlations

		Major falls	Spinning top
Major falls	Pearson Correlation	1.000	.298
	Sig. (1-tailed)		.074
	N	25	25
Spinning top	Pearson Correlation	.298	1.000
	Sig. (1-tailed)	.074	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Spinning top
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Spinning top[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.083	1	1.083	2.249	.147[a]
	Residual	11.077	23	.482		
	Total	12.160	24			

a. Predictors: (Constant), Spinning top

b. Dependent Variable: Major falls

Coefficients[a]

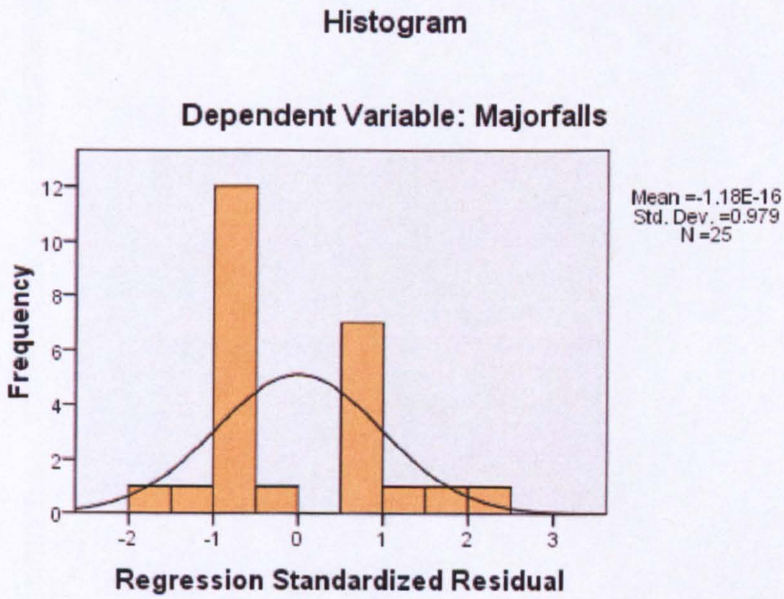
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.462	.154		3.006	.006
	Spinning top	.308	.205	.298	1.500	.147

a. Dependent Variable: Major falls

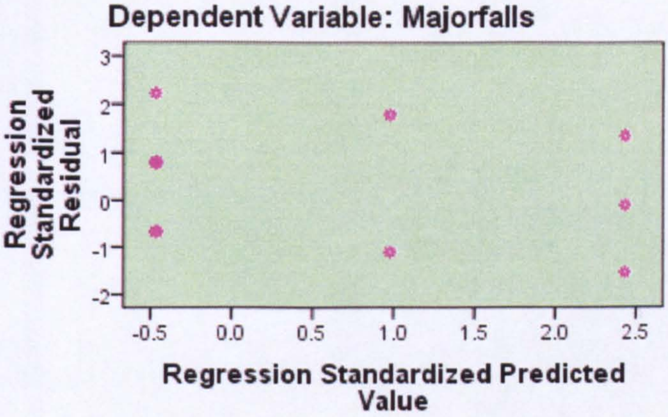
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.46	1.08	.56	.212	25
Residual	-1.077	1.538	.000	.679	25
Std. Predicted Value	-.463	2.433	.000	1.000	25
Std. Residual	-1.552	2.217	.000	.979	25

a. Dependent Variable: Major falls



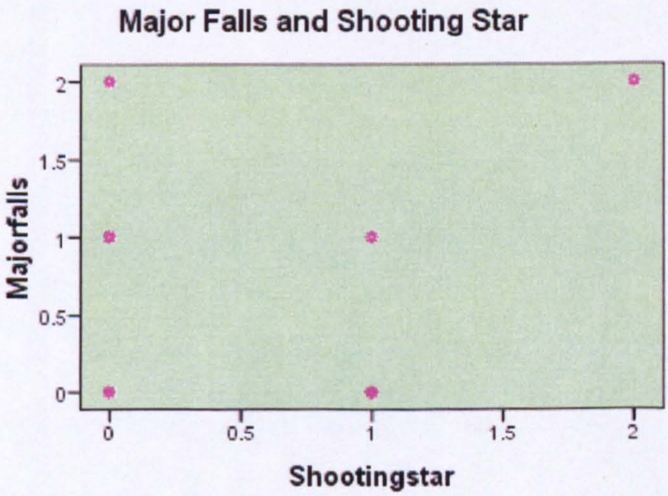
Scatterplot



Major Falls and Shooting Star

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Shooting star WITH Major falls
  /MISSING=LISTWISE
  /TITLE='Major Falls and Shooting Star'.
```



Correlation

```
/VARIABLES=Major falls Shooting star
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Majorfalls	Shootingstar
Majorfalls	Pearson Correlation	1.000	-.004
	Sig. (1-tailed)		.492
	N	25	25
Shootingstar	Pearson Correlation	-.004	1.000
	Sig. (1-tailed)	.492	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Majorfalls
/METHOD=ENTER Shootingstar
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Shooting star[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.004[a]	.000	-.043	.727

a. Predictors: (Constant), Shooting star

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.000	1	.000	.000	.984[a]
	Residual	12.160	23	.529		
	Total	12.160	24			

a. Predictors: (Constant), Shooting star

b. Dependent Variable: Major falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.562	.173		3.245	.004
	Shooting star	-.005	.261	-.004	-.020	.984

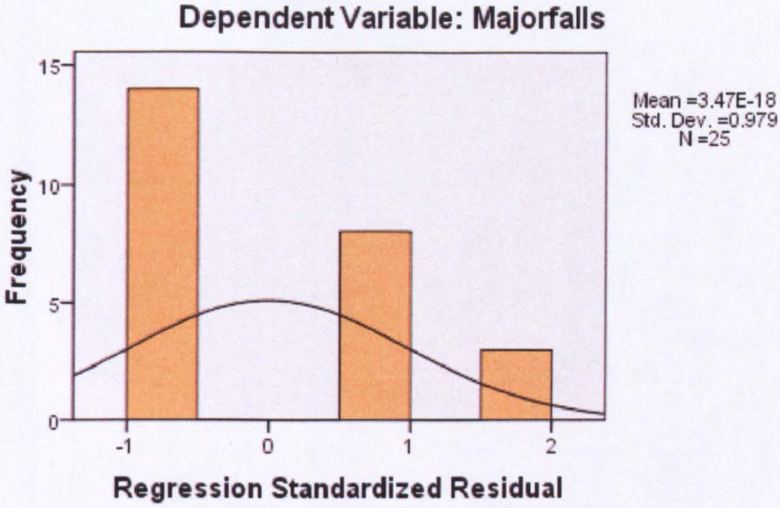
a. Dependent Variable: Major falls

Residuals Statistics[a]

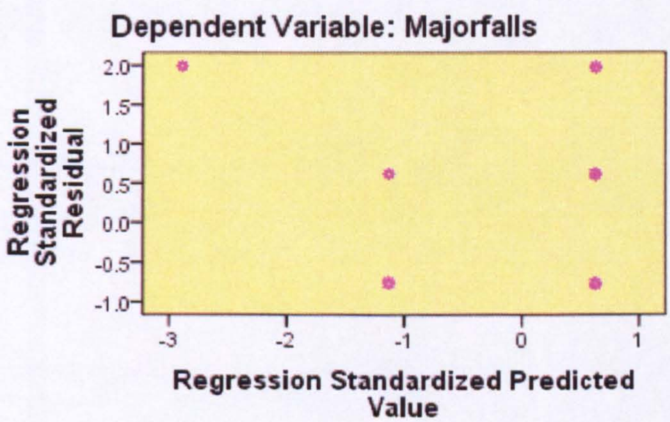
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.55	.56	.56	.003	25
Residual	-.562	1.448	.000	.712	25
Std. Predicted Value	-2.884	.633	.000	1.000	25
Std. Residual	-.773	1.992	.000	.979	25

a. Dependent Variable: Major falls

Histogram



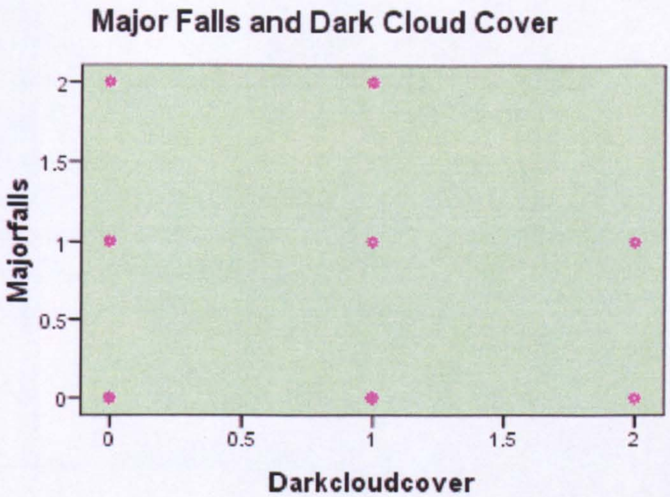
Scatterplot



Major Falls and Dar Cloud Cover

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Dark cloud cover WITH Major falls
  /MISSING=LISTWISE
  /TITLE='Major Falls and Dark Cloud Cover'.
```



Correlation

```
/VARIABLES=Major falls Dark cloud cover
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major falls	Dark cloud cover
Major falls	Pearson Correlation	1.000	.025
	Sig. (1-tailed)		.453
	N	25	25
Dark cloud cover	Pearson Correlation	.025	1.000
	Sig. (1-tailed)	.453	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Dark cloud cover
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Dark cloud cover[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.025[a]	.001	-.043	.727

a. Predictors: (Constant), Dark cloud cover

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.008	1	.008	.014	.905[a]
	Residual	12.152	23	.528		
	Total	12.160	24			

a. Predictors: (Constant), Dark cloud cover

b. Dependent Variable: Major falls

Coefficients[a]

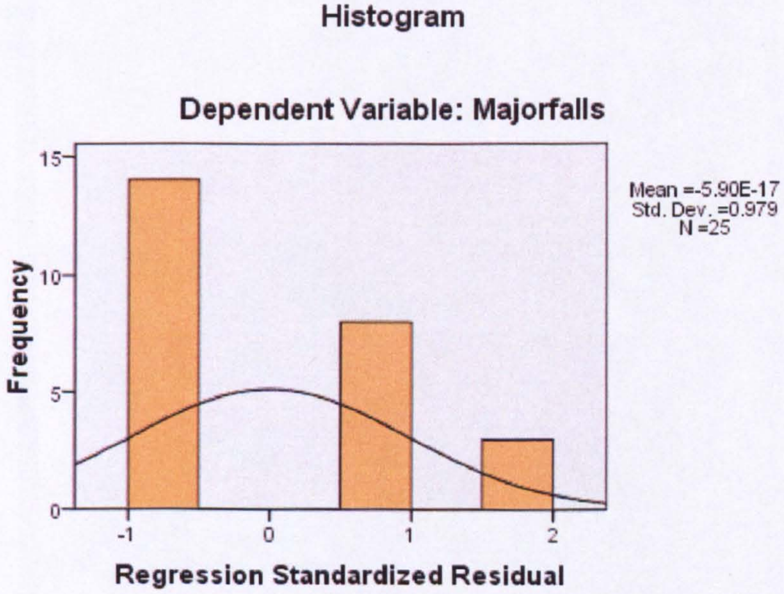
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.547	.182		3.009	.006
	Dark cloud cover	.027	.227	.025	.120	.905

a. Dependent Variable: Major falls

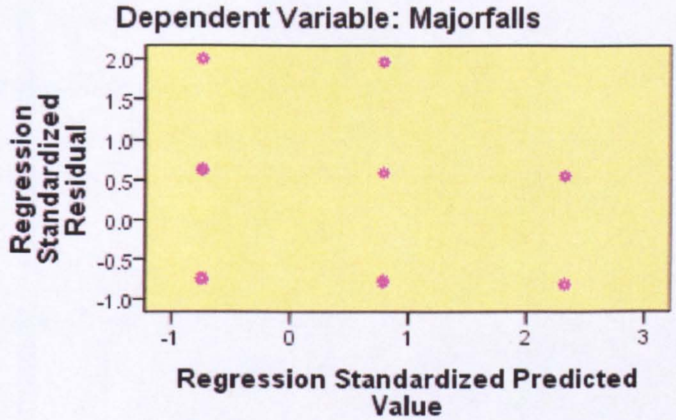
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.55	.60	.56	.018	25
Residual	-.602	1.453	.000	.712	25
Std. Predicted Value	-.735	2.327	.000	1.000	25
Std. Residual	-.828	1.999	.000	.979	25

a. Dependent Variable: Major falls



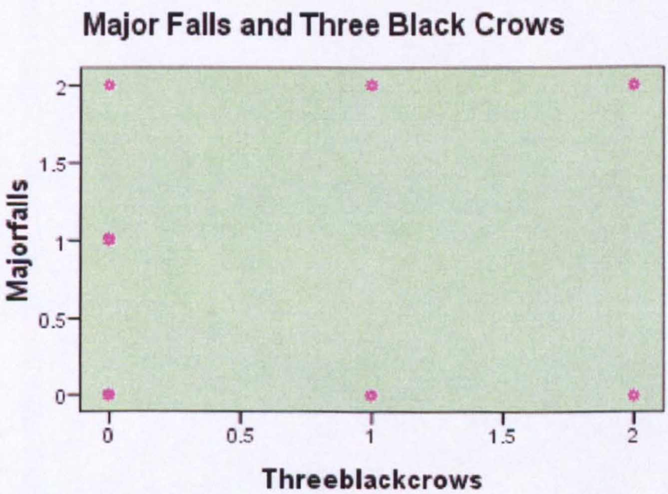
Scatterplot



<u>Major Falls and Three Black Crows</u>

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Three black crows WITH Major falls
  /MISSING=LISTWISE
  /TITLE='Major Falls and Three Black Crows'.
```



Correlation

```
/VARIABLES=Major falls Three black crows
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major falls	Three black crows
Major falls	Pearson Correlation	1.000	.259
	Sig. (1-tailed)		.106
	N	25	25
Three black crows	Pearson Correlation	.259	1.000
	Sig. (1-tailed)	.106	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Three black crows
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Three black crows[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.259[a]	.067	.026	.702

a. Predictors: (Constant), Three black crows

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.814	1	.814	1.651	.212[a]
	Residual	11.346	23	.493		
	Total	12.160	24			

a. Predictors: (Constant), Three black crows

b. Dependent Variable: Major falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.486	.152		3.201	.004
	Three black crows	.308	.240	.259	1.285	.212

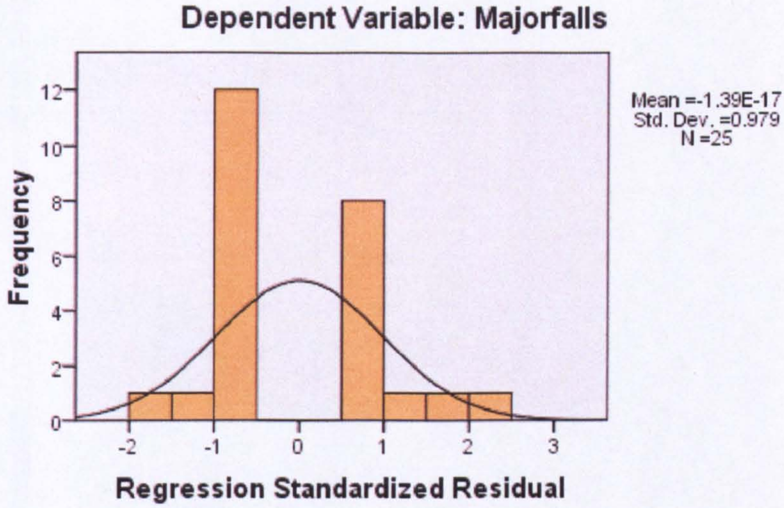
a. Dependent Variable: Major falls

Residuals Statistics[a]

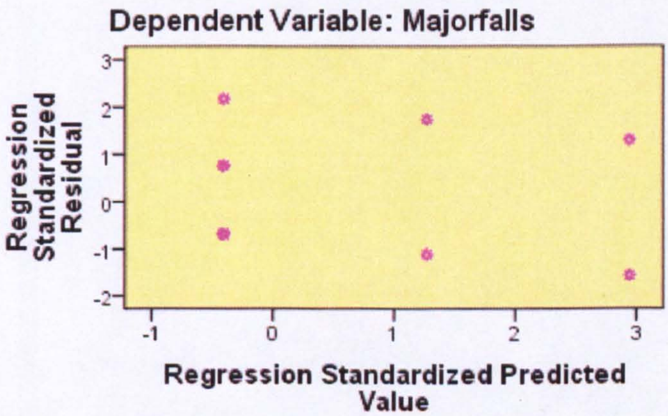
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.49	1.10	.56	.184	25
Residual	-1.103	1.514	.000	.688	25
Std. Predicted Value	-.402	2.947	.000	1.000	25
Std. Residual	-1.570	2.156	.000	.979	25

a. Dependent Variable: Major falls

Histogram



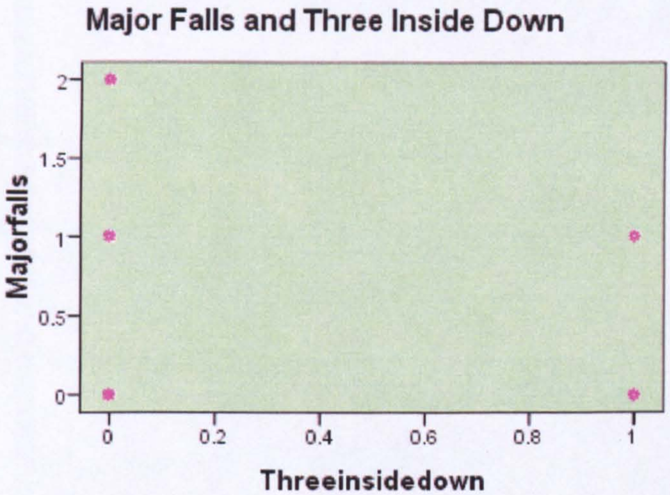
Scatterplot



Major Falls and Three Inside Down

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Three inside down WITH Major falls
  /MISSING=LISTWISE
  /TITLE='Major Falls and Three Inside Down'.
```



Correlation

```
  /VARIABLES=Major falls Three inside down
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Major falls	Three inside down
Major falls	Pearson Correlation	1.000	-.120
	Sig. (1-tailed)		.284
	N	25	25
Three inside down	Pearson Correlation	-.120	1.000
	Sig. (1-tailed)	.284	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Three inside down
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Three inside down[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.120[a]	.014	-.028	.722

a. Predictors: (Constant), Three inside down

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.175	1	.175	.336	.568[a]
	Residual	11.985	23	.521		
	Total	12.160	24			

a. Predictors: (Constant), Three inside down

b. Dependent Variable: Major falls

Coefficients[a]

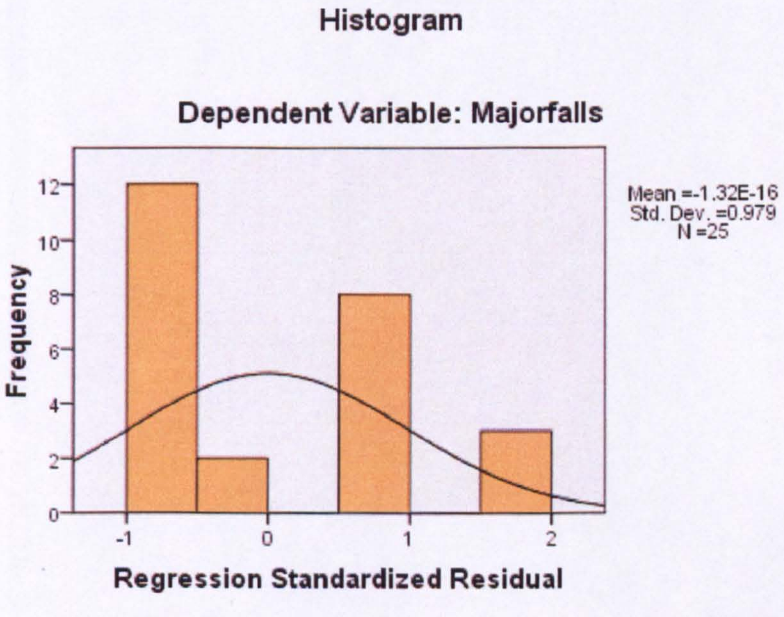
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.591	.154		3.840	.001
	Three inside down	-.258	.444	-.120	-.580	.568

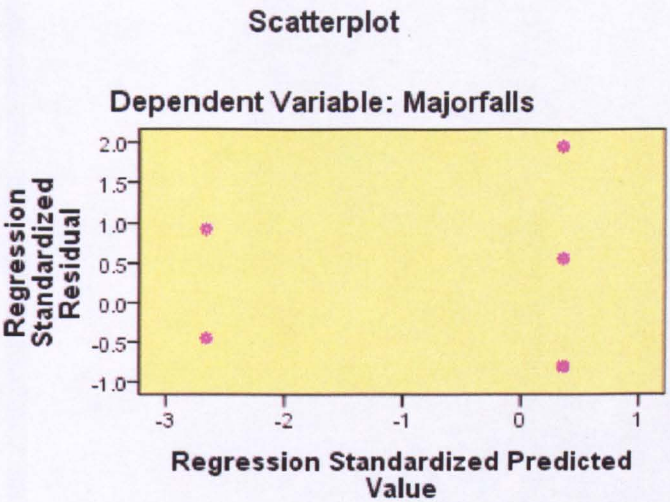
a. Dependent Variable: Major falls

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.33	.59	.56	.085	25
Residual	-.591	1.409	.000	.707	25
Std. Predicted Value	-2.653	.362	.000	1.000	25
Std. Residual	-.819	1.952	.000	.979	25

a. Dependent Variable: Major falls

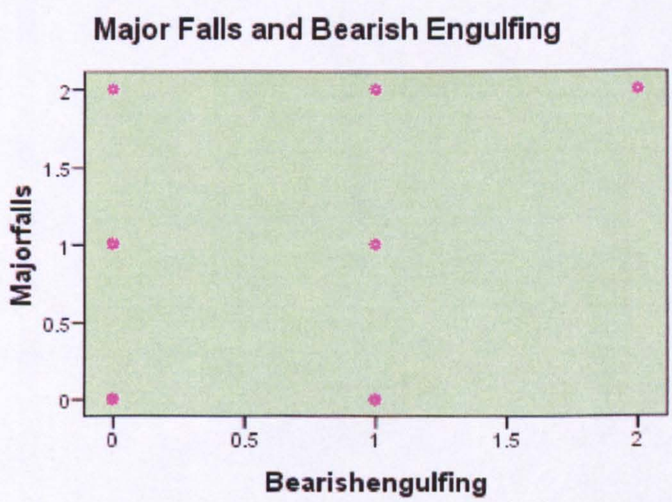




Major Falls and Bearish Engulfing

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Bearish engulfing WITH Major falls
  /MISSING=LISTWISE
  /TITLE='Major Falls and Bearish Engulfing'.
```



Correlation

```
/VARIABLES=Major falls Bearish engulfing
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major falls	Bearish engulfing
Major falls	Pearson Correlation	1.000	.408*
	Sig. (1-tailed)		.022
	N	25	25
Bearish engulfing	Pearson Correlation	.408*	1.000
	Sig. (1-tailed)	.022	
	N	25	25

*. Correlation is significant at the 0.05 level (1-tailed).

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Bearish engulfing
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Bearish engulfing[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.408[a]	.166	.130	.664

a. Predictors: (Constant), Bearish engulfing

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.020	1	2.020	4.581	.043[a]
	Residual	10.140	23	.441		
	Total	12.160	24			

a. Predictors: (Constant), Bearish engulfing

b. Dependent Variable: Major falls

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.427	.147		2.911	.008
	Bearish engulfing	.555	.259	.408	2.140	.043

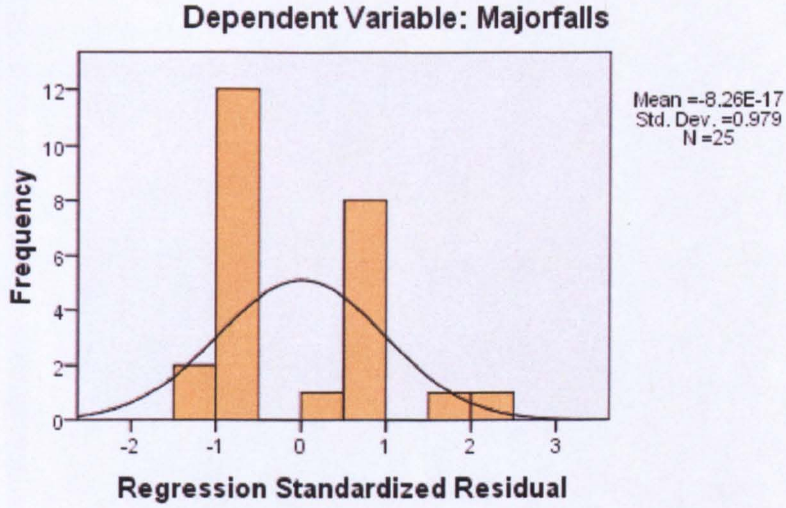
a. Dependent Variable: Major falls

Residuals Statistics[a]

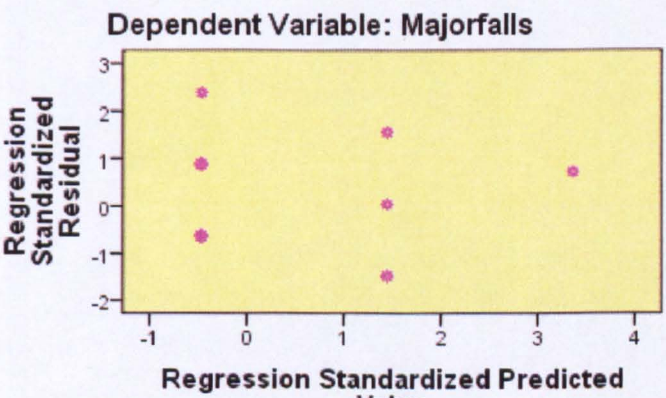
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.43	1.54	.56	.290	25
Residual	-.982	1.573	.000	.650	25
Std. Predicted Value	-.459	3.366	.000	1.000	25
Std. Residual	-1.479	2.369	.000	.979	25

a. Dependent Variable: Major falls

Histogram



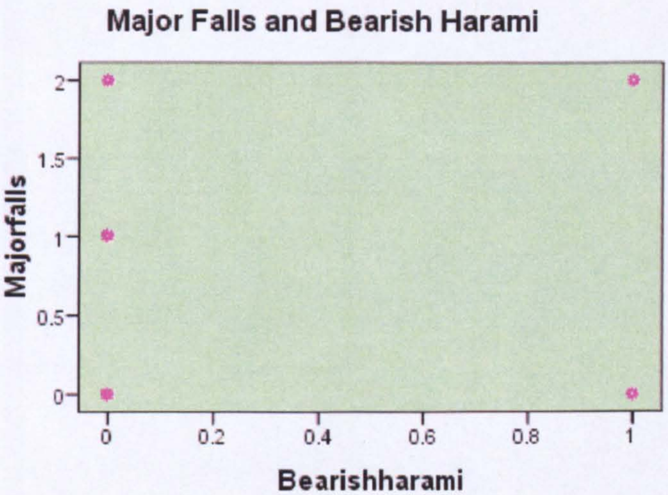
Scatterplot



Major Falls and Bearish Harami

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Bearish harami WITH Major falls
  /MISSING=LISTWISE
  /TITLE='Major Falls and Bearish Harami'.
```



Correlation

```
  /VARIABLES=Major falls Bearish harami
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Major falls	Bearish harami
Major falls	Pearson Correlation	1.000	.186
	Sig. (2-tailed)		.373
	N	25	25
Bearish harami	Pearson Correlation	.186	1.000
	Sig. (2-tailed)	.373	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major falls
/METHOD=ENTER Bearish harami
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Bearish harami[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major falls

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.186[a]	.035	-.007	.714

a. Predictors: (Constant), Bearish harami

b. Dependent Variable: Major falls

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.421	1	.421	.825	.373[a]
	Residual	11.739	23	.510		
	Total	12.160	24			

a. Predictors: (Constant), Bearish harami

b. Dependent Variable: Major falls

Coefficients[a]

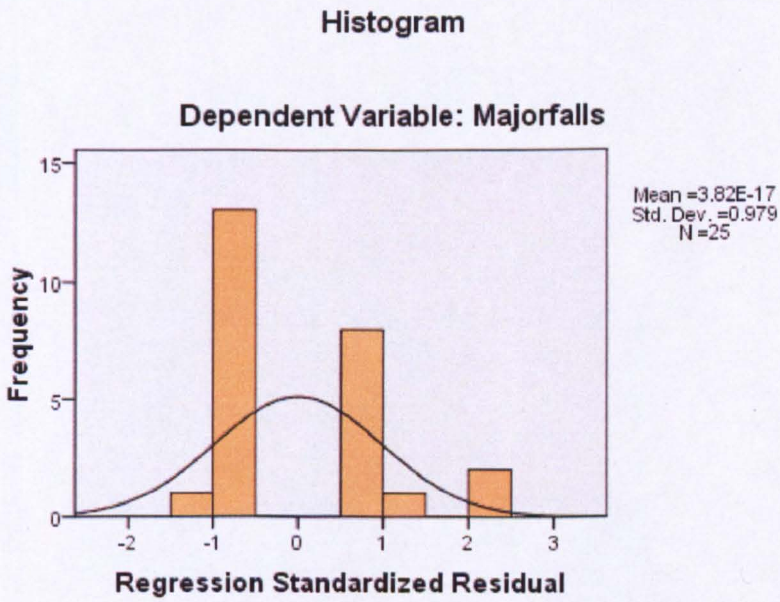
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.522	.149		3.502	.002
	Bearish harami	.478	.527	.186	.908	.373

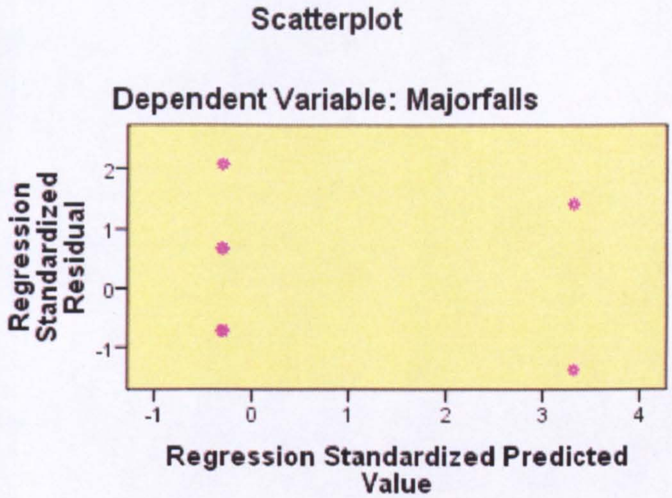
a. Dependent Variable: Major falls

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.52	1.00	.56	.132	25
Residual	-1.000	1.478	.000	.699	25
Std. Predicted Value	-.289	3.323	.000	1.000	25
Std. Residual	-1.400	2.069	.000	.979	25

a. Dependent Variable: Major falls



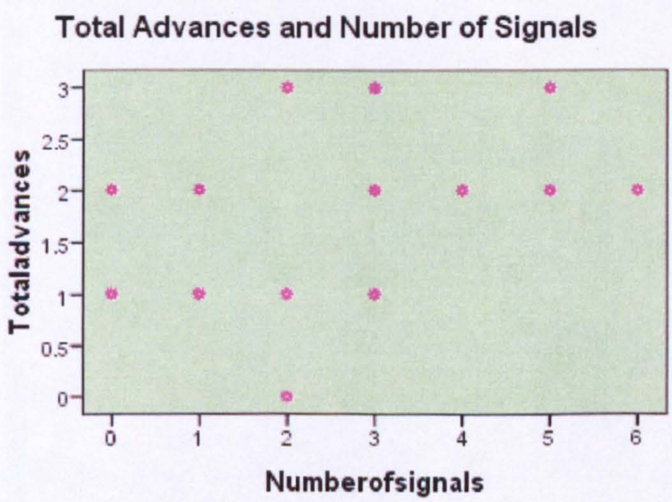


For May Advances

Total Advances and Number of Signals

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Number of signals WITH Total advances
  /MISSING=LISTWISE
  /TITLE='Total Advances and Number of Signals'.
```



Correlation

```
  /VARIABLES=Total advances Number of signals
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Total advances	Number of signals
Total advances	Pearson Correlation	1.000	.408*
	Sig. (1-tailed)		.021
	N	25	25
Number of signals	Pearson Correlation	.408*	1.000
	Sig. (1-tailed)	.021	
	N	25	25

*. Correlation is significant at the 0.05 level (1-tailed).

Regression

```
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Total
advances
  /METHOD=ENTER Number of signals
  /RESIDUALS HIST(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Number of signals[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Total advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.408[a]	.167	.131	.746

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Total advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.562	1	2.562	4.605	.043[a]
	Residual	12.798	23	.556		
	Total	15.360	24			

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Total advances

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.296	.294		4.410	.000
	Number of signals	.194	.090	.408	2.146	.043

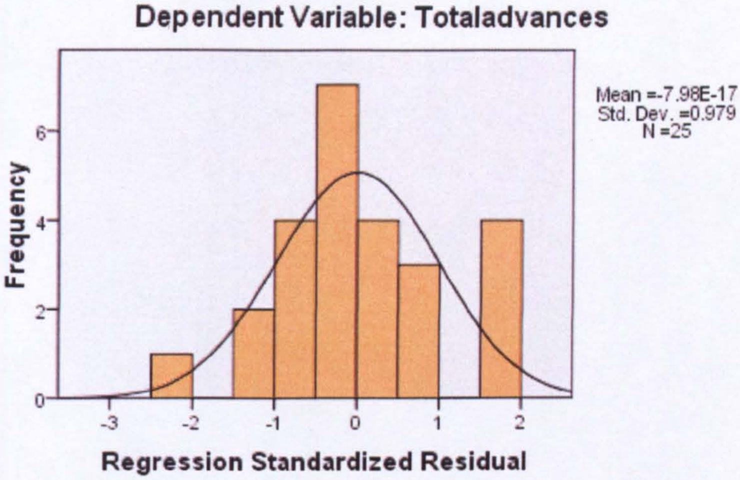
a. Dependent Variable: Total advances

Residuals Statistics[a]

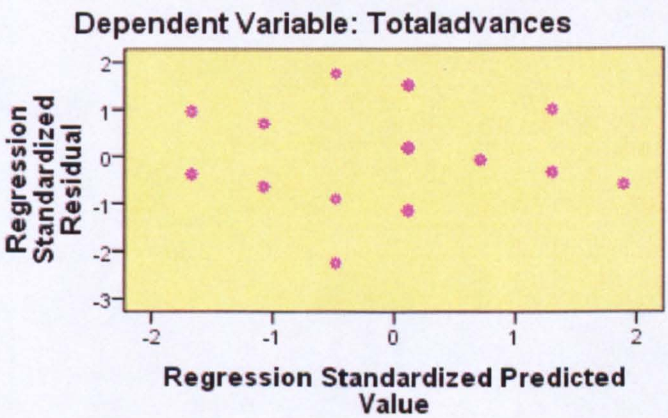
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.30	2.46	1.84	.327	25
Residual	-1.685	1.315	.000	.730	25
Std. Predicted Value	-1.663	1.901	.000	1.000	25
Std. Residual	-2.259	1.763	.000	.979	25

a. Dependent Variable: Total advances

Histogram



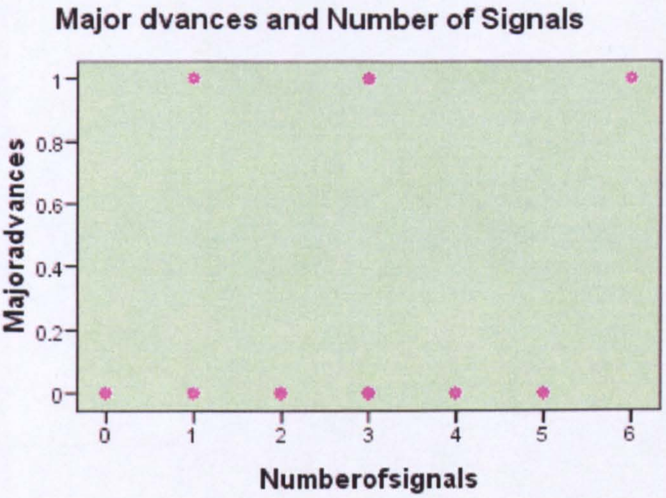
Scatterplot



Major Advances and number of Signals

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Numberofsignals WITH Majoradvances
  /MISSING=LISTWISE
  /TITLE='Major dvances and Number of Signals'.
```



Correlation

```
  /VARIABLES=Number of signals Major advances
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Number of signals	Major advances
Number of signals	Pearson Correlation	1.000	.125
	Sig. (1-tailed)		.276
	N	25	25
Major advances	Pearson Correlation	.125	1.000
	Sig. (1-tailed)	.276	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Number of signals
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Number of signals[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.125[a]	.016	-.027	.442

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.071	1	.071	.365	.552[a]
	Residual	4.489	23	.195		
	Total	4.560	24			

a. Predictors: (Constant), Number of signals

b. Dependent Variable: Major advances

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.149	.174		.858	.400
	Number of signals	.032	.054	.125	.604	.552

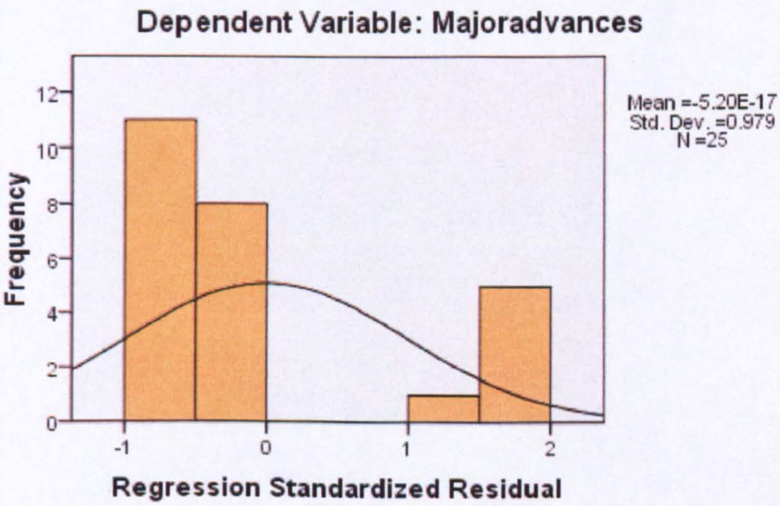
a. Dependent Variable: Major advances

Residuals Statistics[a]

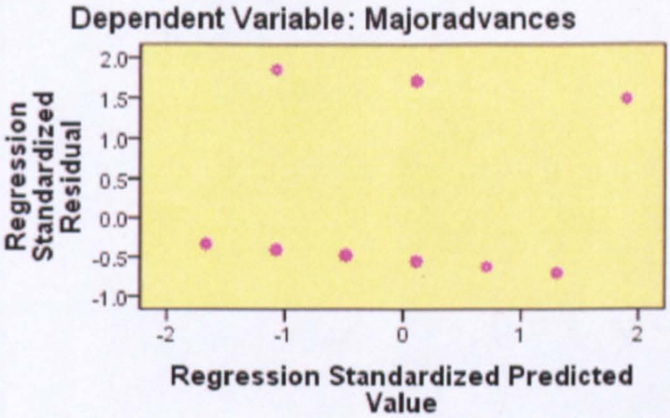
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.15	.34	.24	.054	25
Residual	-.311	.818	.000	.432	25
Std. Predicted Value	-1.663	1.901	.000	1.000	25
Std. Residual	-.704	1.852	.000	.979	25

a. Dependent Variable: Major advances

Histogram



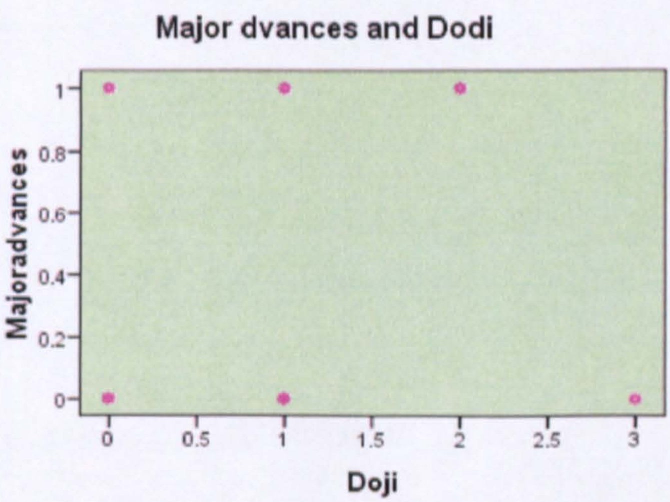
Scatterplot



<u>**Major Advances and Doji**</u>

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Doji WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major advances and Dodi'.
```



Correlation

```
/VARIABLES=Major advances Doji
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major advances	Doji
Major advances	Pearson Correlation	1.000	.335
	Sig. (1-tailed)		.051
	N	25	25
Doji	Pearson Correlation	.335	1.000
	Sig. (1-tailed)	.051	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Doji
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Doji[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.335[a]	.112	.073	.420

a. Predictors: (Constant), Doji

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.511	1	.511	2.901	.102[a]
	Residual	4.049	23	.176		
	Total	4.560	24			

a. Predictors: (Constant), Doji

b. Dependent Variable: Major advances

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.148	.100		1.480	.152
	Doji	.177	.104	.335	1.703	.102

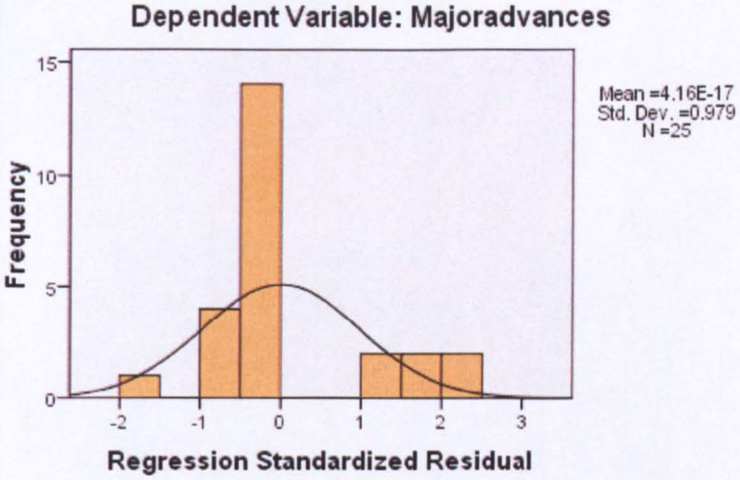
a. Dependent Variable: Major advances

Residuals Statistics[a]

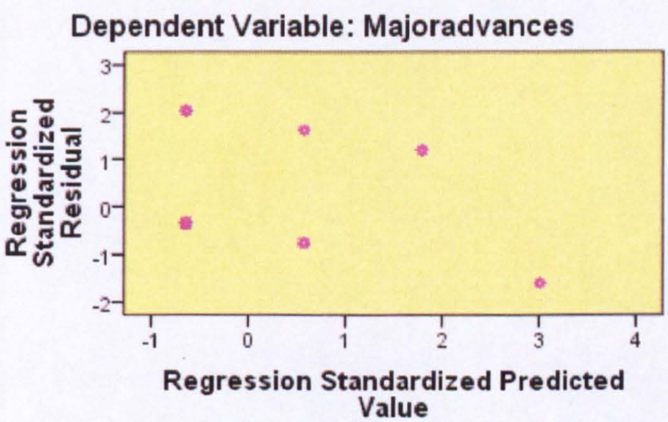
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.15	.68	.24	.146	25
Residual	-.680	.852	.000	.411	25
Std. Predicted Value	-.632	3.015	.000	1.000	25
Std. Residual	-1.620	2.031	.000	.979	25

a. Dependent Variable: Major advances

Histogram



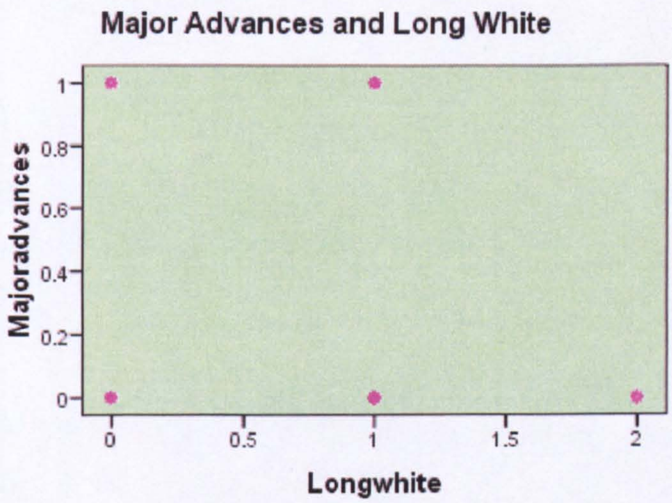
Scatterplot



Mayor Advances and Long White

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Long white WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Long White'.
```



Correlation

```
  /VARIABLES=Major advances Long white
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Major advances	Long white
Major advances	Pearson Correlation	1.000	-.165
	Sig. (1-tailed)		.216
	N	25	25
Long white	Pearson Correlation	-.165	1.000
	Sig. (1-tailed)	.216	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Long white
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Long white[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.165[a]	.027	-.015	.439

a. Predictors: (Constant), Long white

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.124	1	.124	.641	.432[a]
	Residual	4.436	23	.193		
	Total	4.560	24			

a. Predictors: (Constant), Long white

b. Dependent Variable: Major advances

Coefficients[a]

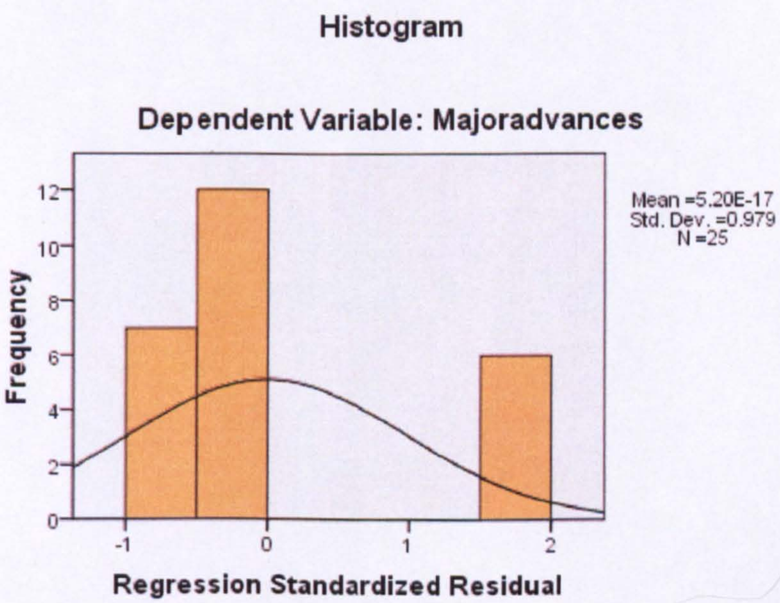
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.318	.131		2.426	.024
	Long white	-.114	.143	-.165	-.800	.432

a. Dependent Variable: Major advances

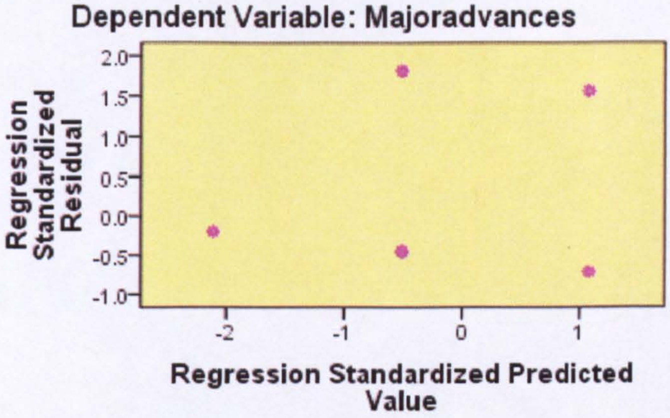
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.09	.32	.24	.072	25
Residual	-.318	.797	.000	.430	25
Std. Predicted Value	-2.105	1.084	.000	1.000	25
Std. Residual	-.724	1.814	.000	.979	25

a. Dependent Variable: Major advances



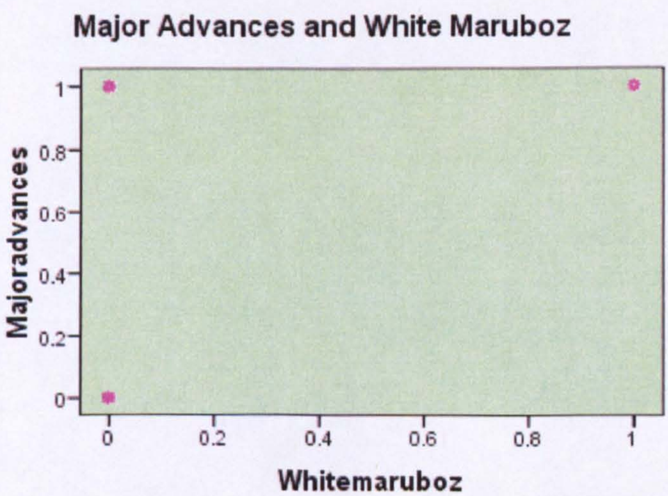
Scatterplot



<u>Major Advances and Maruboz</u>

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=White maruboz WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and White Maruboz'.
```



Correlation

```
/VARIABLES=Major advances White maruboz
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major advances	White maruboz
Major advances	Pearson Correlation	1.000	.363*
	Sig. (1-tailed)		.037
	N	25	25
White maruboz	Pearson Correlation	.363*	1.000
	Sig. (1-tailed)	.037	
	N	25	25

*. Correlation is significant at the 0.05 level (1-tailed).

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER White maruboz
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	White maruboz[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.363[a]	.132	.094	.415

a. Predictors: (Constant), White maruboz

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.602	1	.602	3.496	.074[a]
	Residual	3.958	23	.172		
	Total	4.560	24			

a. Predictors: (Constant), White maruboz

b. Dependent Variable: Major advances

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.208	.085		2.460	.022
	White maruboz	.792	.423	.363	1.870	.074

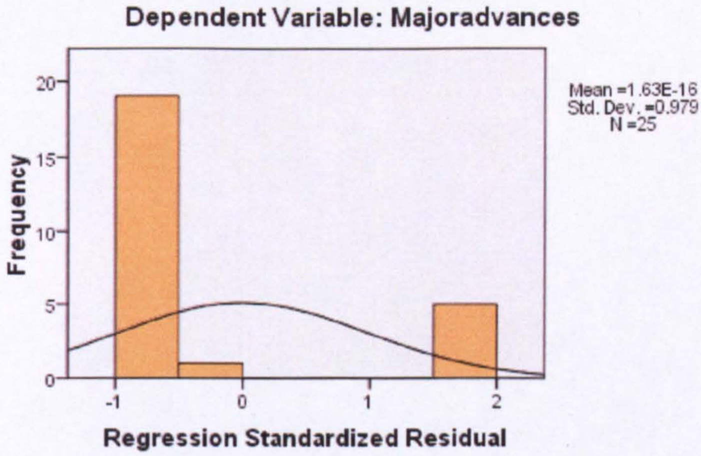
a. Dependent Variable: Major advances

Residuals Statistics[a]

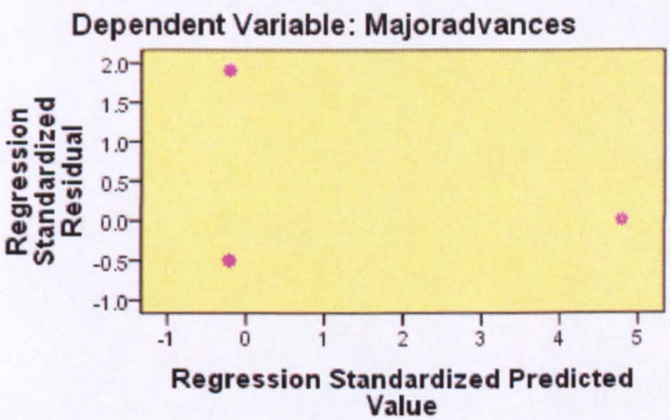
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.21	1.00	.24	.158	25
Residual	-.208	.792	.000	.406	25
Std. Predicted Value	-.200	4.800	.000	1.000	25
Std. Residual	-.502	1.908	.000	.979	25

a. Dependent Variable: Major advances

Histogram



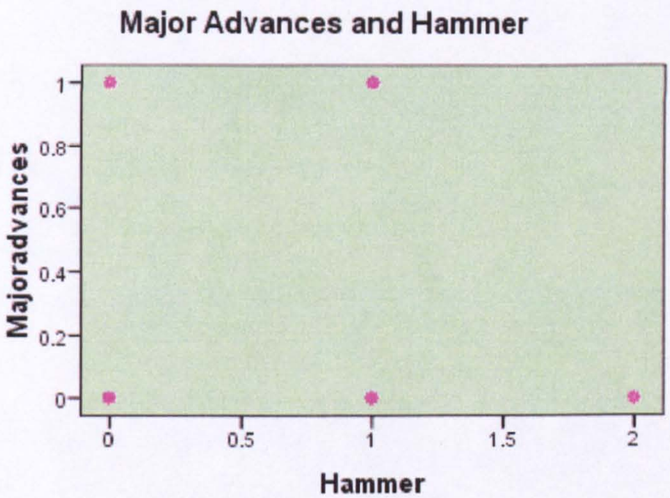
Scatterplot



Major Advances and Hammer

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Hammer WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Hammer'.
```



Correlation

```
  /VARIABLES=Major advances Hammer
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Major advances	Hammer
Major advances	Pearson Correlation	1.000	.089
	Sig. (1-tailed)		.336
	N	25	25
Hammer	Pearson Correlation	.089	1.000
	Sig. (1-tailed)	.336	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Hammer
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Hammer[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.089[a]	.008	-.035	.444

a. Predictors: (Constant), Hammer

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.036	1	.036	.183	.673[a]
	Residual	4.524	23	.197		
	Total	4.560	24			

a. Predictors: (Constant), Hammer

b. Dependent Variable: Major advances

Coefficients[a]

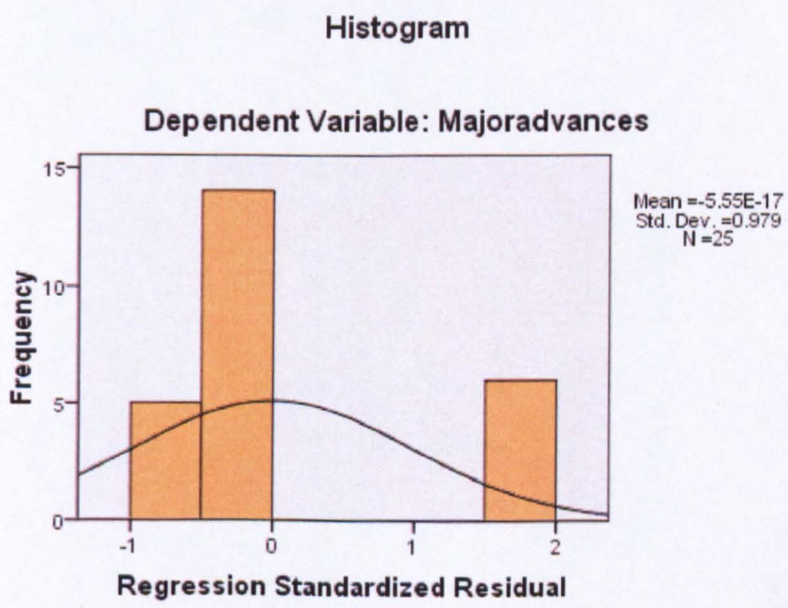
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.216	.105		2.058	.051
	Hammer	.060	.140	.089	.428	.673

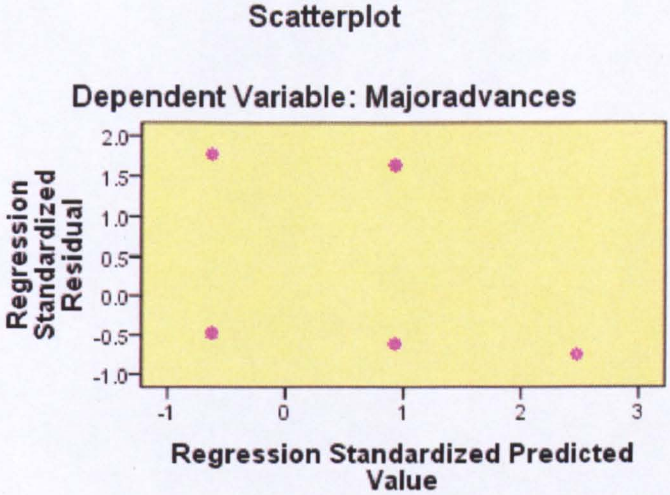
a. Dependent Variable: Major advances

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.22	.34	.24	.039	25
Residual	-.336	.784	.000	.434	25
Std. Predicted Value	-.620	2.479	.000	1.000	25
Std. Residual	-.758	1.768	.000	.979	25

a. Dependent Variable: Major advances

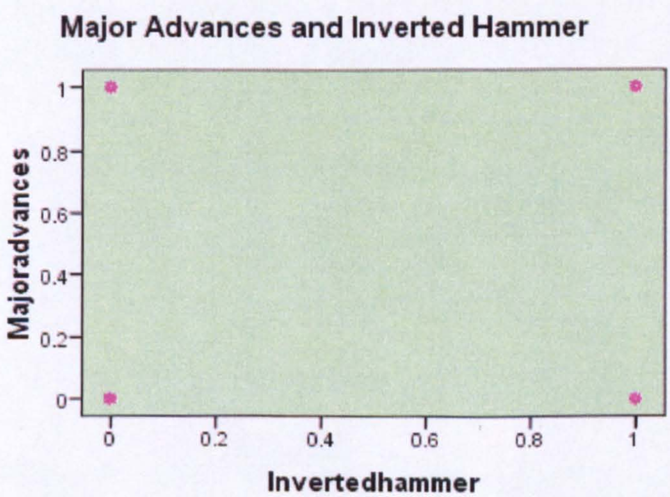




Major Advances and Inverted Hammer

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Inverted hammer WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Inverted Hammer'.
```



Correlation

```
/VARIABLES=Major advances Inverted hammer
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major advances	Inverted hammer
Major advances	Pearson Correlation	1.000	.266
	Sig. (1-tailed)		.100
	N	25	25
Inverted hammer	Pearson Correlation	.266	1.000
	Sig. (1-tailed)	.100	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Inverted hammer
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Inverted hammer[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.266[a]	.071	.030	.429

a. Predictors: (Constant), Inverted hammer

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.322	1	.322	1.747	.199[a]
	Residual	4.238	23	.184		
	Total	4.560	24			

a. Predictors: (Constant), Inverted hammer

b. Dependent Variable: Major advances

Coefficients[a]

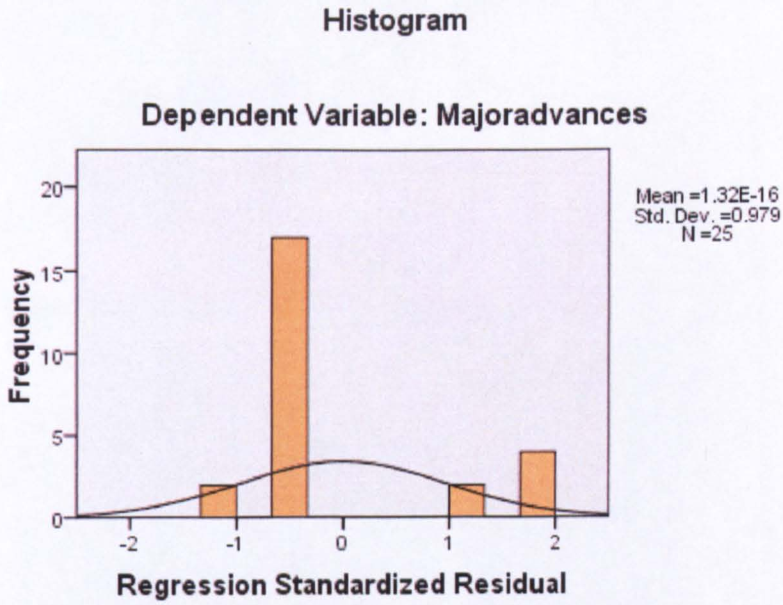
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.190	.094		2.033	.054
	Inverted hammer	.310	.234	.266	1.322	.199

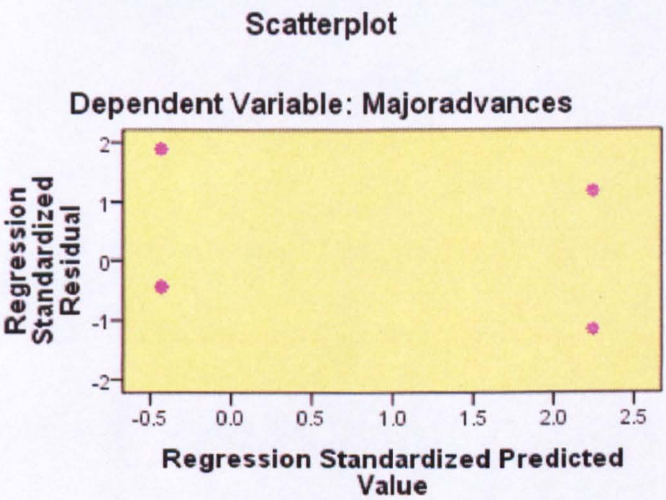
a. Dependent Variable: Major advances

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.19	.50	.24	.116	25
Residual	-.500	.810	.000	.420	25
Std. Predicted Value	-.428	2.245	.000	1.000	25
Std. Residual	-1.165	1.886	.000	.979	25

a. Dependent Variable: Major advances

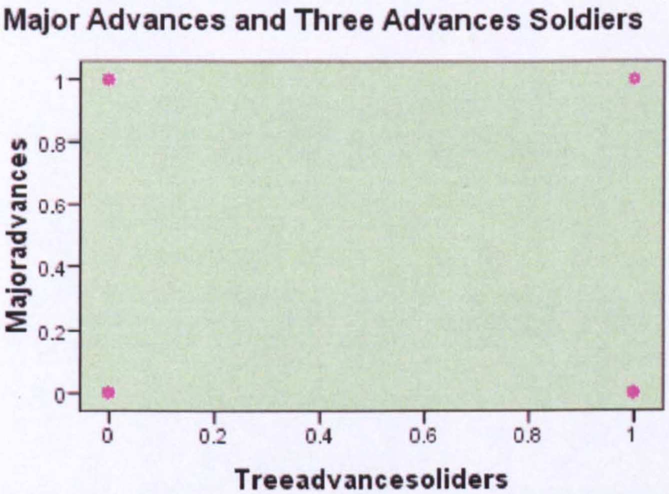

Histogram
Dependent Variable: Majoradvances
Mean =1.32E-16
Std. Dev. =0.979
N =25
Frequency
0
5
10
15
20
-2
-1
0
1
2
Regression Standardized Residual


Scatterplot
Dependent Variable: Majoradvances
Regression Standardized Residual
2
1
0
-1
-2
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Regression Standardized Predicted Value

Major Advances and Three Advanced Soldiers

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Three advanced soliders WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Three Advances Soldiers'.
```



Correlation

```
  /VARIABLES=Major advances Three advanced soldiers
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Major advances	Three Advanced soldiers
Major advances	Pearson Correlation	1.000	-.142
	Sig. (1-tailed)		.249
	N	25	25
Three advanced soldiers	Pearson Correlation	-.142	1.000
	Sig. (1-tailed)	.249	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Three advanced soldiers
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Three advanced soldiers[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Majoradvances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.142[a]	.020	-.022	.441

a. Predictors: (Constant), Three advanced soldiers

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.092	1	.092	.472	.499[a]
	Residual	4.468	23	.194		
	Total	4.560	24			

a. Predictors: (Constant), Three advanced soldiers

b. Dependent Variable: Major advances

Coefficients[a]

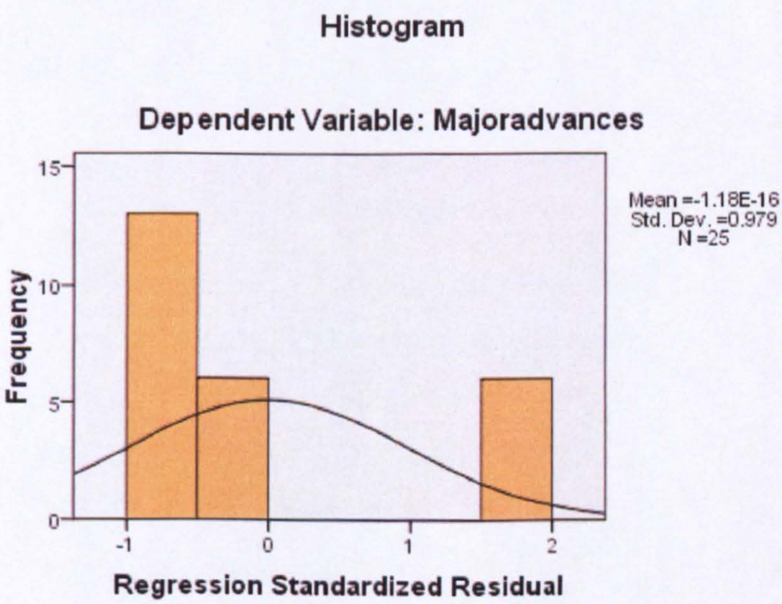
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.278	.104		2.674	.014
	Three advanced soldiers	-.135	.196	-.142	-.687	.499

a. Dependent Variable: Major advances

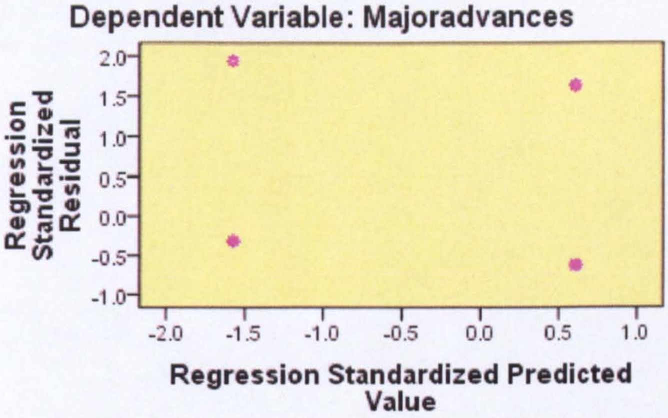
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.14	.28	.24	.062	25
Residual	-.278	.857	.000	.431	25
Std. Predicted Value	-1.571	.611	.000	1.000	25
Std. Residual	-.630	1.945	.000	.979	25

a. Dependent Variable: Major advances



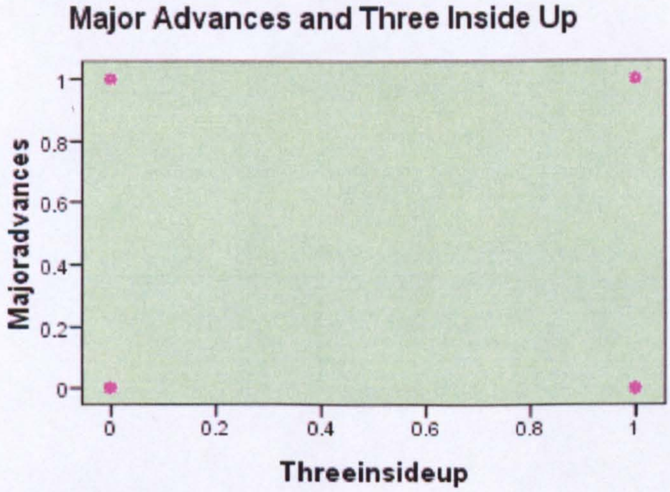
Scatterplot



Major Advances and Three Inside Up

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Three inside up WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Three Inside Up'.
```



Correlation

```
/VARIABLES=Major advances Three inside up
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major advances	Three inside up
Major advances	Pearson Correlation	1.000	.123
	Sig. (1-tailed)		.279
	N	25	25
Three inside up	Pearson Correlation	.123	1.000
	Sig. (1-tailed)	.279	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Three inside up
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Three in side up[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.123[a]	.015	-.028	.442

a. Predictors: (Constant), Three inside up

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.069	1	.069	.352	.559[a]
	Residual	4.491	23	.195		
	Total	4.560	24			

a. Predictors: (Constant), Three inside up

b. Dependent Variable: Major advances

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.211	.101		2.077	.049
	Three inside up	.123	.207	.123	.593	.559

a. Dependent Variable: Major advances

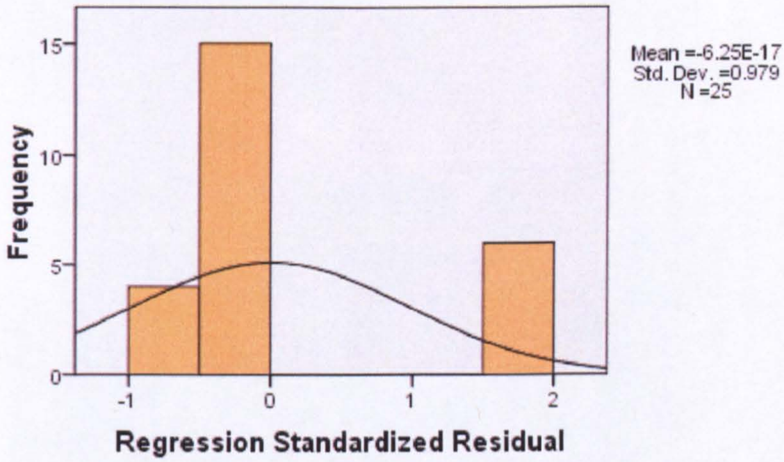
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.21	.33	.24	.054	25
Residual	-.333	.789	.000	.433	25
Std. Predicted Value	-.551	1.744	.000	1.000	25
Std. Residual	-.754	1.787	.000	.979	25

a. Dependent Variable: Major advances

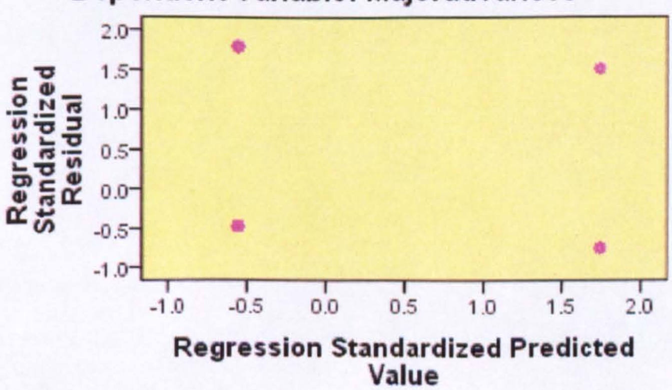
Histogram

Dependent Variable: Majoradvances



Scatterplot

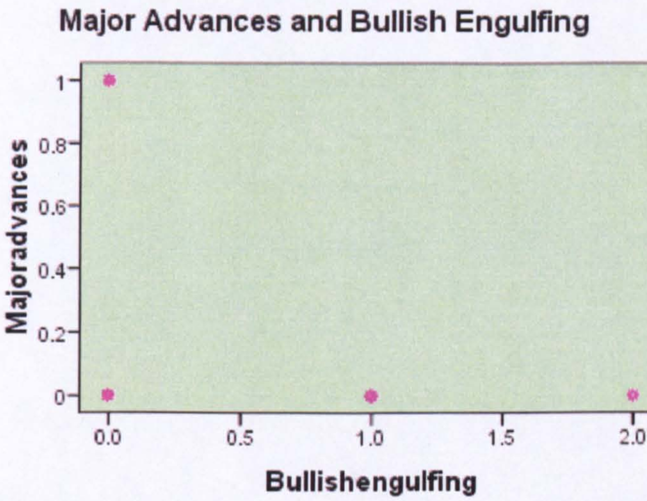
Dependent Variable: Majoradvances



Major Advances and Bullish Engulfing

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Bullish engulfing WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Bullish Engulfing'.
```



Correlation

```
  /VARIABLES=Major advances Bullish engulfing
  /PRINT=ONETAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

		Major advances	Bullish engulfing
Major advances	Pearson Correlation	1.000	-.229
	Sig. (1-tailed)		.135
	N	25	25
Bullish engulfing	Pearson Correlation	-.229	1.000
	Sig. (1-tailed)	.135	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Bullish engulfing
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Bullish engulfing[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.229[a]	.053	.011	.433

a. Predictors: (Constant), Bullish engulfing

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.240	1	.240	1.278	.270[a]
	Residual	4.320	23	.188		
	Total	4.560	24			

a. Predictors: (Constant), Bullish engulfing

b. Dependent Variable: Major advances

Coefficients[a]

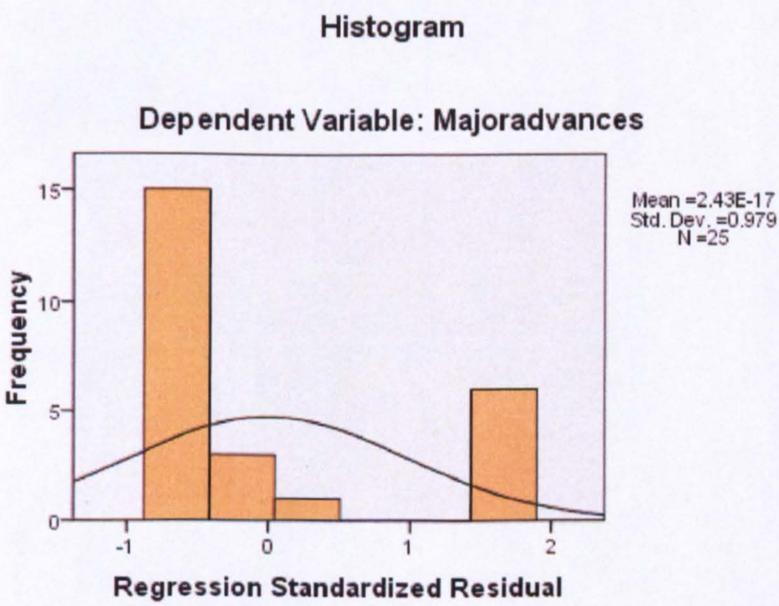
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.280	.094		2.991	.007
	Bullish engulfing	-.200	.177	-.229	-1.130	.270

a. Dependent Variable: Major advances

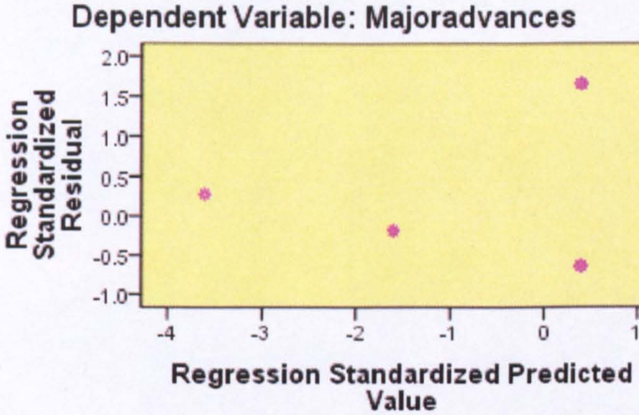
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.12	.28	.24	.100	25
Residual	-.280	.720	.000	.424	25
Std. Predicted Value	-3.600	.400	.000	1.000	25
Std. Residual	-.646	1.661	.000	.979	25

a. Dependent Variable: Major advances



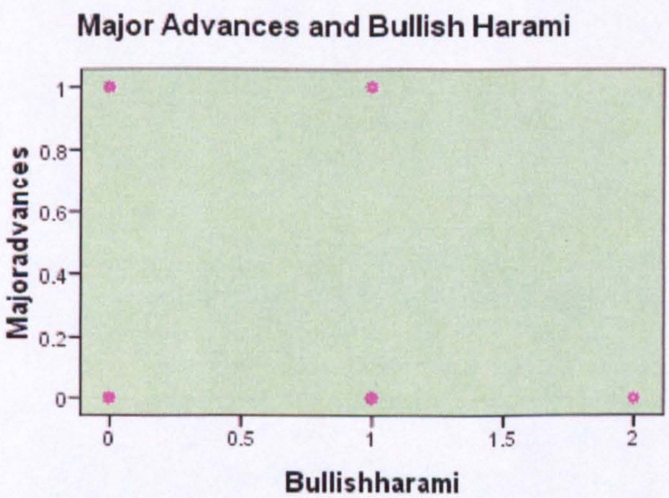
Scatterplot



Major Advances and Bullish Harami

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Bullish harami WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Bullish Harami'.
```



Correlation

```
/VARIABLES=Major advances Bullish harami
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major advances	Bullish harami
Major advances	Pearson Correlation	1.000	-.080
	Sig. (1-tailed)		.351
	N	25	25
Bullish harami	Pearson Correlation	-.080	1.000
	Sig. (1-tailed)	.351	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Bullish harami
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Bullish harami[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.080[a]	.006	-.037	.444

a. Predictors: (Constant), Bullish harami

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.030	1	.030	.150	.702[a]
	Residual	4.530	23	.197		
	Total	4.560	24			

a. Predictors: (Constant), Bullish harami

b. Dependent Variable: Major advances

Coefficients[a]

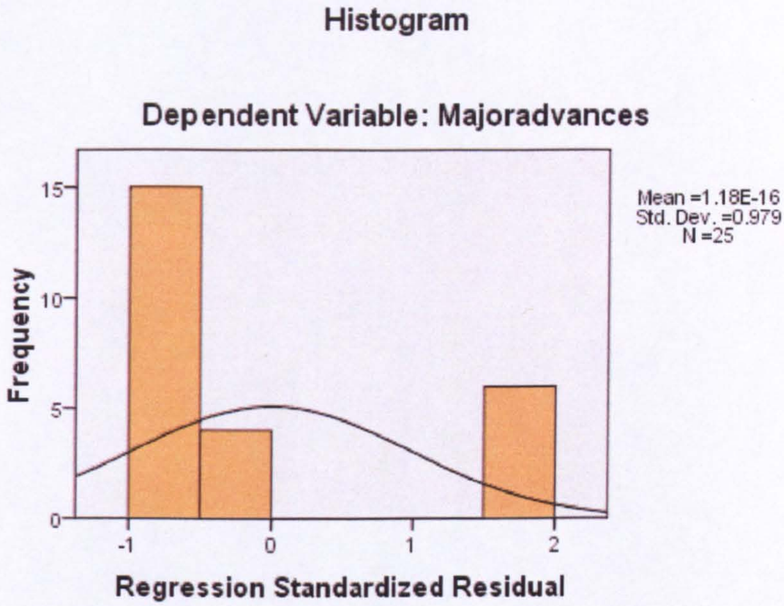
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.256	.098		2.613	.016
	Bullish harami	-.067	.173	-.080	-.387	.702

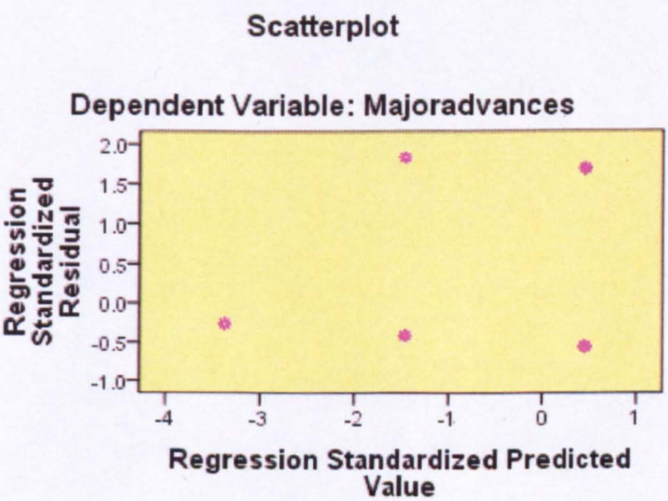
a. Dependent Variable: Major advances

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.12	.26	.24	.035	25
Residual	-.256	.811	.000	.434	25
Std. Predicted Value	-3.366	.459	.000	1.000	25
Std. Residual	-.577	1.827	.000	.979	25

a. Dependent Variable: Major advances

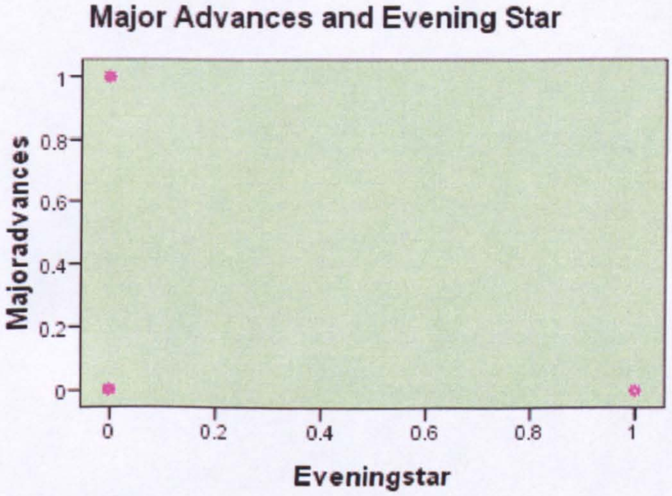

Histogram
Dependent Variable: Majoradvances
Mean =1.18E-16
Std. Dev. =0.979
N =25
Frequency
15
10
5
0
-1
0
1
2
Regression Standardized Residual


Scatterplot
Dependent Variable: Majoradvances
Regression Standardized Residual
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-4
-3
-2
-1
0
1
Regression Standardized Predicted Value

Major Advances and Evening Star

Scatter Diagram

```
GRAPH
  /SCATTERPLOT(BIVAR)=Evening star WITH Major advances
  /MISSING=LISTWISE
  /TITLE='Major Advances and Evening Star'.
```



Correlation

```
/VARIABLES=Major advances Evening star
/PRINT=ONETAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		Major advances	Evening star
Major advances	Pearson Correlation	1.000	-.115
	Sig. (1-tailed)		.293
	N	25	25
Evening star	Pearson Correlation	-.115	1.000
	Sig. (1-tailed)	.293	
	N	25	25

Regression

```
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Major advances
/METHOD=ENTER Evening star
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/RESIDUALS HIST(ZRESID)
/CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Evening star[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Major advances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.115[a]	.013	-.030	.442

a. Predictors: (Constant), Evening star

b. Dependent Variable: Major advances

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.060	1	.060	.307	.585[a]
	Residual	4.500	23	.196		
	Total	4.560	24			

a. Predictors: (Constant), Evening star

b. Dependent Variable: Major advances

Coefficients[a]

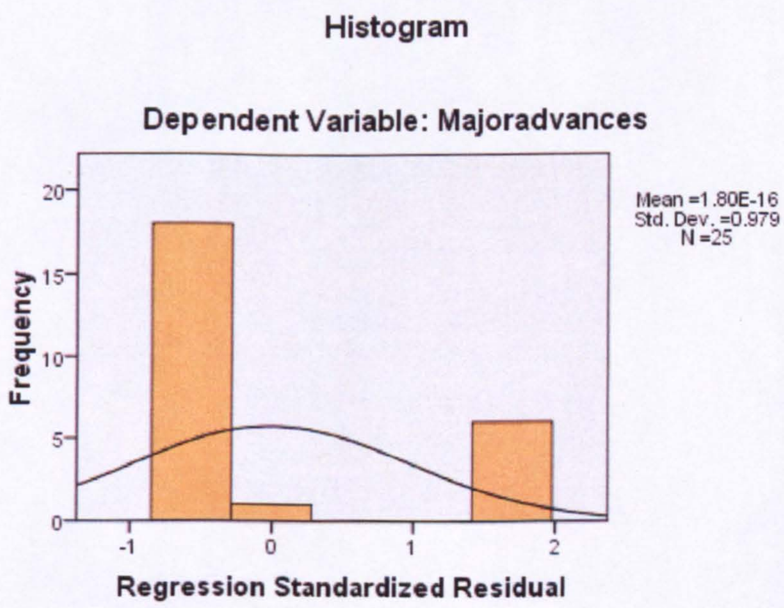
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.250	.090		2.769	.011
	Evening star	-.250	.451	-.115	-.554	.585

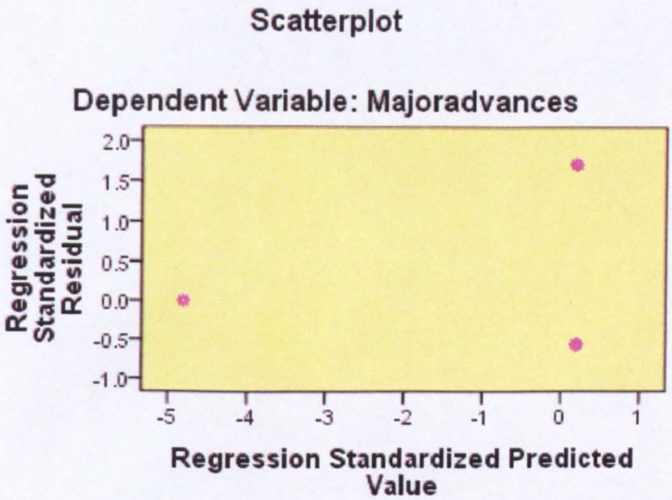
a. Dependent Variable: Major advances

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.00	.25	.24	.050	25
Residual	-.250	.750	.000	.433	25
Std. Predicted Value	-4.800	.200	.000	1.000	25
Std. Residual	-.565	1.696	.000	.979	25

a. Dependent Variable: Major advances




Scatterplot
Dependent Variable: Majoradvances
Regression Standardized Residual
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-5
-4
-3
-2
-1
0
1
Regression Standardized Predicted Value

Summary results of candlestick charting for FTSE 100 Index (1984 – 2008)

For major falls

year	Month Number	Total Falls	Major falls	Crashes	Number of Signals	Doji & Doji Star	Long Black	Black Marubozu	Hanging Man	Spinning Top	Shooting Star	Dark Cloud Cover	3 Black crows	3 inside Down	Bearish Engulfing
1984	1	4	2	0	5	1	2	0	0	0	0	0	2	0	0
1985	2	2	0	0	4	0	1	0	1	0	0	1	0	1	0
1986	3	3	1	0	3	0	1	1	0	0	0	1	0	0	0
1987	4	1	0	0	1	1	0	0	0	0	0	0	0	0	0
1988	5	3	0	0	4	0	1	0	2	0	1	0	0	0	0
1989	6	3	1	0	2	1	1	0	0	0	0	0	0	0	0
1990	7	1	0	0	2	0	0	0	0	1	1	0	0	0	0
1991	8	1	0	0	4	0	1	0	0	0	0	1	1	0	1
1992	9	2	0	0	5	1	1	0	0	0	1	1	0	1	0
1993	10	3	0	0	5	0	0	0	0	0	0	2	2	0	1
1994	11	1	1	0	5	1	1	0	0	0	0	2	0	1	0
1995	12	1	0	0	2	0	1	0	0	0	0	1	0	0	0
1996	13	2	0	0	3	1	1	0	0	0	0	1	0	0	0
1997	14	2	0	0	4	2	1	0	0	0	1	0	0	0	0
1998	15	3	0	0	3	1	1	0	0	0	1	0	0	0	0
1999	16	3	2	0	6	1	0	0	0	1	2	1	0	0	1
2000	17	3	2	0	6	0	0	0	0	2	0	1	1	0	2
2001	18	3	1	0	3	0	1	1	0	0	1	0	0	0	0
2002	19	2	1	0	4	1	0	0	1	2	0	0	0	0	0
2003	20	3	0	0	2	0	1	0	0	0	1	0	0	0	0
2004	21	3	1	0	3	0	3	0	0	0	0	0	0	0	0
2005	22	1	0	0	2	0	0	0	0	2	0	0	0	0	0
2006	23	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2007	24	2	0	0	3	1	1	0	1	0	0	0	0	0	0
2008	25	2	1	0	2	0	0	0	1	0	0	0	0	0	1
Total	25	55	14	1	83	12	19	2	6	8	9	12	6	3	6

For major advances

year	Month Number	Total Advances	Major Advances	Increase above 10%	No. of signals	Doji	Long White	White Marubozu	Hammer	Inverted Hammer	3 Advanced Soldiers	3 Inside Up	Bullish Enulfing	Bullish Harami	Evening Star
1984	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	2	2	0	0	3	0	1	0	0	0	1	1	0	0	0
1986	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	4	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1988	5	2	0	0	1	0	1	0	0	0	0	0	0	0	0
1989	6	2	1	0	6	2	1	1	0	1	1	0	0	0	0
1990	7	2	1	1	3	0	1	0	1	0	0	1	0	0	0
1991	8	2	0	0	5	0	0	0	0	0	0	1	2	1	1
1992	9	2	0	0	4	1	1	0	0	0	0	1	1	0	0
1993	10	3	0	0	3	0	2	0	0	0	1	0	0	0	0
1994	11	0	0	0	2	0	1	0	1	0	0	0	0	0	0
1995	12	3	1	0	3	2	0	0	0	1	0	0	0	0	0
1996	13	1	0	0	2	0	1	0	0	1	0	0	0	0	0
1997	14	2	1	0	3	0	1	0	1	0	0	0	0	1	0
1998	15	2	0	0	4	0	1	0	0	0	1	1	0	1	0
1999	16	1	0	0	1	0	0	0	0	0	0	0	1	0	0
2000	17	1	1	1	3	1	0	0	1	0	0	1	0	0	0
2001	18	2	0	0	3	0	2	0	1	0	0	0	0	0	0
2002	19	1	0	0	3	1	1	0	0	0	1	0	0	0	0
2003	20	3	0	0	3	0	0	0	0	0	0	0	1	2	0
2004	21	3	0	0	2	0	1	0	1	0	0	0	0	0	0
2005	22	2	0	0	5	1	1	0	2	0	1	0	0	0	0
2006	23	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	24	3	0	0	5	1	0	0	2	0	1	0	0	1	0
2008	25	2	0	0	5	3	1	0	0	1	0	0	0	0	0
Total	25	46	6	3	70	13	17	1	10	4	7	6	5	6	1