

**An Investigation into the Presence Of Noise Trading  
in the ISEQ and S&P 500 Stock Exchanges for the  
Period 2003 - 2011**



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## **Abstract**

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The purpose of this study is to investigate the presence of noise trading in the ISEQ and the S&P 500 stock exchanges. Traditional finance scholars have long argued that abnormal returns cannot be gained through security mis-pricing as markets are efficient. The EMH states that when security prices deviate from their fundamental values, prices will be brought back to their fundamental values through the principle of arbitrage.

However, due to noise trading in markets the arbitrage process doesn't take effect and markets remain inefficient for extended periods of time making it possible to yield abnormal returns.

As it is difficult to test for noise trading directly, this study will measure noise trading through the success of a contrarian and momentum investment strategies. These strategies are tested for the period 2003 – 2011 using the top 28 companies from the ISEQ and the top 30 companies from the S&P 500. The study utilises two methodologies; the market model and the adjusted market model to calculate abnormal returns.

The findings of this study show evidence for a contrarian investment strategy in both the ISEQ and S&P 500 stock exchanges for the time year period 2003 – 2011. These findings imply the presence of noise trading in both market in the long run.

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**List of  
Abbreviations**

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EMH	-	Efficient Market Hypothesis
NYSE	-	New York Stock Exchange
AMEX	-	American Stock Exchange
ISEQ	-	Irish Stock Exchange Quotation
S&P	-	Standard and Poor's
CAR	-	Cumulated Abnormal Returns
ACAR	-	Average Cumulated Abnormal Returns
CAPM	-	Capital Asset Pricing Model
US	-	United States
UK	-	United Kingdom

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## **Chapter One**

### **Introduction**

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#### **1.0 Chapter Overview**

This chapter provides a general introduction to the topics discussed in the dissertation. This chapter will begin with an outline of the Efficient Market Hypothesis (EMH) and behavioural finance. Following this the chapter will introduce contrarian and momentum strategies. The chapter will conclude with the rationale for the study and the dissertation structure.

#### **1.2 Background to the Study**

The Efficient Market Hypothesis (EMH) has been the cornerstone of the traditional approach to finance and puts forward the notion that stock markets are efficient. The theory was developed by Fama (1965, 1970) and states that all information concerning a security price is absorbed immediately into the price and there will be no opportunity to make abnormal returns. If security mis-pricing does occur, prices will be brought back to their fundamental values through the principle of arbitrage. Investors are thought of as rational agents who are risk adverse and based financial decisions around rational expectations. The EMH is associated with the random walk theory, which states that all future security prices cannot be predicted in any way from past prices as movements in security prices are random.

However, there is growing evidence against the validity of the EMH in favour of behavioural finance. Behavioural finance recognises the psychology of the investor and the influence that it has on the stock market. This theory differs from the EMH as it believes that investors can be irrational when making investment decisions. The presence of irrational investors or noise traders in the market causes security prices to fluctuate and deviate from their fundamental values. This causes implications for the EMH as these deviations may be prolonged and makes it possible for noise traders to earn abnormal profits. The EMH has a unrealistic expectation of human behaviour as

psychological factors such as overconfidence, overreaction, herding all influence investors financial decisions (Kahneman *et al.*, 1982).

One might expect that noise traders would earn lower profits than rational traders but in reality noise traders can earn higher profits than rational traders (De Long *et al.* 1990a). There are many stock market anomalies and investment strategies that noise traders use to take advantage of security mis-pricing in order to yield abnormal returns; contrarian strategy and momentum strategy to name but a few.

### **1.2.1 Contrarian Strategy**

De Bondt and Thaler (1985) were the first to document the contrarian strategy. This investment strategy investigates investor overreaction through the use of winner and loser portfolios that are based on past stock prices. The returns of this strategy are based on buying a portfolio of past losers and selling a portfolio of past winners. The theory suggests that past winner stock prices will fall and past losing stock prices will rise.

### **1.2.2 Momentum Strategy**

Jegadeesh and Titman (1993) were the first to document the momentum effect. This investment strategy is the opposite to a contrarian strategy. The returns of this strategy are based on buying a portfolio of past winners and selling a portfolio of past losers. The theory suggests that winner stock prices will continue to rise and that loser stock prices will continue to fall.

If these strategies generate abnormal returns markets are deemed to be inefficient and therefore suggests the presence of noise trading.

## **1.5 Rational for the study**

This study aims to get an insight into noise trading by employing contrarian and momentum investment strategies. While there are many studies that examine contrarian and momentum investment strategies in large markets such as the UK and the US there is little evidence for these strategies in smaller markets such as Ireland. After

acknowledging the gap in the literature this study aims to make a contribution to the existence literature.

From this, the main objectives that will be addressed during the course of this study:

1. To determine if the ISEQ and S&P 500 exhibit abnormal returns due to the presence of noise trading by using two different models; the market model and the adjusted market model.
2. To investigate if the presence of noise trading is more evident when using a contrarian strategy or momentum strategy.
3. To contrast the presence of noise trading between a large index the S&P 500 and a small index the ISEQ.

## **1.6 Dissertation Structure**

The remainder of this dissertation will be laid out as follows. Chapter two contains a theoretical background to this study. It will discuss standard finance and the alternative approach to finance, behavioural finance in great detail. It will discuss some of the key foundations of this theory. Chapter three will discuss noise trading evidence for and against the theory will be analysed. Chapter four will address the objectives of this study and outline the methodology that will be used to analyse the data and will finish by outlining the limitations of the study. Chapter five will present the findings of the data which has been analysed using the methodologies mentioned in the previous chapter. Chapter six will provide a discussion around the findings of this study in relation to literature discussed in chapters two and three and the research objectives outlined in chapter four. Finally, chapter six concludes the paper highlighting the major findings and offer recommendations.

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## **Chapter Two**

### **Theoretical Background**

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#### **2.0 Chapter Overview**

This chapter gives a theoretical background to this study. The chapter begins with a discussion around standard finance and the Efficient Market Hypothesis. Secondly, the chapter details the alternative theory of behavioural finance discussing investor psychology, herding behaviour and finally under and overreaction.

#### **2.1 Standard Finance**

The traditional approach to finance assumes that investors, markets and institutions act rationally when making decisions, consider all information available and are affected by fundamental values alone. Standard finance assumes that people are averse to risk, do not regret any decisions that they make, have self control and never suffer from cognitive errors. These assumptions of rationality feed into one of the most researched and cited theories of standard finance, the Efficient Market Hypothesis (EMH).

##### **2.1.1 EMH**

Fama (1965) was the first to introduce the EMH with his theory that stock prices do not repeat themselves in a pattern in any way and future stock prices cannot be predicted by past movements. The theory suggest that stocks prices follow a random walk which states that previous changes in stock prices are independent and uncorrelated with future stock prices therefore making it impossible to make abnormal returns or to predict future stock prices by using past information (Malkiel, 1996).

Fama (1970:383) refined the theory and states “an efficient market fully reflects all available information” and asserts that there are three forms of EMH:

- Weak form of efficiency is where the current stock prices represent all past information is a comprised of random information. Therefore, an investor should not be able to make abnormal returns by using historical data or by using techniques such as technical analysis as current stock prices are uncorrelated with past stock prices.
- Semi-Strong form of efficiency is where the current stock prices represent not only past price information but also adjust quickly to publicly available information about the company. Public information not only incorporates past stock prices but also includes financial reports, company statements and announcements. Therefore, investors cannot make abnormal returns from information that is in the public domain as it has already has been incorporated into the stock price.
- Strong form of efficiency is where the current stock prices represent not only all past and public information but also adjust to private information of a company. Private information may not be readily available to the public as it has not been published but an investor will not be able to gain abnormal returns using private information as it has already been incorporated into the stock price. Although insider trading is illegal that is not to say that it does not happen making the strong form of EMH the most difficult to hold.

The traditional view of finance states that a low valued stock would expect a low value return and a high valued stock would expect a high value return. This suggests that there should be no mis-priced securities in the market i.e. markets would be efficient. However, there have been many studies that violate the EMH and find that markets are not efficient by taking advantage of mis-priced securities. Stock market anomalies such as the Momentum Effect, the Winner Loser Effect, the Size Effect, the January Effect and the Weekend Effect are all examples of how investors make abnormal returns by using historical price data to predict future stock prices.

### **2.1.2 Bayes' Rule**

Bayes' Rule was developed by Thomas Bayes in 1763 and is the cornerstone of standard finance and in its essence means that a person should change their perceived outcome of an event in light of a new event or new information. Rational learning is the concept surrounding Bayes' Rule and this makes the assumption that rational investors learn from their mistakes and from this improve their ability to make rational investment decisions. However, behavioural finance would suggest that investors do not follow Bayes' rule and are not learning from their mistakes and continue to take large risks when making their investment decisions.

## **2.2 Behavioural Finance**

In recent years, literature contradicting standard finance and the EMH has grown significantly and much of it has fallen under the broad category of behavioural finance. Behavioural finance contradicts the traditional view of finance as it takes into account the psychological element of an investor when making a finance decision and realised that people do not act fully rational at all times.

Empirical research shows that rational asset pricing models do not explain deviations in security prices as they tend to under and overreact making markets inefficient (Daniel *et al.*, 1998). Behavioural finance takes into account what the traditional approach doesn't, for instance why an investor trades in certain stocks over others and how investors choose their portfolios. Behavioural finance argues that investors cannot do this without having any bias towards certain stocks and will be affected by risk when choosing stocks.

Expected utility theory is the proposed theory of standard finance and EMH around investor decision making under risk and uncertainty. The theory assumes that investors act as rational agents at all times, even if some investors do not act rationally, market forces will force investors to make rational decisions as the market itself is efficient (Baker and Nofsinger, 2010).

Kahnemann and Tversky's (1979) prospect theory is behavioural finance's alternative to expected utility theory. The theory takes into consideration the cognitive biases that



investors may have when making a financial decision under uncertainty and risk. The authors find that individuals put more weight on avoiding losses than they do on making gains when making decisions. Many scholars such as March (1978), Altman (2004), Todd and Gigerenzer (2003) and Smith (2003, 2005) have supported Kahnemann and Tversky's (1979) prospect theory.

Behavioural finance has two main building blocks; psychology of investors and limits to arbitrage which the theory suggests could explain market inefficiency such as stock market anomalies and asset bubbles due to the EMH inability to explain these patterns (Ritter, 2003).

### **2.2.1 Investor Psychology**

As investors are human like anyone else their financial decisions will be influenced by their emotions. This causes an otherwise rational investor to act irrationally as they become emotionally attached to a security.

#### **2.2.1.1 Overconfidence**

*“Overconfidence does not make traders wealthy, but the process of becoming wealthy can make traders overconfident”*

- Gervais and Odean, (2001:2)

According to Taylor and Brown (1988) people have overly positive self evaluations and are unrealistically optimistic. Investors become overconfident in their abilities of picking winning stocks. An example of this would include if the fundamental value of a stock was falling the investor would not sell the stock in time and end up making a loss even though the rational thing to do would have been to sell the stock (Odean, 1998a).

Shefrin and Statman (1985) were the first to document the disposition effect which is the tendency for investors to sell winning stocks too early and hold on to losing stocks too long. This reinforces the notion that when an investor earns profits it allows them to maintain self-esteem but incurring losses causes them to admit their investment decision was wrong, and therefore is avoided.

Odean (1998b) finds that the more overconfident an investor is the higher their trading volume. Yet, Barber and Odean (2001) find that an investor that trades at a high volume do not make higher profits. This is due to greater transaction cost incurred when trading at higher volumes. These findings contradict what is considered to be rational trading behaviour where an investor would only make a trade if expected profits outweigh transaction costs (Hilton, 2001).

Hindsight bias is the tendency for individuals after the outcome of an event to believe falsely that they were able to predict the particular outcome before it occurred (Fischhoff, 1975). Investors who suffer from hindsight bias are overly optimistic about their abilities and believe that they “knew all along” that the particular event was going to happen. This mentality leads investors to console their losses and therefore do not learn from the experience (Hawkins and Hastie, 1990).

It can be hard for individuals to forget or put a preconceived notion out of their mind when making a decision, this may result in confirmation bias. Confirmation bias can be defined as seeking selective evidence or information which confirms existing beliefs rather than seeking information that would contradict existing beliefs or would lead one to rationalise their decision (Nickerson, 1998). Confirmation bias can lead an investor to make a one-sided investment decision without taking in account the whole picture, which may lead them to overestimate expected returns and underestimate potential risk.

Biased self attribution feeds into investor overconfidence (Gervais and Odean, 2001) and can be defined as the tendency for individuals to attribute success to their own abilities and attribute failure to external forces (Hastorf *et al.*, 1970). If investors experience a run of successful trades they start to develop an inflated opinion of their own skill, which may result in complacency and exaggerated risk taking. However, if investors experience a run of unsuccessful trades, it is simply attributed to misfortune, thus never learning from their mistakes.

According to Odean (1999), overconfident investors trade so excessively that returns diminish. Odean (1998b) argues that investor overconfidence can cause markets to under react to information of rational investors and cause security prices to become volatile. Shiller (1981) finds supporting evidence stating that there is excess volatility in markets that cannot be attributed to merely adjusting to information.

Many scholars have determined different theories for investor overconfidence such as gender (Barber and Odean, 2001), investor type (Benos, 1998), investor psychological traits (Biais *et al.*, 2005) and confidence intervals used in forecasting models (Budescu and Du, 2007). In short, what investors perceive is going to happen and what logic tells them what is going to happen does not always concur.

### **2.2.1.2 Heuristics**

Kahneman and Tversky (1982) identify rules of thumb or heuristics that investors use when making financial decisions. The first one is the representativeness heuristic, which states that an investor will make their decision based on an argument of probability that is assumed by the investor drawing together patterns and similarities in data that may not actually exist. When people make decisions based on representativeness, it is likely that they will not evaluate the situation accurately. People tend to overestimate its ability to accurately predict the likelihood of an event. The representativeness heuristic is favoured because of its accessibility.

The second is the availability heuristics, which states that an investor will make their financial decision based on the weight of information that easily comes to mind whether it is factual or not. This heuristic operates on the notion that "if you can think of it, it must be important". Wärneryd (2001) notes availability can be based on experience, memory or imagination. An example would include, an investor making a investment decision due to media coverage rather than hard facts. Sometimes, this heuristic can be beneficial, however the frequency that information comes to mind is not always an accurate reflection of actual probability of an event.

The next heuristic is anchoring which is the tendency for an investor to make financial decisions by attaching or anchoring their decisions around a reference point that may or may not have any logical relevance to the decision. An example would include anchoring an investment decision on a particular point on graph with no other information about the security or how the security is performing. Although, this may seem an unlikely, anchoring is quite prevalent when people are dealing with new concepts.

Solvicet. *al* (2002) developed the final heuristic, the affect heuristic which is how a person's emotions can affect their perceived risks or benefits of a situation. Research shows that risks and benefits are negatively correlated in people's minds. If a person's feelings towards a situation are positive, then they are more likely to perceive the risks as low and the benefits high, whereas if their feelings are negative, then they are more likely perceive the risks as high and benefits low. If an investor has earned high returns from a particular security, they will have a positive association with it and may continue to trade the security regardless of whether it is a good investment or not.

### **2.3 Herding and Information Cascades**

Herding can be defined as an individual copying another individual or a group of individuals' actions or decisions which may or may not include the individual's own private information. However, information cascades occur when an individual observes and copies another individual or a group of individuals' actions or decisions totally disregarding their own private information (Celen and Kariv, 2004).

It is important for investors to know if there is herding behaviour in the market as their reliance on the same public information rather than private information may cause stock prices to deviate from their fundamental value. If stock prices move from their fundamental values, investors may be trading on noise rather than information.

Lakonishok *et al.* (1992) were one of the first to conduct an empirical study of herding behaviour. The authors conducted a study of 769 tax exempt funds (primarily pension funds) which are managed by 341 different institutional investors. The study observes some herding among institutional investors when trading small stocks but observes little or no herding when trading large stocks, which counts for 95 per cent institutional investors' trading. The authors conclude that the magnitude of herding is not enough to influence stock prices. Wermers (1999) finds similar results with high levels of herding of small stocks when conducting a study of mutual funds.

However, Tan *et al.* (2008) find contrasting results to that of Lakonishok *et al.* (1992) stating that herding behaviour does have an influence on the movement of A shares, in rising markets with high trading volume when testing A and B shares in Chinese markets.

Standard finance considers herding behaviour to be irrational. However, Keynes (1936: 158) postulates that this is a rational action as it is better for an investor's reputation to "fail conventionally than to succeed unconventionally" as if they "follow the herd" their judgments are seen to be sound. Scharfstein and Stein (1990) supports this view stating that institutional investors ignore their own private information and copy the decisions of other investors regardless, as the risk to their reputation is significantly reduced when other traders make the same mistake and the blame can be shared among them. Devenow and Welch (1996) and Pally (1995) add investors can hide within the herd when their investment decisions are unprofitable as there is safety in numbers.

Many researchers have developed theories as to why institutional investors herd. Hirsheifer *et al.* (1994) note that institutional investors simply may track the same or similar variables and obtain correlated private information and trade on that information at the same time. The authors also noted that investors may have the similar trading strategies and trade on a similar portfolio of securities. According to Bikhchandani *et al.* (1992) institutional investors who have observed the trades of better informed investors, may deduce private information from these observations and make similar trades as better informed investors. Falkenstein (1996) argues that institutional investors have specific set security characteristics that they will trade on such as liquidity level, idiosyncratic volatility, size of security.

## **2.4 Overreaction and Underreaction**

Lo (1997) states that investors do not always react to information in the correct proportion that is asserted by the EMH. Under and overreaction occurs due to investor sentiment around securities. Empirical research has shown that security prices underreact to news such as earnings announcements which is incorporated slowly over short time horizons of one to twelve months. On the other hand, security prices overreact to a series of good or bad news events over long time horizons of three to five years (Barberis *et al.*, 1998). These market under and overreactions to investor sentiment make it viable to profit from trading strategies such as contrarian and momentum strategies and in doing so violate the EMH.

De Bondt and Thaler (1985) were the first to find evidence for a contrarian strategy in the NYSE. The authors find that a portfolio of 35 past losers outperformed the market by 19.6 per cent whereas a portfolio of 35 past winners underperformed the market by 5 per cent over a three year period. The authors state that their findings are a violation of Bayes' rule as stock prices overreact to new events or information.

Lehman (1990) finds evidence of market overreaction when using a contrarian strategy. These findings differ to that of De Bondt and Thaler (1985) as they provide evidence for a contrarian strategy in the short term. The authors find that portfolios of winners and losers selected based on returns in the previous week generate abnormal returns. Jegadeesh (1990) finds similar results for portfolios of winners and losers based on their prior months return yielding a two per cent profit. However, the authors note that although a contrarian strategy yields abnormal returns they may not be entirely attributed to overreaction. They state that these returns may be explained by a lack of liquidity in markets or short term pressure on prices rather than overreaction.

Lo and MacKinlay (1990) support these results stating that 50 per cent of abnormal returns generated by a contrarian strategy can be attributed to normal economic factors such as time lag and the remaining 50 per cent can be attributed to overreaction. Jegadeesh and Titman (1995) develop this further and state that stock prices overreact to information regarding the firm, but have a delayed reaction to common factors such as size, industry, valuation etc. Danielet *al.* (1998) find similar results when conducting a study on investor psychology. The authors state the investors tend to overreact to private information and underreact to public information.

According to the EMH all investors are rational and one would expect that the recommendations made by financial analysts would be rational. However, in a later study, De Bondt and Thaler (1990) find that financial analysts do overreact as their forecasts are too extreme to be considered rational. These are significant results as analysts' forecasts have some influence on the stock market as their recommendations are acted upon by other investors.

Jegadeesh and Titman (1993) were the first to document the momentum strategy when conducting a study of the NYSE and AMEX stock exchanges. The authors find

that a portfolio of stocks that performed the best over the previous three to twelve months continue to perform well over the following three to twelve months and likewise a portfolio of stocks that performed the worst over the previous three to twelve months continue to perform poorly over the following three to twelve months. The authors find this strategy yields monthly returns of 1.13 per cent. Grundy and Martin (2001) find similar results for the momentum strategy with their study generating monthly returns of 0.44 per cent.

Rounwenhorst (1998) investigates an international portfolio of medium term winners and losers across 12 European countries between 1980 - 1995. The author finds support for a momentum strategy with past winners outperforming past losers by one per cent when adjusted for risk by one per cent a month. Return continuation is present in all 12 countries and holds for a short time period of one year. Hong and Stein (1999) also find evidence for a momentum strategy in the short to medium term and also find evidence of a price reversal in the long run.

Bremer and Sweeney (1991) find evidence for a momentum strategy for very short time periods. The authors find that a loser portfolio which has large negative daily rates of return, are followed by positive rebounds over the next two days. Where the one day price fall has been greater than ten per cent, the average first day rebound is 1.773 per cent, and by the second day the cumulative rebound is approximately 2.2 per cent.

Siganos (2007) finds evidence for the momentum effect when using a portfolio of extreme winners and losers of 40 companies each. The study finds returns of 2.09 per cent a month and that these returns are almost double than those gained by employing conventional portfolios.

Lesmondet *al.* (2004) finds evidence that contradicts that of Jegadeesh and Titman (1993), stating that although, a momentum strategy can be profitable, these profits are diminished due high transaction costs. The authors state that the stocks that an investor has to trade in order to participate in momentum trading are the stocks associated with high trading costs.

Conrad and Kaul (1998) conducts a study investigating both contrarian and momentum strategies in the U.S. for the period 1962 - 1985. The authors find

evidence for both strategies but returns rely heavily on the time period in which the strategy is implemented. A contrarian strategy yields greater returns in the immediate short term and in the long term of two to five years. A momentum strategy yields greater returns when holding periods are between three and twelve months. The authors argue that momentum returns can be attributed cross sectional difference in expected returns and the momentum effect occurs due to investor overreaction and herding behaviour.

Galariotis *et al.* (2007) conduct a study investigating both contrarian and momentum strategies in the UK for the 40 year period. The authors find evidence for both momentum and contrarian strategies across a range of combinations of formation and holding periods. The authors find that a momentum strategy yields greater returns with short formation and holding periods and a contrarian strategy yields greater returns with longer formation and holding periods.

These findings can be used to reject the EMH in favour of behavioural finance but traditional finance scholars will argue that these results enforce the EMH as if the amount of overreaction is equal to the amount of underreaction in the long run then EMH holds.

## **2.5 Chapter Summary**

This chapter gave an outline of standard finance and the EMH. Behavioural finance has been discussed in great detail with the psychology of the investor and its influence on the stock market at the forefront.



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## Chapter There

### Literature Review

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### 3.0 Chapter Overview

This chapter will discuss some of the existing literature around noise traders. It will first give an introduction to noise traders. Secondly, the implications for EHM. Finally, the chapter will close with providing evidence for and against noise traders.

### 3.1 Noise Traders

*‘...one way to think about noise is that it is the opposite of news. Rational traders make decisions on the basis of news (facts, forecasts, etc.). Noise traders make decisions based on anything else.’*

- Thaler (1993: xvii)

It has been long argued by traditional finance scholars such as Friedman (1953), Samuelson (1971 and 1977) and Figlewski (1979) that noise traders will eventually lose their earnings as they do not trade rationally and are unaware that they trade on a buy high sell low strategy. Traditional finance assumes that noise traders will have no influence on security prices as irrational traders will cancel each other out and rational investors will stabilise markets keeping them efficient.

One of the first scholars to recognise that investors do not behave rationally was Keynes (1936:154) when he coined the phrase “animal spirits”, the author used the term to describe how a person’s emotions such as optimism influence trading decisions rather than a rational evaluation of expected return. Due to these “animal spirits” Keynes (1936) implies that security prices will not completely be determined by economic variables and those who trade on strategies based on fundamental values face greater risks. Keynes (1936) also developed the beauty contest metaphor when describing the way in which investors viewed securities and made their investment

decisions. The author states that investors determine the price of securities not based on what their fundamental value is, but rather on what they think everyone else thinks that their value is.

Black (1986) argues that noise traders keep markets efficient as in order for financial markets to be liquid, rational traders will never invest enough to make security prices efficient as this would involve undertaking a level of risk that rational investors would not. Due to this level of risk, rational investors as a whole will not invest enough to eliminate the level of noise in stock prices as they can never be certain that the information they are trading on is actual information or whether it is noise. Similarly, it is hard to distinguish if information has been incorporated into the stock price or is it noise that causes price fluctuations leading rational investors to trade on noise when they think that they are trading on information.

Noise creates volatility in markets as the value of a security price moves from its fundamental value due to the amount of noise that is reflected in the stock price, informed traders will bring stock prices back to their fundamental values but only gradually (Black 1986). Shiller (1981) finds excess volatility when conducting a study of the movements in stock prices in relation to changes in dividends. These movements cannot be fully accounted for by new information about future dividends. Therefore, movements in stock prices cannot all be explained by rational traders implying that there is noise in markets.

Empirical evidence suggests that the more liquid a market is the more likely it is for noise traders to invest in that market. Chin *et al.* (2002) find evidence that noise traders are more aggressive in smaller illiquid markets and add future risk to that market. The authors find that the negative impact of noise traders in the New Zealand stock exchange, a small illiquid market, and find that there is greater opportunity for a contrarian investment strategy to pay off in larger more liquid markets like US and Japan.

### **3.2 Limits to Arbitrage**

The EMH assumes that whenever a mispricing of a security occurs, an opportunity for riskless profit is created for rational investors through arbitrage. Arbitrage keeps markets efficient as it brings security prices back to their fundamental values.

Noise traders are important when discussing market efficiency as they create limits to arbitrage as prices remain in a non-equilibrium state for an extended period of time than expected by EMH. As a result, rational investors cannot arbitrage away pricing inefficiencies. Shleifer and Summers (1990) describe the arbitrageurs as rational investors who take advantage of mis-priced securities to make a riskless profit. Arbitrageurs buy and sell mis-priced securities in different markets for a profit until they are equalised and brought back to their fundamental values.

However the presence of noise traders does not allow this arbitrage process to take effect as Keynes (1936:157) outlines “markets can remain irrational longer than you can remain solvent”. Additionally, Shleifer and Vishney (1990) state that arbitrageurs have short time horizons as they may have to borrow money in order to take advantage of the arbitrage opportunity and these transaction cost and fees can mount up before the investors can reap the benefits of the arbitrage opportunity. Also, Shleifer and Summers (1990) state that the performance of most investors is monitored at on a yearly bases but and usually takes place every few months. As a result resources for long-term arbitrage for investors is scarce.

### **3.2.1 Fundamental risk**

The most obvious risk that a rational investor trying to make arbitrage profits face is fundamental risk. This occurs when an investor buys a stock at its fundamental value and this price falls due to new bad information reflected in the stock price. Most arbitrageurs will try to hedge their losses by selling the same or similar security in another market at the same time but the problem with this is that substitutes are not always perfect making it impossible to fully remove fundamental risk. Fundamental risk can limit arbitrage in the long run (Shleifer and Vishny, 1997).

### **3.2.2 Noise Trader Risk**

Another risk to arbitrage is noise trader risk which happens when a rational investor trying to make an arbitrage profit buys a stock at it fundamental value and noise causes the security price to fall and puts downward pressure on the security price to continue falling from the security’s fundamental value. An investor will have to sell the stock before the stock has time to recover therefore making a loss, the volume of

noise in the market will prevent investors trying to make an arbitrage profit in the short term. De Long *et al.* (1990a) states the unpredictable opinions of noise traders cause securities to diverge from their fundamental values and rational investors will not risk trying to make an arbitrage profit in an uncertain market and Barberis and Thaler (2003) add that noise traders irrational beliefs get worse in the direction of already distorted prices.

### **3.3 Evidence for Noise Traders**

Developing a theoretical framework, De Long *et al.* (1990a:706) find contradicting results to that of Friedman (1953) and other traditional finance scholars and develop the theory further stating that noise traders "falsely believe that they have special information about the future price of risky assets". The authors find that irrational noise traders can earn higher returns than rational traders as they are been rewarded for bearing more risk even when they buy high and sell low. The authors also argue that noise traders do have an influence over security prices and cause them to move from their fundamental prices and in doing so reduces arbitrage opportunities in the short run even with the absence of fundamental risk. The authors note that noise trader risk may not be fundamental risk but the unpredictable behaviour of irrational traders and its influence on security prices and as a result noise traders create their own space in the market. Russell and Thaler (1985) find supporting evidence stating that the presence of rational investors is not enough to keep security prices at fundamental prices.

De Long *et al.* (1990b) find evidence that contradicts the traditional view of finance that rational investors should go against irrational investors when making investment decisions in order to stabilise markets. The authors find that it is profitable for rational investors to follow an irrational trader's positive feedback trading method whereby they sell when markets are declining and buy when markets are rising. If rational investors can anticipate these movements before a noise trader acts on them their investment will increase due to the divergence from security's fundamental values as a result of pressure from noise traders.

De Long *et al.* (1991) examine the existence of noise traders in the long run using a model where noise traders do not have any influence over security prices. The authors find that noise traders as a group not only survive in the long run but also dominate the market and obtain higher earnings and a higher accumulation of wealth than rational investors. The authors state that noise traders hold portfolios with high growth rates and will eventually overtake the portfolios of rational investors.

Palomino (1996) finds similar results to De Long *et al.* (1990a 1990b) when testing for noise trader risk in imperfect competitive small markets. The author finds that when noise traders earn higher returns than rational investors, noise traders obtain a higher expected utility than rational investors. This influences other investors to trade irrationally as well and therefore noise traders eventually dominating the market in the long run.

Kogan *et al.* (2006) argues that the survival of noise traders in the long run and their influence on security prices are not mutually exclusive (Friedman, 1953). The authors find that noise traders still have an influence over security prices even after their earnings have deteriorated. This proves that even if noise traders are losing money on trades their actions have an influence on security prices.

### **3.4 Contrasting View**

Sandroni (2000) and Blume and Easley (2006) find contrasting results to that of De Long *et al.* (1991) stating that the survival of investors in the long run can be explained by discount factors, investor attitude towards risk and their beliefs about stock market efficiency. Sandroni (2000) finds that if investors have the same discount factor and make rational decisions, they will survive in the long run regardless of the level of risk undertaken by the investor. Blume and Easley (2006) state that traditional finance assumptions hold up to some extent and depends on whether markets are incomplete or complete. In a complete market the authors find that noise traders do not survive in the long run but denote that they may survive in an incomplete market as securities remain mispriced even in the long run.

Bhushan *et al.* (1997) finds evidence against De Long *et al.* (1990a) stating that noise traders do not create their own space in the market as they believe that they trade like

rational traders. The authors argue that noise traders assume the securities they invest in are mispriced and that their future movements are random.

### **3.5 Chapter Summary**

This chapter has looked at the main literature around noise traders. The chapter provides evidence for and against noise traders. A general understanding of the area has hopefully been achieved.

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## **Chapter Four**

### **Methodology**

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#### **4.0 Chapter Overview**

This chapter will outline the methodology and data that will be used to conduct this study. Firstly, the research objectives will be outlined. The chapter will then look at the research design and the data that will be used to conduct the primary research. The methodologies that will be used to analyse the data will be assessed. Finally, the chapter will conclude with the limitations of study with regards to the data and methodologies utilised.

#### **4.1 Research Objectives**

Based upon the issues and topics discussed in the previous two chapters as well as taking into account constraints due to accessibility, the following objectives will be addressed during the course of this study:

1. To determine if the ISEQ and S&P 500 exhibit abnormal returns due to the presence of noise trading by using two different models; the market model and the adjusted market model.
2. To investigate if the presence of noise trading is more evident when using a contrarian strategy or momentum strategy
3. To contrast the presence of noise trading between a large index the S&P 500 and a small index the ISEQ.

## **4.2 Hypothesis Formation**

The purpose of this study is to determine the presence of noise traders in the ISEQ index for Ireland and the S&P 500 index for America. The presence of noise trading is difficult to determine directly, therefore trading strategies are the most efficient way of determine the existence of noise trading. Contrarian and momentum investment strategies are the most appropriate means to determine the presence of noise trading as these strategies will be able to give an indication if noise is reflected in security prices due to market overreaction, price reversals and price continuations. There are multiple methods of testing contrarian and momentum investment strategies, this study will use the market model and adjusted market model to investigate if these investment strategies yield abnormal returns. If these investment strategies yield abnormal returns markets are not efficient implying that noise trading is present in markets. The following hypotheses will be tested in order to determine the presence of noise trading in markets:

$H_0$ : The null hypothesis states that noise trading is not present as abnormal returns are not generated by using a contrarian and momentum investment strategies, indicating that markets are efficient.

$H_A$ : The alternative hypothesis states that the presence of noise trading can be detected by abnormal returns generated using contrarian and/or momentum investment strategies, indicating that markets are not efficient.

## **4.3 Research Design**

### **4.3.1 Data**

Quantitative data will be used to conduct this study. The top companies from the ISEQ and S&P 500 by market capitalisation. Those that have all of the available data will be selected for this study. Weekly return data for the ISEQ and S&P 500 will be used for a nine year period between 1<sup>st</sup> January 2003 and 31<sup>st</sup> December 2011. This data can be easily accessed from Thompson One Banker database.

There are many reasons why weekly data and a nine-year time period were chosen. Firstly, a nine-year time period provided the study the largest data set possible. De



Bondt and Thaler (1985) use a sample of 70 in their portfolio of extreme winners and losers however, it is not possible to collect such a large data sample for this study as data for the ISEQ is limited. For this reason and in order to maintain similar standard of analysis for both indices this study will consists of the top 28 companies from the ISEQ and the top 30 companies from the S&P 500 even though there are many more companies from the S&P 500 that had the relevant data.

Although, a nine year time period is small in comparison to the studies of De Bondt and Thaler (1985) and Jegadeesh and Titman (1995) which used time periods of 56 and 27 years respectively. This time period also allows us to see if noise trading exists to the present day.

Finally, weekly data was selected as daily data can be too volatile and monthly data may miss some important events as it does have enough observations. Shleifer and Vishny (1997) state that many investors have short time horizons therefore weekly data is most appropriate as it takes into account these observations.

Weekly returns data has to transformed so that abnormal returns can be measured. In order to do this, the weekly change in stock and index prices has to be obtained. This can be calculated by getting the natural log of each stock and index prices. The first step is to divided one weeks return of a company by the previous weeks return. When this is obtained the natural log formula can be applied. This can be written as:

$$LN \frac{P_t}{P_{t-1}} \quad (4.1)$$

This equation has to be applied to the individual weekly returns of each company and index. These returns can then can be used in the market model and adjusted market model to measure abnormal returns.

#### **4.3.2 Market Model**

This study mirrors the model used by De Bondt and Thaler (1985) and is widely used by researchers today. The market model measures abnormal returns by running a standard regression on the returns generated from equation 4.1, which tests the

relationship between market returns and company returns. Company returns the dependent variable are run against the index returns the independent variable in this regression. The market model can be written as:

$$R_{it} = \alpha_i + \beta(R_{mt}) + \varepsilon_{it} \quad (4.2)$$

This formula is used for each individual company. From each regression, a list of residuals ( $\varepsilon_{it}$ ) are obtained. These residuals are used as the abnormal returns and are used to calculate the formation and holding periods.

#### **4.3.3 Adjusted Market Model**

The adjusted market model mirrors the model used by De Bondt and Thaler (1987). The adjusted market model takes equation 4.2 and puts  $\alpha$  is equal to zero and  $\beta$  equal to one. We can write this formula as:

$$R_{it} - R_{mt} = \varepsilon_{it} \quad (4.3)$$

This formula is used for each individual company and the results are then sorted into the formation and holding periods.

#### **4.3.4 Construction of Formation and Holding Periods**

Before the abnormal returns generated by the market model and adjusted market model can be sorted into winners and losers, formation and holding periods have to be constructed in order to test if contrarian and momentum investment strategies are profitable.

Formation and holding periods for a contrarian investment strategy will be constructed as follows:

*Table 4.1 Contrarian Strategy Formation and Holding Periods*

	<b>Formation Period</b>	<b>Holding Period</b>
<b>Period 1</b>	2003 to 2005	2006 to 2008
<b>Period 2</b>	2006 to 2008	2009 to 2011

This study follows a three year formation and three year holding period as it will allow comparison to other studies such as De Bondt and Thaler (1985) and Jegadeesh and Titman (1993) who utilise the same formation and holding periods.

Formation and holding periods for a momentum investment strategy will be constructed as follows:

*Table 4.2 Momentum Strategy Formation and Holding Periods*

	<b>Formation Period</b>	<b>Holding Period</b>
<b>Period 1</b>	2003	2004
<b>Period 2</b>	2004	2005
<b>Period 3</b>	2005	2006
<b>Period 4</b>	2006	2007
<b>Period 5</b>	2007	2008
<b>Period 6</b>	2008	2009
<b>Period 7</b>	2009	2010
<b>Period 8</b>	2010	2011

This study follows a one year formation and one year holding period as it will allow comparison to other studies such as Jegadeesh and Titman (1993), Rounwenhorst (1998) and Conrad and Kaul (1998) who utilise the same formation and holding periods.

All years in formation and holding periods run from the first week in January to the final week in December.

#### 4.3.5 Formation of Winner and Loser Portfolios

The next step is to apply the Cumulated Abnormal Returns (CAR) equation. It is calculated by aggregating the abnormal returns in the periods listed in tables 4.1 and 4.2 above. This method has been widely used by De Bondt and Thaler (1985, 1987) and Conrad and Kaul (1993) and can be written as:

$$CAR_{it} = \sum_{t=1}^T AR_{it} \quad (4.4)$$

When this formula has been applied the CAR of the companies can be ranked into winner and loser portfolios. The portfolios consist of the companies ranked highest and lowest in terms of CAR. For the ISEQ, the top 14 companies with the highest CAR will be put into the winners portfolio and the remaining 14 companies will be put into the losers portfolio. For the S&P 500, the top 15 companies with the highest CAR will be put into the winners portfolio and the remaining 15 companies will be put into the losers portfolio.

The final step is to calculate the Average Cumulated Abnormal Returns (ACAR) which is the average of the CAR winner and loser portfolios. The method has been used by Bondt and Thaler (1985, 1987) and Conrad and Kaul (1993) in their previous research and can be written as:

$$ACAR_{pt} = \frac{\sum_{i=1}^n CAR_{it}}{n} \quad (4.5)$$

When the ACAR formula has been applied to the winner and loser portfolios we can determine if a contrarian or momentum investment strategy is profitable. For a contrarian strategy the ACAR of the loser portfolio is subtracted from the ACAR of the winner portfolio. This can be written as:

$$ACAR_L - ACAR_W \quad (4.6)$$

For a momentum strategy the ACAR of the winner portfolio is subtracted from the ACAR of the loser portfolio. This can be written as:

$$ACAR_W - ACAR_L \quad (4.7)$$

If the results of the above equations are greater than zero then a contrarian/momentum strategies are profitable.

However, it must be noted that the CAR equation may lead to misleading findings as Conrad and Kaul (1993) state returns are said to follow a random walk and the CAR equations can present significant positive or negative results when there are non actually present.

#### **4.3.6 Formation of Extreme Winner and Extreme Loser Portfolios**

Following a similar strategy to the studies of Siganos (2007) and De Bondt and Thaler (1985). These studies construct portfolios of extreme winners and extreme losers by taking the previous CAR winner and loser portfolios formations and using them to create new portfolios. This involves taking the top seven winners with the highest returns to create a portfolio of extreme winners and the top seven losers with the lowest returns to create a portfolio of extreme losers. The ACAR formula is applied in a similar way to the new portfolios. In order to determine if a contrarian strategy is profitable the ACAR of the extreme loser portfolio is subtracted from the ACAR of the extreme winner portfolio. This can be written as:

$$ACAR_{\text{Extreme L}} - ACAR_{\text{Extreme W}} \quad (4.8)$$

In order to determine if a momentum is profitable the ACAR of the extreme winner portfolio is subtracted from the ACAR of the extreme loser portfolio. This can be written as:

$$ACAR_{\text{Extreme W}} - ACAR_{\text{Extreme L}} \quad (4.9)$$

As before, if the results from equations 4.8 and 4.9 are greater than zero then abnormal returns are generated and the strategy is profitable. These steps are applied to all of the winner and loser portfolios in each formation and holding periods in tables 4.1 and 4.2.

#### **4.4 Limitations**

A major limitation of this study is the limited amount of data available for the ISEQ. Out of the 56 companies listed on the ISEQ only 28 of them had the relevant data. Although, this study could have been conducted over a slightly longer 12 year time period if six companies without the relevant data were omitted from the ISEQ data set. However, this may have lead to similar findings between a portfolio of winner and losers and a portfolio of extreme winners and extreme losers therefore a shorter time period with a large data set was chosen.

Also, a longer time period similar to that in De Bondt and Thaler (1985) would deliver more robust finding's the additional research would have taken too long due to time constraints.

Other limitations of this study include the methodologies employed. As there are other methodologies available such as the three factor model and CAPM that may give more robust findings.

#### **4.5 Chapter Summary**

This chapter details how the study is going to be carried out by outlining what data and methodologies are best suited to the study in order to fulfil the research hypothesis and research objectives.

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## Chapter Five

### Findings

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#### 5.0 Chapter Overview

This chapter outlines the findings of the primary research conducted in this study. This chapter will present the results of the two methodologies outlined in the previous chapter which are used to investigate the presence of noise traders in the ISEQ and S&P 500 stock exchanges for the period 2003 – 2011 using contrarian and momentum investment strategies

#### 5.1 Contrarian Strategy Returns

Table 5.1 displays the abnormal returns generated by a contrarian strategy using market model and adjusted market model for the ISEQ and S&P 500 stock exchanges.

*Table 5.1 Contrarian Strategy Returns*

	Market Model Returns		Adjusted Market Model Returns	
Holding Period:	ISEQ	S&P 500	ISEQ	S&P 500
1. 2006-2008	0.6073	0.2486	0.0546	0.3097
2. 2009-2011	0.4738	0.2007	-0.8084	-0.2616
Average	0.5405	0.2247	-0.3769	0.0240

Market model returns for the ISEQ, in holding period one earn returns of 60.73 per cent above the market. This strategy continues to be successful in the second holding period earning returns of 47.38 per cent above the market and making a overall average return of 54.05 per cent. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of losers show expected results in both holding periods, outperforming the market on average by 5.7 per cent. The winner portfolio also shows expected results in both holding periods underperforming the market on average by 193.61 per cent (See Appendix C, Table

1). This indicates large price reversals suggesting the market overreaction. These results are consistent with the overreaction hypothesis implying that markets are not efficient and that noise trading is present.

Market model returns for the S&P 500, during the first holding period yield a return of 24.86 per cent above the market and outperform the market by 20.07 per cent in the second holding period. A contrarian strategy earns overall average returns of 22.47 per cent above market returns for the period 2003 -2011 however, returns diminish by over four per cent from the first holding period to the second. There are some interesting findings when we take a look at the individual winner and loser portfolios. In the first holding period the winners portfolio presents unexpected results, outperforming the market by 4.62 per cent. This result does not show a price reversal from previous winning stocks. However, in the first holding the loser portfolio period does show expected result as it outperforms the market by 29.49 per cent. In the second holding period the winners portfolio does yield expected results underperforming the market by 21.18 per cent showing a price reversal. In contrast, the losers portfolio does not yield expected result as it underperforms the market by 1.1 per cent (See Appendix C, Table 2). As a contrarian strategy is successful in both stock exchanges using a market model, it implies that noise trading is present for the period 2003 – 2011.

For the ISEQ, the adjusted market model yields returns of 5.46 per cent over market returns in the first holding period earning. However, this strategy is unprofitable in holding period two underperforming the market by 80.84 per cent. A strategy of buying past losers and buying past losers for the period 2003 -2011 is not profitable underperforming the market by 37.69 per cent. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of winners in holding periods one and two yield unexpected results outperforming the market by 17.59 per cent and 24.51 per cent respectively. A portfolio of losers in holding period one yields expected results outperforming the market by 23.05 per cent. However, in holding period two the portfolio of losers yields unexpected results underperforming the market by 56.35 per cent (See Appendix C, Table 3).

For the S&P 500, a strategy of buying past losers and selling past winners is profitable in holding period one earning returns of 30.97 per cent above market returns.



However, these returns are nearly eroded away in the second holding period as the strategy underperforms the market by 26.16 per cent, making an overall average profit of just over four per cent above market returns. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio winners show unexpected results for holding periods one and two as they outperform the market by 6.12 per cent and 5.56 per cent respectively. In the first holding, a portfolio of losers shows expected results outperforming the market by 37.09 per cent. However, the second holding period shows unexpected results underperforming the market by 20.56 per cent (See Appendix C, Table 4). These results indicate that noise trading is present the first holding period but shows no evidence for noise trading in the second holding period.

## 5.2 Contrarian Strategy Returns Extreme Portfolio

Table 5.2 displays returns for a contrarian after taking the previous portfolio formations in table 5.1 and omitting half of the companies leaving the portfolios compiled with the most extreme winner and loser companies.

*Table 5.2 Contrarian Strategy Returns Extreme Portfolio*

<b>Holding Period:</b>	<b>Market Model Returns</b>		<b>Adjusted Market Model Returns</b>	
	<b>ISEQ</b>	<b>S&amp;P 500</b>	<b>ISEQ</b>	<b>S&amp;P 500</b>
<b>1. 2006-2008</b>	0.8986	0.4652	0.1982	-0.0403
<b>2. 2009-2011</b>	1.0144	0.1516	-1.365	-0.4474
<b>Average</b>	0.9559	0.3084	-0.5835	-0.2439

For the ISEQ, the overall average returns increase from 54.05 per cent above market returns to 95.6 per cent above market returns when using the market model. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners yield expected results underperforming the market by 80.85 per cent in holding period one and 86.86 per cent in holding period two. A portfolio of extreme losers also show expected results outperforming the market by 8.90 per cent in holding period one and 14.57 per cent in holding period two (See Appendix D, Table 1). These results indicate that the level of noise trading is increasing from holding period one to holding period two.

For the S&P 500, a contrarian strategy is successful in both holding periods using the market model. The effect reduces significantly from the first holding period to the second with average returns reducing 31.36 per cent. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners yield expected results in both holding periods with underperforming the market by 13.39 per cent and 14.98 per cent respectively showing a price reversal. The losers portfolio also yields expected results in holding periods one and two outperforming the market by 33.13 per cent and 0.18 percent receptively (See Appendix D, Table 2). These results indicate that prices are moving back to their fundamental values and level of noise trading is decreasing.

For the ISEQ, the adjusted market model is profitable in holding period one earning 19.81 per cent over market returns. However, a contrarian strategy is unsuccessful in the second holding period underperforming the market by 136.52 per cent. A contrarian strategy does not earn abnormal returns using the market model underperforming the market by 58.35. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners yields unexpected results in holding periods one and two outperforming the market by 6.16 per cent and 19.30 respectively. The portfolio of losers yields expected results in holding period one outperforming the market by 25.98 per cent. However, the portfolio yields unexpected results in holding period two underperforming the by 117.23 per cent (See Appendix D, Table 3).

For the S&P 500, a contrarian strategy does not yield abnormal returns using the adjusted market model. A contrarian strategy underperforms the market by 4.03 per cent in the first holding period and 44.74 per cent in the second holding period. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners show unexpected results outperforming the market in both holding periods. In the first holding period, the portfolio of losers shows the only expected results outperforming the market by 33.27 per cent. The second holding period also shows unexpected results underperforming the market by 37.17 per cent (See Appendix D, Table 4). This result indicates that the level of noise trading has decreased from holding period one to holding period two in both stock exchanges.

### 5.3 Momentum Strategy Returns

*Table 5.3 Momentum Strategy Returns*

	Market Model Returns		Adjusted Market Model Returns	
Holding Period:	ISEQ	S&P 500	ISEQ	S&P 500
1. 2004	0.0089	-0.0426	0.0249	0.0729
2. 2005	-0.1059	0.0689	-0.0543	0.1062
3. 2006	0.0668	0.0129	0.0612	-0.0812
4. 2007	-0.1173	-0.0359	-0.2779	0.0849
5. 2008	0.0498	-0.3318	0.3671	-0.0399
6. 2009	-0.2177	-0.2503	-0.1013	-0.1767
7. 2010	0.0009	-0.0927	0.1207	-0.0055
8. 2011	0.1278	0.0024	0.3360	-0.0057
Average	-0.0233	-0.0836	0.0596	-0.0056

For the ISEQ, the market model does not yield abnormal returns. There is evidence of the momentum effect in some of the individual holding periods but the strategy doesn't earn a profit for the time period 2003 – 2011 with overall average returns underperforming the market by 2.33 per cent. However, a momentum strategy yields returns in holding periods three, five and eight outperforming the market by 6.68 per cent, 4.98 per cent and 12.78 per cent respectively. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of losers shows evidence for the momentum effect in holding periods three, five and eight underperforming the market by 2.16 per cent, 39.86 per cent and 30.59 per cent implying that previous losing stocks continue to fall. A portfolio of winners show evidence of the momentum effect from holding period one to two increasing from 3.65 per cent above market returns to 6.36 per cent above market returns indicating that previous winners continue to grow. There is also evidence of the momentum effect in holding periods three and four of the winner portfolio although, their returns do not increase dramatically year on year, their returns remain positive implying a price continuation (See Appendix E, Table 1).

A momentum strategy does not hold using the market model for the S&P 500 hold for the period 2003 – 2011 with overall average returns underperforming the market by

8.36 per cent. However, a momentum strategy does provide positive returns in holding periods two, three and eight. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of winners presents some evidence of the momentum effect in holding periods three and four, showing positive returns outperforming the market by 4.03 per cent and 3.49 per cent respectively. However, the remaining holding periods present negative returns showing a price reversal rather than a price continuation. A portfolio of losers also shows little evidence for the momentum effect with the expectation of holding periods one, two and eight underperforming the market by 0.02 per cent, 6.89 per cent and 2.05 per cent respectively (See Appendix E, Table 2). These results provide little evidence for noise trading in either markets as they both yield negative returns.

The adjusted market model yields abnormal returns for the ISEQ, outperforming the market by 5.95 per cent. However, the strategy yields negative returns in holding periods two, four and six. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of winners yields expected positive returns in holding periods two, four, five and seven outperforming the market by 6.15 per cent, 9.54 per cent, 19.21 per cent and 10.54 per cent respectively. There is also evidence of the momentum effect from holding periods four to five with returns increasing ten percent implying a price continuation. A portfolio of losers also shows expected negative returns in holding periods one, three, five, seven and eight underperforming the market by 3.03 per cent, 7.03 per cent, 17.49 per cent, 1.53 per cent and 38.37 per cent respectively (See Appendix E, Table 3). As a momentum strategy holds, it implies that noise trading is present.

A momentum strategy does not hold for the S&P 500 using the adjusted market model for the period 2003 – 2011 as overall average earnings underperform the market by 0.56 per cent. However, this strategy is profitable in holding periods one, two and four outperforming the market by 7.28 per cent, 10.62 per cent and 8.49 per cent respectively. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of winners shows evidence of the momentum effect in holding periods one, two, three and four as the present expected positive returns and yields overall average of 0.92 per cent above market returns. There is also evidence of the momentum effect from holding periods three to four when returns increase from 0.52 per cent to 10.83 per cent implying that winning

stock prices continue to increase. A portfolio of loser show evidence for the momentum effect in holding periods one, two, seven and eight as the present expected negative returns. Evidence for the momentum effect is also seen form holding periods one to two as returns decrease from 4.53 per cent to 8.92 per cent indicating that losing stock prices continue to fall (See Appendix E, Table 4). These results indicate the presence of noise trading in the ISEQ but does not show any evidence for the S&P 500.

#### 5.4 Momentum Strategy Returns Extreme Portfolio

*Table 5.4 Momentum Strategy Returns Extreme Portfolio*

<b>Holding Period:</b>	<b>Market Model Returns</b>		<b>Adjusted Market Model Returns</b>	
	<b>ISEQ</b>	<b>S&amp;P 500</b>	<b>ISEQ</b>	<b>S&amp;P 500</b>
1. <b>2004</b>	-0.20371	-0.04259	0.158127	0.161394
2. <b>2005</b>	-0.42949	0.068993	-0.20994	0.161583
3. <b>2006</b>	0.102966	0.012959	-0.0381	-0.09763
4. <b>2007</b>	-0.1751	-0.0359	-0.42828	-0.04821
5. <b>2008</b>	0.411531	0.3318	0.529012	-0.04517
6. <b>2009</b>	-0.30172	-0.25026	0.160766	-0.1279
7. <b>2010</b>	0.025554	-0.09268	0.322537	0.004758
8. <b>2011</b>	0.126981	0.002382	0.620354	-0.02652
<b>Average</b>	-0.05537	-0.08361	0.139309	-0.00221

A momentum strategy does not hold for the period 2003 – 2011 using the market model for the ISEQ. The overall average returns underperform the market by 5.54 per cent. However, a momentum strategy is profitable in holding periods three five, seven and eight outperforming the market by 10.23 per cent, 41.15 per cent, 2.56 per cent and 12.70 per cent respectively. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners show little evidence for the momentum effect only yielding positive returns in holding periods two and four. A portfolio of extreme losers shows evidence for the momentum effect in holding periods three, five, seven and eight underperforming the

market by 12.75 per cent, 60.56 per cent, 7.66 per cent and 33.69 per cent respectively (See Appendix F, Table 1).

A momentum strategy doesn't hold for the S&P 500 for the period 2003 – 2011 using the market model. The strategy yields overall average returns of 17.09 per cent under the market. A momentum strategy only yields a profit in holding period two outperforming the market by 2.89 per cent. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners shows expected positive returns in holding period one only, outperforming the market by 1.14 per cent. A portfolio of extreme losers shows expected negative returns in holding periods two and eight underperforming the market by 1.46 per cent and 1.04 per cent respectively (See Appendix F, Table 2). These results indicate that there is little noise trading present in either the ISEQ or the S&P 500 stock exchanges.

A momentum strategy holds for the period 2003 – 2011 for the ISEQ using the adjusted market model earning returns 13.93 per cent above the market. This strategy is profitable in all holding periods except two, three and four. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners show expected positive returns in all but holding periods three and eight. The portfolio yields overall average earnings of 7.67 per cent above market returns implying the winning stock prices continue to increase. A portfolio of losers present similar results with all but holding periods two and four showing expected negative returns. There is also evidence of the momentum effect from holding periods seven to eight of the extreme loser portfolio, when returns fall from 12.54 per cent below the market to 71.10 per cent indicating that losing stock price continue to fall (See Appendix F, Table 3).

A momentum strategy does not hold for the period 2003 – 2011 for the S&P 500 using the adjusted market model as overall average returns underperform the market by 0.22 per cent. Although this strategy is profitable in holding periods one two and seven outperforming the market by 16.14 per cent and 16.16 per cent respectively. There are some interesting findings when we take a look at the individual winner and loser portfolios. A portfolio of extreme winners show expected positive returns in holding periods one, two, four and seven. However, the portfolios overall average return underperforms the market by 0.15 per cent. A portfolio of extreme losers show

expected negative returns in holding periods one, two, six and eight. There is also evidence of the momentum effect from holding periods one to two when returns decrease from 1.78 per cent to 5.82 per cent indicating that loser stock prices continue to fall (See Appendix F, Table 4). These results indicate that there is noise trading present in the ISEQ but there is little evidence of noise trading in the S&P 500.

### **5.3 Chapter Summary**

This chapter has presented the results to the primary research using the market model and adjusted market model. The findings present some evidence of noise trading using contrarian and momentum strategies. The market model presents abnormal returns for a contrarian strategy in both ISEQ and S&P 500 stock exchanges. However, the market model does not yield abnormal returns for a momentum strategy in either the ISEQ or the S&P 500. For the ISEQ, the adjusted market model presents abnormal returns using a momentum strategy but doesn't earn abnormal returns using a contrarian strategy. For the S&P 500, the adjusted market model presents returns using a contrarian strategy but doesn't earn abnormal returns using a momentum strategy.

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## Chapter Six

### Discussion

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#### 6.0 Chapter Overview

This chapter will discuss and analyse the results of the primary research outlined in the previous chapter. The findings will be discussed in relation to the previous literature and the research objectives of this study. Finally, the chapter will discuss any areas for future research.

#### 6.1 Market Model

The results from the market model show an indication of noise trading in the ISEQ and the S&P 500 stock exchanges when using a contrarian strategy. The market model shows abnormal returns for all periods tested when using a contrarian strategy however, does not show any returns for a momentum strategy for any periods tested. Using the market model, a contrarian strategy outperforms the market by 54.05 percent for the ISEQ and outperforms the market by 22.47 per cent for the S&P 500. When using a portfolio of extreme of winners and losers the market model shows higher returns in both markets outperforming the ISEQ by 95.59 per cent and the S&P 500 by 30.84 per cent. These results can be seen in tables 5.1 and 5.2. These results are consistent with the findings of De Bondt and Thaler (1985). However, it must be noted that De Bondt and Thaler (1985) study finds that a portfolio of losers have higher returns than a portfolio of winners. We can see from appendix C, table 1 that for the ISEQ, a portfolio of winners earns 193.61 per cent above the market yielding higher returns than a portfolio of losers yielding 5.65 percent. There are similar results for a extreme portfolio of winners and losers, with the winner portfolio earning 83.86 per cent and the loser portfolio earning 11.74 per cent (See appendix D, table 1). However, when we look at the S&P 500 returns, a portfolio of losers yields higher returns than a portfolio of winners (See appendix C, table 2). These results also extend



to a portfolio of extreme winners and losers for the S&P 500 (See appendix D, table 2).

## **6.2 Adjusted Market Model**

Unlike the market model the adjusted market model does not show abnormal returns for the ISEQ when using a contrarian strategy. However, the adjusted market model shows an indication of noise trading in the ISEQ when using a momentum strategy outperforming the market by 5.96 per cent. These returns increase when testing a portfolio of extreme winners and losers, outperforming the market by 13.93 per cent. The adjusted market model shows abnormal returns for the S&P 500 when employing a contrarian strategy outperforming the market by 2.40 per cent. However, this result does not extend to portfolio of extreme winners and losers, which underperforms the market by 24.39 per cent. This result is interesting as you would expect the level of noise in a extreme portfolio to increase when compared to a conventional portfolio and therefore, generate higher returns as suggested by De Bondt and Thaler (1985).

In theory model market model should yield lower returns than the adjusted market model as returns are adjusted for risk in the market model. However, the findings of this study do not agree, as market model returns are significantly higher than adjusted market model returns. This makes the findings of this study more robust as the market model are more reliable. A possible explanation for this, is when an investor buys a portfolio of losers they are undertaking more risk than if they where to buy a portfolio of winners and therefore have a higher rate of return. This supports De Long *et al.* (1990a) and Palomino (1996) findings that noise traders can earn more the rational traders as they are been rewarded for bearing more risk.

## **6.3 Contrarian Returns**

As we seen above a contrarian strategy is successful when using a market model for both the ISEQ and the S&P 500 stock exchanges for the period 2003-2011. These findings imply that there is a presence of noise trading in the long run as a contrarian strategy is successful for all holding period in both stock exchanges when using a

market model. These results support the findings of De Long *et al.* (1991) showing evidence for the survival of noise trading in the long run.

This study looks at a conventional portfolios of winners and losers of 14 companies each for the ISEQ and 15 companies each for the S&P 500. This study also looks at a at portfolios of extreme winner and loser of seven companies each for each stock exchange. This follows a similar strategy to that of De Bondt and Thaler (1985), in theory the extreme portfolio should yield higher returns. For the ISEQ, returns increase 41.54 per cent when using the market model. For the S&P 500, returns increase 6.17 per cent when using the market model.

All winner portfolios show the expected price reversal and all loser portfolios show expected positive returns for the ISEQ when using the market model. For the S&P 500, in holding period one neither the winner or loser portfolio show expected results although, the strategy is still successful. However, in holding period two both portfolios show expected results but yield smaller returns than the first holding period (See appendix C, table 2). These results suggest that the market is violate and supports Shiller (1981) findings that movements in stock prices cannot be fully explained by rational traders implying that there is noise in markets.

#### **6.4 Momentum Returns**

This study shows little evidence for the momentum with only showing returns in two of eight periods tested. A momentum strategy yields no returns when using the market model. When using the adjusted market model, abnormal returns are generated for the ISEQ, outperforming the market by 5.96 per cent. This result increases to 13.93 per cent above market returns for a portfolio of extreme winners and losers. These results support the findings of Siganos (2007) that portfolios of extreme winner and loser yield double than those gained by employing conventional portfolios.

Although, this study does not show much evidence for a momentum strategy in the long run, there is some evidence of price continuations in the individual time periods. When using the adjusted market model the S&P 500 shows positive returns in the winners portfolio for holding periods one to five indicating a price continuation. Similarly, the loser portfolio present negative returns in holding periods one and two

making a momentum strategy profitable in these holding periods outperforming the market by 7.29 per cent in holding period one and 10.62 percent in holding period two (See appendix E, table 4). These returns increase to 16.14 per cent in holding period one and 16.16 per cent in holding period two when testing portfolio of extreme winners and losers (See appendix F, table 4). These results support Conrad and Kaul (1998) findings that a momentum strategy yields greater returns when formation and holding periods are between three and twelve months.

The contrarian and momentum returns of this study are consistent the findings of Galariotis *et al.* (2007) that a contrarian strategy yields greater returns with longer formation and holding periods a momentum strategy yields greater returns with short formation and holding periods. From the contrarian and momentum returns of this study, we can imply that noise trading is more evident when using a contrarian strategy.

## **6.5 ISEQ versus S&P 500**

As discussed above this study generates abnormal returns when using the market model and employing a contrarian strategy. However there is some variation among the returns between the two stock exchanges. When testing the convention portfolio the ISEQ yields higher return outperforming the market by 54.05 per cent compared to 22.47 per cent for the S&P 500. When testing the extreme portfolio the ISEQ also earns higher returns outperforming the market by 95.59 per cent compared to 30.84 per cent for the S&P 500. These results indicate that noise trading is more evident in the ISEQ. These results support the findings of Chin *et al.* (2002) that noise traders are more aggressive in smaller illiquid markets.

The findings of this study add to studies of De Bondt and Thaler (1985) as they also test for a contrarian strategy in US markets. This study finds that a contrarian strategy is profitable to the present day in US markets. This study finds that on average a portfolio extreme losers outperform the market by 16.66 per cent compared to De Bondt and Thaler (1985) study which yields 19.6 per cent above the market. This study finds that on average a portfolio of extreme winners underperforms the market by 14.19 per cent compared to De Bondt and Thaler (1985) study which yields 5 per

cent under the market (See appendix D, table 2). This study shows more evidence of a price reversal suggesting that the market is more volatile than it was when De Bondt and Thaler (1985) study was conducted.

The findings of this study add to studies of Jegadeesh and Titman (1993) as they also test for a momentum strategy in US markets. Although, this study does not find evidence for the strategy to the present day in US markets, when using the market model, it does provide some similar results. In holding period two, this study finds yearly returns of 6.89 per cent compared to that of Jegadeesh and Titman (1993), who find on average yearly returns of 12.01 per cent.

## **6.6 Market Efficiency**

The results of this study find that the weak form of efficiency for the EMH does not hold in the ISEQ and S&P 500 stock exchanges as there is some degree of future price prediction using past data. This contradicts Fama (1970) and other standard finance scholars who state that the weak form of efficiency holds and should be impossible to earn abnormal returns by using past data.

This study suggests the presence of noise traders which can be interrupted as market inefficiency. It is evident from this study markets have remained inefficient in the long term. This study suggests that security mis-pricing does not get quickly corrected as suggested by Fama (1970) but security prices deviate from their fundamental prices and remain that way for extended periods of time therefore, creating a limit to arbitrage. This study suggests that markets are not learning from their mistakes as noise is constantly surviving the process of arbitrage in the long run. These findings support those of Keynes (1936), Shleifer and Vishny (1997) and De Long *et al.* (1990a).

However, as this study does not test noise directly it is hard to determine what proportion of mis-pricing can be attributed to noise or attributed to other factors such as time lags. For this study, it is therefore, difficult to determine if the survival of noise traders in the long run, is a result of their influence on security price or as De Long *et al.* (1991) suggests is a result of noise traders holding portfolios with high growth rates.

## 6.7 Recommendations for Future Research

This findings of this study suggest that this area should be looked at future as the EMH states that overall average returns should be close to zero. However, this study yields constant abnormal returns for the nine-year time period.

A more in dept analysis of the ISEQ should be addressed in the future. As there is no prior research for this stock exchange it was not possible to compare returns directly which was a drawback to this study. This would have added more dept to this study as the ISEQ generated the highest returns and where consistent through the nine-year testing period.

This study showed little evidence for a momentum strategy which was a surprising results. For future research, shorted formation and holding periods for three to six months as well as one year formation and holding periods similar to that of Jegadeesh and Titman (1993) and Grundy and Martin (2001) should be incorporated. This may have yielded higher returns as there was some evidence of momentum profits in early holding and formation periods of this study.

For future research, a range of reliable methodologies should be employed as this study found ambiguous results for the market model and the adjusted market model, with the adjusted market model showing little evidence for either a contrarian or momentum strategy. This asks questions around the reliability of the particular model. The more models employed in a the study the more accurate the findings will be. Models should also include transaction costs as suggested by Lesmondet *al.* (2004) before determining if a particular strategy is profitable.

A larger data set in relation to stock exchanges would provide an interesting addition for a future study. The inclusion of stock exchange from Asia, Australia, UK and other European countries would provide an international diversity to the study. Another option would be to compare emerging markets and developed markets.

A longer time period would provide the study with more in depth accurate and robust findings, similar to the study conducted by Galariotiset *al.* (2007) which uses a 40 year time period.

## **6.8 Chapter Summary**

This chapter has discussed the major findings were discussed in relation to the literature review. The success of the methodologies and investment strategies were analysed. The presence of noise traders in the ISEQ and S&P 500 was analysed. Finally, recommendations for future research were discussed.

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## **Chapter Seven**

### **Conclusion**

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#### **7.0 Chapter Overview**

This chapter will give an overall conclusion to the study. The original research objectives and hypothesis will be revisited in order to clarify if they were reached.

#### **7.1 Primary Research**

The main research objective or research question of this study was to investigate the presence of noise trading in the ISEQ and the S&P 500 stock exchanges for the period 2003-2011. As noise trading cannot be tested directly, this study looked at a contrarian strategy and a momentum strategy to test for market inefficiency. If these strategies are successful then we can conclude that markets are not efficient and imply that noise trading is present.

In order to investigate if a contrarian or momentum strategy are successful, two methodologies were implemented, the market model and the adjusted market model. Formation and holding periods were created for both strategies, in order to determine winner and loser portfolios. From these winner and loser portfolios we were able to determine the profitability of the contrarian and momentum investment strategies.

The major findings of this study addressed the research objectives outline in the methodology chapter. The market model generates higher abnormal returns than the adjusted market model for both the ISEQ and S&P 500 stock exchanges.

A contrarian strategy yields higher abnormal returns than a momentum strategy in both the ISEQ and S&P 500. Of these contrarian abnormal returns, the largest are attributed to the ISEQ. The findings of this study support and add to that of De Bondt and Thaler (1985).

From the above findings we can conclude that the weak form of the EMH has been violated as future stock prices were predicted from past data, indicating that markets are inefficient.

## **7.2 Research Hypotheses**

The following research hypotheses were tested in this study in order to determine the presence of noise trading in markets:

H<sub>0</sub>: The null hypothesis states that noise trading is not present as abnormal returns are not generated by using a contrarian and momentum investment strategies, indicating that markets are efficient.

H<sub>A</sub>: The alternative hypothesis states that the presence of noise trading can be detected by abnormal returns generated using contrarian and/or momentum investment strategies, indicating that markets are not efficient.

From the findings of this study we can reject the null hypothesis and accept the alternative hypotheses as we can suggest the presence of noise trading due to abnormal returns generated from a contrarian strategy. Our findings suggest noise trading survives in the long run supporting De Long *et. al.* (1991).

## **7.3 Main Implications Incurred from this Study**

From the study that has just been conducted there are a number of recommendations:

- A larger data set would have been beneficial to this study as a major limitation of this study was the lack of data available for the ISEQ. This would have given the study a more dramatic comparison between the conventional portfolios and the extreme portfolios.
- This study would have benefited, if another type of methodology had been implemented as neither model the market model or the adjusted market gave much insight for a momentum strategy. Also, another type of methodology would have given more accurate and robust findings as cross referencing of results would have been possible.



- This study would have benefited, if more countries were included. As this study already address a small and a large market, the inclusion of an emerging may have given some interesting results.

#### **7.4 Concluding Remarks**

This study was undertaking to examine the presence of noise traders in ISEQ and S&P 500 stock exchanges through the profitability of contrarian and momentum strategies. This study has addressed its research objectives and through this process the research conducted within this study has added to the existence literature around this topic.

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## **Appendix A**

### **Personal Reflection**

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At the beginning of the Master of Business programme, one of my initial worries was the undertaking of this dissertation. In the beginning, I found it hard to imagine completing the dissertation process. However, on completion I feel that this dissertation has been an integral part of the learning process of masters programme and has provided me with the necessary skills required for the working world.

One of the key learning's from this process is the importance of time management. I feel that I spent too much time at the beginning of the process reading articles trying to gain insight into the subject area. I now believe that reading the abstract and conclusion would have been enough to a general ideal of the details of a article rather than trying to grasp an understanding of everything the article had say. However, as the process continued I found myself limiting my time on a particular task and moving onto something else if I felt I was getting nowhere with it.

Another key learning experience that I feel will benefit me greatly in the future, is the ability to receive constructive criticism on something that I believed at the time was good work. Through this process it has taught me to be critical of myself.

My research skills have improved greatly. I am now confident using online databases. Along with this I have found that my critiquing skills have improved greatly. I can now compare and contrast different authors findings with ease.

Although, there has been a lot of blood sweat and tears gone into the dissertation process. I have enjoyed the challenge that this process presented over the last few months. I feel that I have risen to the challenge and the completion has given be a huge sense of achievement.

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**Appendix B**  
**List of Companies**

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**List of US Companies**

<b>Ticker</b>	<b>Company</b>	<b>Market Cap \$ millions</b>
AAPL	Apple Inc.	574,427
XOM	Exxon Mobil	403,132
MSFT	Microsoft Corporation	257,003
WMT	Wal-Mart Stores	242,025
IBM	IBM	225,322
CVX	Chevron Corporation	214,761
BRK.A	Berkshire Hathaway	209,700
GE	General Electric	209,629
T	AT&T Inc.	208,019
JNJ	Johnson & Johnson	190,910
WFC	Wells Fargo & Co.	180,166
PFE	Pfizer Inc.	178,180
PG	Procter & Gamble	177,888
KO	Coca-Cola Co.	174,565
ORCL	Oracle Corp.	150,699
MRK	Merck & Co.	133,646
INTC	Intel Corp.	131,108
JPM	JPMorgan Chase	130,838
VZ	Verizon Communion	126,894
ABT-N	Abbott Laboratories	103,529
AMZN-O	Amazon.com, Inc	101,895
QCOM-O	QUALCOMM, Inc	99,535
MCD-N	McDonald's Corporation	94,267
SLB-N	Schlumberger Limited.	91,535
CSCO-O	Cisco Systems, Inc.	89,326
DIS-N	The Walt Disney Company	87,563
CMCSA- O	Comcast Corporation	87,302
BAC-N	Bank of America Corp	78,240
HD-N	The Home Depot, Inc.	78,003
C-N	Citigroup Inc.	77,975

## List of Irish Companies

<b>Ticker</b>	<b>Company</b>	<b>Market Cap € millions</b>
AIB-DB	ALLIED IRISH BANKS PLC	24282
CRG-DB	CRH PLC	10684
KRZ-DB	KERRY GROUP PLC	6204
DRX-DB	ELAN CORPORATION PLC	5600
RY4B-DB	RYANAIR HOLDINGS PLC	5585
DRS-DB	DRAGON OIL PLC	3498
BIR-DB	BANK OF IRELAND	2652
PLS-DB	PADDY POWER PLC	2617
GL9-DB	GLANBIA PLC	1811
DCC-DB	DCC PLC	1591
IJF-DB	ICON PLC	1142
KRX-DB	KINGSPAN GROUP PLC	1084
GN5-DB	GRAFTON GROUP PLC	626
PZQA-DB	PROVIDENCE RESOURCES PLC	557
UN6A-DB	UNITED DRUG PLC	492
IR5A-DB	IRISH CONTINENTAL GROUP PLC	371
EG7-DB	FBD HOLDINGS PLC	261
IFG-DB	IFG GROUP PLC	183
FQ3-DB	FYFFES PLC	131
DOY-DB	ABBAY PLC	130
IPDC-DB	INDEPENDENT NEWS & MEDIA PLC	124
DQ5-DB	CPL RESOURCES PLC	84
DOP-DB	AMINEX PLC	49
DLE-DB	DATALEX PLC	41
DQ7-DB	DONEGAL CREAMERIES PLC	33
ORQ-DB	ORMONDE MINING PLC	32
OVX-DB	OVOCA GOLD PLC	12
OKRA-DB	PRIME ACTIVE CAPITAL PLC	2

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**Appendix C**

**Contrarian Strategy Returns**

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**Table 1 Market Model Returns ISEQ Contrarian Strategy**

<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	-0.557622218	0.049679435	0.607301653
2. 2009 - 2011	-0.410428012	0.06332364	0.473751653
Average	-1.93610046	0.056501538	0.540526653

**Table 2 Market Model Returns S&P 500 Contrarian Strategy**

<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	0.046295669	0.294894952	0.248599
2. 2009 - 2011	-0.211784031	-0.011040591	0.200743
Average	-0.08274	0.141927	0.24671

**Table 3 Adjusted Market Model Returns ISEQ Contrarian Strategy**

<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	0.175915096	0.23048934	0.054574
2. 2009 - 2011	0.245129142	-0.563229964	-0.80836
Average	0.210522	-0.16637	-0.37689

**Table 4 Adjusted Market Model Returns S&P 500 Contrarian Strategy**

<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	0.061226369	0.370905118	0.309678749
2. 2009 - 2011	0.055642282	-0.205945651	-0.261587933
Average	0.058434326	0.082479733	0.024045408

## Appendix D

### Contrarian Strategy Returns for Extreme Winners & Losers

**Table 1 Market Model Returns ISEQ Contrarian Strategy**

<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	-0.808530612	0.089028203	0.897558815
2. 2009 - 2011	-0.868610301	0.145756779	1.014367079
Average	-0.83857046	0.117392491	0.955962947

**Table 2 Market Model Returns S&P 500 Contrarian Strategy**

<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	-0.133889653	0.331293071	0.465183
2. 2009 - 2011	-0.149806525	0.00181339	0.15162
Average	-0.14185	0.166553	0.308401

**Table 3 Adjusted Market Model Returns ISEQ Contrarian Strategy**

<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	0.061587029	0.259742284	0.198155
2. 2009 - 2011	0.193027372	-1.17218771	-1.36522
Average	0.127307	-0.45622	-0.58353

**Table 4 Adjusted Market Model Returns S&P 500 Contrarian Strategy**

<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Losers - Winners</b>
1. 2006 – 2008	0.372959547	0.332654085	-0.040305462
2. 2009 - 2011	0.075759339	-0.371655637	-0.447414976
Average	0.224359443	-0.019500776	-0.243860219

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**Appendix E**

**Momentum Strategy Returns**

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**Table 1 Market Model Returns ISEQ Momentum Strategy**

<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	0.036544574	0.027599492	0.008945
2. <b>2005</b>	0.063610832	0.169499743	-0.10589
3. <b>2006</b>	0.045162398	-0.021630832	0.066793
4. <b>2007</b>	0.049286108	0.166577906	-0.11729
5. <b>2008</b>	-0.348744722	-0.398593641	0.049849
6. <b>2009</b>	-0.045333364	0.172314596	-0.21765
7. <b>2010</b>	0.000966906	0.00882065	0.000967
8. <b>2011</b>	-0.178019583	-0.305853577	0.127834
<b>Average</b>	-0.04707	-0.02266	-0.02331

**Table 2 Market Model Returns S&P 500 Momentum Strategy**

<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	-0.042744831	-0.000157931	-0.04259
2. <b>2005</b>	-0.029576429	-0.068992987	0.068993
3. <b>2006</b>	0.040321489	0.027362486	0.012959
4. <b>2007</b>	0.034855627	0.070751661	-0.0359
5. <b>2008</b>	-0.081948116	0.249847474	-0.3318
6. <b>2009</b>	-0.193205972	0.057052245	-0.25026
7. <b>2010</b>	-0.070318135	0.022360047	-0.09268
8. <b>2011</b>	-0.018165156	-0.020547652	0.002382
<b>Average</b>	-0.0451	0.042209	-0.08361

<b>Table 3 Adjusted Market Model Returns ISEQ Momentum Strategy</b>			
<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	-0.005272797	-0.03026133	0.024989
2. <b>2005</b>	0.061502439	0.115765019	-0.05426
3. <b>2006</b>	-0.009154568	-0.070319132	0.061165
4. <b>2007</b>	0.095421056	0.373330124	-0.27791
5. <b>2008</b>	0.192098473	-0.174971517	0.36707
6. <b>2009</b>	-0.038997969	0.062234539	-0.10123
7. <b>2010</b>	0.105423607	-0.015318554	0.120742
8. <b>2011</b>	-0.047720719	-0.383721726	0.336001
<b>Average</b>	0.044162	-0.01541	0.05957

<b>Table 4 Adjusted Market Model Returns S&amp;P 500 Momentum Strategy</b>			
<b>Holding Period:</b>	<b>Winners</b>	<b>Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	0.027497952	-0.045325308	0.072823
2. <b>2005</b>	0.017018377	-0.089173419	0.106192
3. <b>2006</b>	0.005162008	0.086366002	-0.0812
4. <b>2007</b>	0.108287564	0.0234199	0.084868
5. <b>2008</b>	0.084490572	0.12440544	-0.03991
6. <b>2009</b>	-0.146172459	0.030523637	-0.1767
7. <b>2010</b>	-0.014318385	-0.008813172	-0.00551
8. <b>2011</b>	-0.008592151	-0.002930839	-0.00566
<b>Average</b>	0.009172	0.014809	-0.00564



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## Appendix F

### Momentum Strategy Returns for Extreme Winners & Losers

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**Table 1 Market Model Returns ISEQ Momentum Strategy**

<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	-0.141689638	0.062023228	-0.20371
2. <b>2005</b>	0.001962766	0.431457439	-0.42949
3. <b>2006</b>	-0.024535564	-0.127501327	0.102966
4. <b>2007</b>	0.064848155	0.239950399	-0.1751
5. <b>2008</b>	-0.191078465	-0.602609398	0.411531
6. <b>2009</b>	-0.037429288	0.264289861	-0.30172
7. <b>2010</b>	-0.051042274	-0.07659581	0.025554
8. <b>2011</b>	-0.209916641	-0.336898115	0.126981
<b>Average</b>	-0.07361	-0.01824	-0.05537

**Table 2 Market Model Returns S&P 500 Momentum Strategy**

<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Winners – Losers</b>
1. <b>2004</b>	-0.096947032	0.053632677	-0.15058
2. <b>2005</b>	0.014324097	-0.014565105	0.028889
3. <b>2006</b>	-0.006703111	0.066996516	-0.0737
4. <b>2007</b>	-0.048231694	0.07453203	-0.12276
5. <b>2008</b>	-0.220799904	0.369456968	-0.590257
6. <b>2009</b>	-0.142219709	0.125817895	-0.26804
7. <b>2010</b>	-0.091217998	0.07533324	-0.16655
8. <b>2011</b>	-0.034879412	-0.010358289	-0.02452
<b>Average</b>	-0.07833	0.092606	-0.17094

<b>Table 3 Adjusted Market Model Returns ISEQ Momentum Strategy</b>			
<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	0.123705161	-0.034421587	0.158127
2. <b>2005</b>	0.155103555	0.365046103	-0.20994
3. <b>2006</b>	-0.038102451	-0.163383362	-0.0381
4. <b>2007</b>	0.042406098	0.470687089	-0.42828
5. <b>2008</b>	0.212005693	-0.317006622	0.529012
6. <b>2009</b>	0.012713086	-0.148052606	0.160766
7. <b>2010</b>	0.197137158	-0.125399651	0.322537
8. <b>2011</b>	-0.090693401	-0.711047379	0.620354
<b>Average</b>	0.076784	-0.08295	0.139309

<b>Table 4 Adjusted Market Model Returns S&amp;P 500 Momentum Strategy</b>			
<b>Holding Period:</b>	<b>Extreme Winners</b>	<b>Extreme Losers</b>	<b>Returns Winners - Losers</b>
1. <b>2004</b>	0.143598963	-0.017794954	0.161394
2. <b>2005</b>	0.103423124	-0.058160306	0.161583
3. <b>2006</b>	-0.001414683	0.096214588	-0.09763
4. <b>2007</b>	0.032058503	0.080266762	-0.04821
5. <b>2008</b>	-0.037852748	0.007315945	-0.04517
6. <b>2009</b>	-0.165668207	-0.037769866	-0.1279
7. <b>2010</b>	0.023242648	0.018484649	0.004758
8. <b>2011</b>	-0.109986956	-0.08346399	-0.02652
<b>Average</b>	-0.00157	0.000637	-0.00221

