A Study of the Effects of a Contrarian Approach to Stock Selection in the Irish Stock Market

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Abstract:

The main question that this paper intends to address is whether evidence of an overreaction effect or contrarian trading strategy exists in the Irish stock market. There have been very few studies of this nature conducted on the Irish Stock Market to date. A contrarian expects that the past price stock movements in one direction will be followed by movements in the opposite direction.

This overreaction effect has been found to exist in almost all major stock markets around the world as many studies have been conducted and published over the last thirty years (Galriotis, 2014). The study will be based on the work of De Bondt and Thaler (1985) which has been identified as the seminal work on this subject.

The methodology will employ a deductive approach. In line with the De Bondt and Thaler (1985) paper, a market adjusted model will be used. Cumulative Abnormal Returns (CAR) will be calculated as the basis for the tests with independent t-tests calculated as a support. It is essentially a technical analysis based on past information.

Two horizon periods of two years and six years will be used to test for evidence of a contrarian strategy in the Irish Stock Market over an eighteen-year period from 2001 to 2018. They will consist of winner and loser portfolios. An arbitrage strategy will also be tested for to see if investors buy losers and sell winner portfolios.

This is also a test of market efficiency at the weak form level. Monthly returns for the specified timeframe have been extracted from the Bloomberg platform.

The results of the study find that there is an overreaction effect in the Irish Stock Market. The profitability of the arbitrage strategy is 2.3% in the two-year period rising to 31.4% in the longer six-year horizon period. These results equate to market inefficiency in the Irish context.

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Chapter 1: Introduction

This paper will examine if investors in the Irish stock market overreact to new information which can be interpreted through share return reversals. As such, it is essentially a study of whether the Irish market is efficient or not. The other anomaly of momentum will be included in the narrative of this paper but will not be tested.

A contrarian expects that the past price stock movements in one direction will be followed by movements in the opposite direction. Contrarian trading mainly occurs in the long term, although it can be seen in the very short-term and is achieved through analysing historic performance of a stock, however it can also be applied to different asset classes and using alternative performance measures (De Bondt and Thaler, 1985).

The majority of the literature agrees that asymmetric reversals are present but there is much disagreement on what is driving these reversals. It has been accepted that contrarian performance is mainly driven by investor overreaction to firm-specific news and that size and seasonality do not fully explain the outcome. In addition, the inclusion of risk does not fully explain the anomaly. While Fama and French (1996) offer justifications for the contrarian results through the introduction of more risk sources, this has been contradicted by subsequent studies (Antoniou *et al.,* 2006). In the 1990's the literature switched to momentum trading to try and explain what the previous works could not and in a lot of what followed reversals were linked with momentum.

Both strategies have their foundations in behavioural psychology. A contrarian strategy hypothesises that investors in a market overreact incorrectly to good and bad news, resulting in the price of the stock to increase or decrease significantly but later correcting when prices

return to their more normal level in line with their fundamental values (DeBondt and Thaler, 1985). Momentum is based on the underreaction hypothesis where investors do not sufficiently react to new information thereby causing prices to inadequately adjust (Jegadeesh and Titman, 1993).

Initial studies of the phenomena tended to focus on the US stock market (De Bondt and Thaler, 1985) (Jegadeesh and Titman, 1993) but there has since been several reports of evidence in other countries or markets such as the UK (Galariotis *et al*, 2007) Australia (Demir *et al.*, 2004) and China (Shi and Zhou, 2017) to name but a few. The effects of momentum and contrarian have also been found in other asset classes including currencies, where it was shown that momentum returns were not as easy to come by due to the presence of limits to arbitrage (Menkhoff *et al.* 2012) and mutual funds where strong evidence was found of momentum investing where past winners were purchased but the past losers were not always sold (Grinblatt *et al.* 1995).

There have been a limited number of studies of contrarian and momentum effects in the Irish equity market. One study of momentum found that the Irish stock market was quite efficient but based on strategies that were highly non-normally distributed (O'Sullivan and O'Sullivan, 2010). Contrarian or overreaction in the Irish equity market has been examined from the perspective of market efficiency and results found a degree of inefficiency (Ryan and Donnelly, 2000). The momentum phenomenon will also be discussed as it has been linked to reversals.

Evidence has been found of bigger winner-loser reversals in smaller markets versus larger markets which could be due to market imperfections (Richards, 1997).

The Irish stock market is a smaller market with a lower level of liquidity and a higher degree of share ownership versus other larger markets (O'Sullivan and O'Sullivan, 2010).

While each strategy can be used stand-alone, there have been a considerable number of papers that have linked both strategies and it has been observed that usually reversals follow momentum (Richards, 1997). This could be because momentum exacerbates prices that will then initiate reversals (Daniel *et al.*, 1998).

This research will examine the Irish stock market for evidence of contrarian effects over an eighteen-year period from 2000 to 2018.

The main data source for this study will be Bloomberg. The monthly closing prices for all members of the Irish Stock Exchange (ISEQ) have been retrieved from Bloomberg platform.

Chapter 2: The Literature Review

2.1 Contrarian Investment Strategy

A contrarian investment strategy is considered to be a style of active portfolio management mainly involving shares (Galariotis, 2014) but can also apply to other forms of securities, such as index futures where significant reversals were found in successive weekly returns when the preceding week had surprisingly low turnover (Connolly and Stivers, 2003).

The strategy's aim is to beat the market by finding and leveraging predictable patterns of return. These patterns have been linked to investors misled reactions to mainly firm specific news that has been attributed to behavioural biases and heuristics, for example, investor overconfidence in relation to the accuracy of private information and biased self-attribution where investors assume a successful outcome is linked to their own skill (Daniel *et al,* 1998.)

The strategy is perceived as an anomaly (Vayanos and Wooley, 2013) as it uses past and hence out of date information to model the future.

Obi and Sil (1996) state that there are two types of investment analysts, fundamentalists and technical analysts. The former base their investment decisions on a thorough analysis of a company's performance and risk i.e. the fundamentals. The technical analyst seeks to make a profit by identifying patterns in historical price and volume data. It is this approach that De Bondt and Thaler, (1985) wrote about in their seminal paper on contrarian investment strategies which will form the foundation of this study.

This anomaly provides evidence that does not support the Efficient Market Hypothesis (EMH). The EMH suggests that above-normal returns (returns in excess of some benchmark) cannot be consistently

earned as share prices include all available market information (Obi and Sil, 1996).

Fama (1970) ranked market efficiency into three levels:

- ➢ Weak form market efficiency means that stock prices reflect all historical price and market information, so investors should not be able to find trends by studying historical data to find abnormal returns.
- ➢ Semi strong-form efficiency includes weak form information and all publicly available information, for example, merger announcements in the press.
- ➢ Finally, strong form market efficiency includes everything in the previous two forms but also private information. This would imply that insider information is also included in a share price.

There has only been empirical evidence produced for the weak form and semi strong form market efficiency (Obi and Sil, 1996).

Any trading strategy that can successfully take advantage of price overreactions is in direct conflict with the weak-form market efficiency.

There have been several empirical studies on the effects of a contrarian strategy and they are regularly employed by investors around the world.

Its anomalous characteristics have been examined by Power and Lonie (1993) who found that the abnormal returns to be earned through this strategy were higher than for other anomalies and with much less transaction costs. They also found that the overreaction hypothesis is backed up by evidence from cognitive psychology whereby people tend to overreact to surprise information that they see as impacting their future.

These strategies however are at odds with the weak-form market efficiency put forth by Professor Eugene Fama in 1970 which claims

that share prices include all past price and market information. An investment strategy that aims to take advantage of price overreactions implies that the market did in fact overreact to information and is now trying to self-correct, therefore the investor who recognises this can take the necessary steps in advance of the correction and potentially make abnormal profits (Obi and Sil, 1996).

The strategy posits that the initial reactions of investors will be corrected in due course and prices will revert to more stable levels. To generate profits, the contrarian will go long on past losers and short on past winners and the momentum investor will short past losers and long past winners (DeBondt & Thaler, 1985) (Jegadeesh and Titman, 1993).

It has been shown that the momentum and contrarian strategies are not mutually exclusive. Investors can underreact to major news about prices while overreacting to shocks that are not accompanied by information. It seems that price changes that come with information are more strongly correlated with future earnings surprises than price changes with no information (Savor, 2012).

However, there are conflicting views which suggest that the strategies are in fact independent as it is only reversals that are related to tax deferral seasonality (Grinblatt and Moskowitz, 2004). They argue that when effective capital gains tax rates are expected to decrease, poorly performing stocks experience heavy selling pressure which would improve the gains to be had from momentum strategies but would make a contrarian strategy less attractive. Alternatively, if the capital gains tax rates are expected to increase, the opposite happens and the contrarian will experience gains while yields from momentum will decline.

There is an expectation that the presence of sophisticated investors should lead to efficiency in financial markets as they behave more

rationally than a retail investor. Kaniel *et al.* (2008) find that retail investors who tend to be more risk averse than professional investors tend to exhibit the hallmarks of the contrarian and provide the necessary liquidity to the market which satisfies the institutional investor demand for immediacy.

Nevertheless, there is evidence that the managers of companies behave like contrarians in relation to the value of their company in that their perception of mispricing is a factor in their decision making. Furthermore, managers in value firms have been shown to purchase shares openly in the market in spite of previous firm risk exposure through share and option holdings and other equity-based remuneration (Jenter, 2005).

2.2 The Original Study

The seminal paper on investor overreaction was written by the eminent economists, Werner de Bondt and Richard Thaler in 1985. They focused on an empirical test of the overreaction hypothesis, which at the time was the first study to predict a new market irregularity using this behavioural principle.

The De Bondt and Thaler (1985) test was to identify if share prices systematically yield positive returns then an investor should be able to predict their reversal from just the past data without the need of any other information such as earnings. They put forth two hypotheses, the first was that if excessive stock price movements in one direction will be followed by a price movement in the opposite direction and secondly, the more excessive the first price movement should mean that the following adjustment will be even bigger. The two hypotheses infer a contravention of the weak-form market efficiency.

Their tests assess how much systematic nonzero residual return behaviour in the test period ($t > 0$) is connected with systematic residual returns in the portfolio preformation months ($t < 0$). They concentrated on shares that exhibited either significant gains or significant losses across periods of up to five years (De Bondt and Thaler, 1985).

The empirical investigation employed by De Bondt and Thaler (1985) involved three types of models to calculate excess returns, namely, a market-adjusted model, a market model and the Sharpe-Lintner version of the Capital Asset Pricing Model (CAPM). As all three methods are single index models (uses the market index to proxy for the common macroeconomic factor, Bodie *et al.* 2011) that are derived from the CAPM, De Bondt and Thaler (1985) identified that there would be misspecification issues that could impede the results.

2.3 *The Models:*

The market adjusted model assumes that expected returns are equal across securities but not necessarily the same for a given security.

The cumulative abnormal return is calculated as the sum of all abnormal returns over the test period. It therefore obtains the total firm-specific stock movement for the whole period when the market may be reacting to new information (Bodie *et al.* 2011). This model is popular because it is easy to use and is regularly employed to analyse stock price behaviour based on past returns.

The Capital Asset Pricing Model describes the relationship between systematic risk and expected return for a share but also many other assets. It is still widely used today in the investment community despite it's unrealistic assumptions which are briefly discussed below:

- There are lots of investors each with their own amount of wealth that is small compared to the wealth of all investors. Investors are price-takers meaning that they behave as if share prices are not affected by their own trades. This is a normal assumption of microeconomics for perfect competition.
- All investors have the same holding period. This behaviour is short-sighted as it precludes everything that can happen after the single period horizon which is not optimal.
- Investments are only made in publicly traded assets such as stocks and bonds and so excluding nontraded assets, private companies and government funded assets. Investors can also borrow at a fixed risk-free rate regardless of amount.
- Investors pay no taxes or transaction costs which is completely unrealistic as investors choice of assets will be influenced by what type of tax they may pay and additionally, trading is expensive with commissions and fees based on the size of the trade and the reputation of the individual investor.
- All investors are rational adhering to the Markowitz model for portfolio selection.
- All investors have homogeneous expectations or beliefs. This broadly means that they analyse stocks in the same way and have the same economic outlook of the world. (Bodie *et al*. 2011).

De Bondt and Thaler (1985) discovered that the results were similar irrespective of which of the three residual models were used. Following that, they reported only the results from the market adjusted model and made no adjustment for risk with the exception of the movements of the market as a whole and using the same adjustment for all stocks. Additionally, De Bondt (1985) had shown that using market adjusted residuals gave another benefit in that it would probably bias the design of the research against the overreaction hypotheses.

Their study involved the analysis of monthly data for the New York Stock Exchange as recorded by the Centre for Research in Security Prices (CRSP) based at the University of Chicago, whereby they ran tests using cumulative abnormal returns (CARs) to see if extreme changes in stock prices were followed by a reversal and in line with this they tested if the scale of the reversal was affected by the size of the original movement. They did find evidence of overreaction and observed that the reversals were asymmetric and were larger for past losers who were shown to be more risk averse. They mostly observed the reversals in January, although not always.

This paper will adopt the same methodology. There is no prescribed model to test for the overreaction hypothesis, therefore the CAR model will serve as the test in this paper as it has been shown in the literature that other more complicated models ultimately yield similar results.

2.4 Subsequent studies:

A lot of the earlier papers that followed De Bondt and Thaler (1985) used the same methodology but with different samples. Pettengill and Jordan (1990) found similar results using a later period and overlapping samples but they focused more on firm size and stock market seasonality. They found that the winner-loser reversal did not entirely occur. The losers did quite obviously become winners but the same could not be said for the winners. The size of the firm did have an influence on the results with the results of the larger firms being more in line with overreaction. Regarding market seasonality, the majority of the winner-loser reversals arose in January with the effect occurring mostly at the change of the year, however this could not be explained by tax loss selling.

Another paper (Chopra *et al.,* 1992) found that the reversals are much stronger for smaller firms as opposed to larger companies and this firm

size can somewhat explain the anomaly. However, they claim that the reason large firms do not exhibit the overreaction effect is because their shares are held by large institutional investors who are rational while the smaller firms who experience reversals are held by irrational individual investors.

De Bondt and Thaler (1987) following on from their 1985 work found that the excess returns are not strongly resulting from size, tax effects or risk changes and that the loser excess returns could be elucidated by biased assumptions about the future. In this study, they found that company profits for the loser firms were shown to have fallen sharply during the portfolio formation periods but then recovered strongly in the subsequent years.

They wondered if the market failed to anticipate the reversals in profits which led to another study by De Bondt and Thaler (1990) which examined if professional security analysts were also guilty of overreaction and indeed their results came to that conclusion.

However, Grinblatt and Keloharju (2000) disagreed with them as they found that it was mainly less sophisticated retail investors that overreact with the more advanced investor buying past winners and selling past losers (momentum).

2.5 The measurement problem:

Most of the literature that followed found broadly similar results to De Bondt and Thaler but different justifications were explored. Fama and French, (1996) acknowledge that the previous studies demonstrated that the patterns in average returns cannot be explained by the Capital Asset Pricing Model and are therefore anomalies. They claim that these anomalies mostly vanish when their three-factor model is used (Fama and French, 1993).

The majority of subsequent studies used the Cumulative Abnormal Returns model as per De Bondt and Thaler (1985). Conrad and Kaul (1993) contested that the use of cumulative abnormal returns led to upwardly biased results. They claimed that this process of cumulation, in addition to cumulating the real return also cumulates single period upward bias caused by errors in measurement. They used buy and hold abnormal returns which they claimed do not have this bias. Using this method, they observed a low-priced firm effect with reversals only observed in January.

However, according to Fama (1998) buy-and-hold abnormal returns make problems with a bad model worse and he advocated that the CAR method was more appropriate. Jegadeesh and Titman (2001) also highlighted methodological errors in Conrad and Kaul's study.

The choice of the trading commencement month has been questioned in relation to long run performance. Ball *et al.* (1995) instead of using the usual December initiation trading month that was typical of the literature, used June where they found a reduction of 34 per cent in contrarian portfolio returns. They deduced that the December month end was not as a result of overreaction but instead due to microstructure (the rules of the market ,fairness, success and failure and how the layout of the market impacts the exchange of assets, price formation and price discovery, *Financial Trading and Investing, Second Edition, 2018).*

It was found that the bid-ask spread in transaction prices is the main driver of contrarian profits in the short run, once removed there is little proof of overreaction (Kaul and Nimalendran,1990). Their results found that the bid-ask spread can account for as much as 52 percent of small stock volatility and 23 percent of large stock that affects reversals.

Contrarian profits due to transaction costs may not hold for the longer term. It has been suggested that it could be as a result of market makers being unable to meet the demands of traders (Lehmann, 1990) which may be due to market inefficiency for liquidity.

Continuing on the liquidity theme, Avramov *et al.* (2006) found that the biggest reversals and the chance to generate contrarian strategy profits occur in stocks with low liquidity and high trading volume but that these potential profits are in fact smaller than the transaction costs.

Short-sellers behave like contrarians as they appear to increase trading after positive returns predicting future negative abnormal returns with some accuracy (Diether *et al.,* 2009). They found that as short sellers are opportunistic risk takers, the results are in line with short sellers trading on short-term stock price overreaction.

Generally, it has been found that liquidity can only partially account for the positive results of overreaction, bid-ask bias and risk also play a role (Loughran and Ritter, 1996).

2.6 The role of risk:

The role of risk is crucial. Its link with overreaction is instinctively at odds because a return owed to risk cannot be considered abnormal. The performance of contrarian trading has been shown to be quite tightly tied to risk and not just firm specific news (Loughran and Ritter, 1996). The inclusion of additional sources of risk can explain contrarian performance (Fama and French, 1996). However, this argument cannot be fully sustained in other key markets such as the UK where it was found that profits were available to short-term contrarian strategists and were even more obvious for very large cap stocks. Even when the sample is adjusted for risk, seasonality and

other market frictions or whether an equally weighted or value weighted portfolio is used, profits endure. The main factor that contrarian profits are built on, it would seem here, is the investor overreaction to firm-specific news (Antoniou *et al.,* 2006).

The use of a multi factor model has shown that results are not market specific. Similar results to the UK were also found in Greece. The introduction of additional risk factors improves the model but does not absorb contrarian performance (Antoniou *et al.* 2005, 2006).

Brock *et al.* (1992) using additional techniques such as bootstrapping generated results that found in favour of the technical strategies and more importantly that risk relevant to beta could not describe the returns.

2.7 The value investment strategy:

Value investors are often compared to the contrarian, the main difference being that value strategies are based on ratios such as price to book, price earnings and free cash flow rather than historical returns.

Lakonishok *et al.* (1994) found that value stocks did better than their growth counterparts by 11 percent annually. Size is a primary factor in this. Reversals are as a result of upward revisions in the value stocks' future prospects and downward revisions in a growth stocks' prospects.

However, Daniel and Titman (2006) challenged the work of Lakonishok *et al.,* (1994) claiming that there is no connection between overreaction and a company's fundamentals.

2.8 Other explanations:

There is empirical evidence that proposes a lead/lag relationship between winners and losers which explains reversals in that the positive performance of winners anticipates positive loser performance i.e. contrarian (Lo and MacKinlay, 1988).

Zarowin (1990) was interested in the role of risk in relation to winners and losers. A lot of the preceding literature found that losers were smaller and therefore more risky than winners. He wanted to test if this could explain the contrarian performance and so he replicated the De Bondt and Thaler (1985) paper. He found that indeed losers are more risky than winners but that risk changes and risk effects were quite limited. Size and seasonality were impacting factors with losers performing better than winners in January and regarding size, when the winners were smaller they tended to do better than the bigger losers.

2.9 The Retail - v- The Professional investor

There is an expectation that professional investors are more sophisticated than retail investors and so should act more rationally thus making markets more efficient, however studies exist that demonstrate that this is not the case. One such study or experiment was conducted by Drehmann et al. in 2005 and succinctly described by Noussair & Tucker (2013). The experiment ultimately showed that traders act as contrarians. A large internet-based field experiment was conducted in which players play a betting game. The players are given private information and are offered the opportunity to place a bet on one of two possible outcomes or to abstain from betting. The odds are updated after each bet so that they show the conditional probability of each outcome. Therefore, the price links the expected payoff of betting on each of the two available options based on public information only.

Hence it is always best to bet in line with one's private information. There are a number of actions that vary the displays that the players can see, if an option not to bet is available, and whether prices are set assuming the presence of error in the bets of previous players. All of the actions have one thing in common and that it is always ideal, in terms of boosting expected value, to bet on the outcome that is in line with the private information. Despite this, only two thirds of the decisions were consistent with private signals. There was little evidence of herding but refraining from making a bet in addition to contrarian behaviour was rife.

Stein (2009) put forth that there was no clear evidence that professional investors in a market lead to market efficiency in either the short or long term. He examined two factors that could cause difficulty, crowding which is where a trader seeking excess profits can never know how many other traders are doing the same thing and the second factor is their leverage decisions whereby two traders buy the same stocks using borrowings and one is hit with a negative shock resulting in them having to liquidate some of their portfolio to meet margin calls which could create a fire sale effect inflicting losses on the other trader.

2.10 Momentum trading:

Fama (1998) contends that the theory of market efficiency is upheld as anomalies result from chance. The irregularities can be caused by the methods used but this can be managed by making changes. However, Fama does acknowledge that the underreaction written about by authors such as Jegadeesh and Titman's (1993) momentum trading or Ball and Brown's (1968) persistence of drifts following earnings announcements cannot be explained. The debate focuses on whether momentum is irrational or rational and therefore related to risk or measurement issues.

The most cited paper on momentum is by Jegadeesh and Titman (1993). Their study finds that purchasing shares with strong past performance and selling shares that gave weak past results yield significant returns over a three to twelve month holding period, i.e. momentum. They found that the abnormal returns disappeared in the following two years i.e. reversal.

Momentum has also been examined through prospect theory (Li and Yang, 2013). They proposed a general equilibrium model that could be adapted to show that the S-shaped value function of prospect theory can drive a disposition effect, whereby investors sell assets that have increased in value and keep assets that have fallen in value.

Griffin *et al*. (2003) claimed that momentum could be explained by using an Arbitrage Pricing Theory model rather than macroeconomic factors. They used the arbitrage pricing model to control for indigenous risks in 40 markets.

Momentum and value strategies when examined jointly were found across different asset classes in several markets (Asness *et al*., 2013). They discovered that momentum and value returns exhibit positive correlation across asset classes but are negatively correlated with each other both within and across asset classes. They found common global risks by using a three-factor model. They conclude that their results challenge "existing behavioural, institutional and asset pricing theories that largely focus on US equities".

Substantial abnormal returns were found with a diversified portfolio of momentum strategies and most notable during extreme market conditions (Moskowitz *et al.,* 2012). Rather than use the previous cross-section method they look at the share's individual past return, hence time series. They found evidence of both underreaction in the short term with longer term reversals (overreaction). Additionally, they

found that speculators profited from time series momentum at the expense of those who hedge.

Shi and Zhou (2017) applied this time series method for both momentum and contrarian strategies in the Chinese stock market and found that they did exist with a time series momentum effect in the short run and a time series contrarian effect in the long run, highlighting that the outcomes are dependent on the look back and holding periods in addition to the specific characteristics of the firm.

Using the Capital Asset Pricing Model, the Fama and French three factor model and Carhart's four factor model, Fama and French (2012) examined four regions (North America, Japan, Europe and Asia Pacific). They found momentum returns in all regions except Japan and the ranges of the average returns reduced from smaller to bigger stocks.

Other behavioural explanations have been put forward for the strategies. Daniel *et al.* (1998) proposed a theory based on the psychological biases of overconfidence by investors in relation to the accuracy of private information and also the self-attribution bias which results in disproportionate changes in investor confidence following the results of their investment decisions. They found that these investors overreacted to private information and underreacted to public information. They seem to downplay their forecasting errors and their confidence increases when the public information is in line with their forecasts and a decrease in confidence when the public information is not aligned.

2.11 The links between momentum and contrarian:

There is evidence in the literature that both momentum and reversals are present in times of optimism (Cooper *et al.* 2004). They found that momentum is followed by reversal in the long term and that their results stand up to the influencing macroeconomic factors such as size and analyst coverage.

Barberis *et al.* (1998) explored a model that suits both momentum and contrarian based on the work of Tversky and Kahneman (1974). They use heuristics to investigate how investors make their investment choices. They found that overreaction is consistent with the representativeness heuristic. Investors tend to view events as the norm and ignore the laws of probability, for example, an investor may choose a particular stock because that firm has had a history of earnings growth while failing to see that few firms can grow indefinitely.

They also find that underreaction is consistent with the conservatism heuristic meaning that investors are slow to revise their decisions when new information becomes available. Barberis *et al*, (1998) conclude that in line with the empirical evidence, investors pay too much attention to the strength of the news they see rather than the statistical weight that the news carries when doing their forecast planning. This evidence also challenges the efficient market hypothesis as it states that excess profits can be enjoyed by an investor by exploiting this underreaction and overreaction without bearing the additional risk.

Easterwood and Nutt (1999) highlighted that analysts are systematically optimistic overreacting to good news and underreacting to bad news.

Hong and Stein (1999) focus on the relationship between two types of agents who exhibit only partial rationality, that is, those who have private information and the momentum traders who trade based on

past performance. The investment time horizon of the momentum trader is directly linked to when reversals will happen and their risk tolerance is inversely related to the reversals.

Bloomfield *et al.* (2009) agree with Hong and Stein (1999), but they find that long term reversals require the presence of irrational traders unlike for momentum which is a more robust phenomenon.

Vayonos and Woolley (2013) suggest a model for both phenomena which follows rational as opposed to behavioural beliefs. Their study examines the flows between investment funds. They find that the flows arise when there is a change in the efficiency of the fund manager which the investor either sees directly or assumes based on past performance. This suggests that abnormal returns can be generated by watching for fund flows and forming a strategy either momentum or contrarian depending on whether they require a long or short investment horizon.

2.12 Conclusion of the literature review:

There has been over thirty years of research on both momentum and contrarian strategies and as a result much more is now known. The literature is centred on two main explanations, a rational explanation and a behavioural one. Most of the literature is in agreement that returns on assets may not be so random and therefore in violation of the efficient market hypothesis (Galariotis, 2014).

Risk and asset pricing models have not been successful in explaining momentum and likewise the contrarian strategy is not fully explained by a multifactor model approach (Galariotis, 2014).

Galariotis (2014) proposes the inclusion of new factors into the asset pricing models. Factors related to liquidity and international risk

(Asness et al, 2013) or other factors that will encapsulate macroeconomic risks (Liu and Zhang, 2008).

The following sections will cover the research question and the methodology to be used.

Chapter 3: The Research Question

Main objective:

The main objective of this study is to test for the effects of a contrarian strategy in the Irish stock market over an eighteen-year period from 2001-2018.

This will be done based on empirical testing. There are several methods that vary in sophistication that could be used but here a very simple market adjusted model will be used which consists of cumulative abnormal returns (De Bondt and Thaler, 1985). The goal is to see if there is any evidence of the overreaction effect and thereby if the Irish market is inefficient.

There appears to be a very limited number of studies of this nature previously conducted on the Irish stock market. Even though the Irish stock market is small relative to other markets, it is worth testing as it has been shown that the effects of the phenomena have been found in smaller markets (Richards, 1997).

Null hypothesis H_0=no evidence of a contrarian investment strategy in the Irish stock market

Alternate hypothesis H_1=there is evidence of a contrarian investment strategy in the Irish stock market

Sub-objective:

Is the Irish stock market efficient or inefficient? A study of this nature could be of interest as any evidence of abnormal returns would contravene the efficient market hypothesis (O'Sullivan and O'Sullivan, 2010).

Sub-objective:

Can an investor earn abnormal profits by being long past losers and short past winners i.e. contrarian This can be tested by constructing an arbitrage portfolio.

Chapter 4: Methodology

This study uses a forecasting research or objectivist approach methodology which comes from the positivist perspective.

Positivism studies are where the researcher is independent from the study and there is no human interaction. Crowther and Lancaster (2008) contend that in general, a positivist study normally uses a deductive approach.

A deductive approach is when a hypothesis is developed which is based on existing theory and the research is designed to test the hypothesis (Wilson, 2010).

Gulati (2009) finds that a deductive approach can mean reasoning from the specific to the general. If causality is implied by a certain theory or case study it may also be applicable in many cases. A deductive approach may test the existing relationship to see if it was obtained in a more general circumstance.

This paper will apply the methodology mainly used by De Bondt and Thaler (1985) in their seminal work on the subject and also on the work of Ryan and Donnelly (2000) which is specific to the Irish situation. They covered an eighteen-year period from 1979-1996.

Here, an eighteen-year period will also be examined from 2000-2018. The choice of this length of time is in keeping with previous studies and also covers two major economic recessions. The performance of the ISEQ can be seen in Figure 1 at the end of this paper for the period under review and also in Figure 2 against the S&P 500 index. The direction is broadly the same except the decrease around the dot com bubble impact is not as severe in Ireland mainly due to the lack of tech company listings on the Irish index.

This paper will only be concerned with the following:

(i)   testing shares that have major abnormal returns and

(ii)   the direction and size of the return in the following period, indeed if it does exist. As firms are not randomly selected but based on performance and ranked, the firms will not be known until after the formation period is formed.

This methodology is different from the usual event studies as it will not be identifying any one particular event, such as a merger or earnings announcement.

As abnormal returns will be used this implies that the concern is only with extreme movements in the share prices. Only data about historic returns is being examined, no other information will be included, therefore overreaction is only testing whether the Irish market is weak form efficient.

There is no specific overreaction model in existence. The purpose of this paper is to show if an overreaction effect actually exists in the Irish context through a heuristic explanation rather than a mathematical explanation.

Ryan and Donnelly (2000) noted that this approach is comparable to a test of filter rules whereby a trading strategy is defined to see if it yields the desired results. Of course, it is a very subjective test and it is important to clarify that an overreaction strategy is more than a simple ad-hoc trading strategy, it uses hypothesis testing which is that an investor either overreacts or not to key information.

This paper is only concerned with whether there is evidence of a contrarian investment strategy in the Irish stock market as opposed to offering any of the psychological reasons that have been put forward as to why investors over or underreact (momentum) to new information. Antoniou *et al.* (2013) found that news which conflicts with an investors' sentiment leads to cognitive dissonance which in turn slows the dispersal of this news. Their results are in line with those of

Cooper *et al.* (2004) who found that both momentum and reversals are present in periods of optimism even when size, multiple risks and market conditions are included.

Instead of using the ISEQ index as the benchmark for market returns, an equally weighted index will be constructed to act as the market index. Previous studies (Brown and Warner, 1980) have found that using an equally weighted index can lead to more meaningful tests versus a value-weighted index. They found that using a value weighted index can falsely reject the null hypothesis.

There would appear to be very few studies on either the existence of momentum or contrarian effects in the Irish Stock Market.

This is of little wonder as the ISM is both small and more illiquid than its international counterparts and could be assumed at the outset that no evidence will exist.

There have been two main published studies on momentum in recent years. The first conducted by O'Donnell and Baur, 2007 and the second by O'Sullivan and O'Sullivan, 2010 which expanded on the 2007 study. Both found evidence of a momentum strategy. There has been one unpublished study of the contrarian strategy by Ryan and Donnelly (2000).

The total number of constituents listed on the Irish Stock Exchange is 108 over the review period and were obtained from the Bloomberg platform. The period under review comprises eighteen years of data ranging from January 2001 up until December 2018. This length of time appears to be relatively consistent with other studies of this nature, for example, Richards (1997); Stock (1990), Ryan and Donnelly (2000); O'Donnell & Baur (2007).

Initially, daily stock prices were downloaded from Bloomberg, however it was decided to go back and retrieve the monthly prices for each

constituent again from Bloomberg. The reason for this is that it has been identified in the literature (De Bondt and Thaler, 1985) that problems exist with both daily and weekly data regarding the risk and return variables such as the consequences of the impact of irregular trading which could be a feature of the Irish stock market but also the bid-ask spread.

All delisted stocks have been included in order to prevent survivorship bias within the sample.

There were 216 months observed for companies that spanned the whole review period so this was used as the maximum number of months. Of the 108 companies, there were 22 companies that had less than 50 months and these were excluded from the total. This is most likely due to non-trading. After that there was a total of 86 companies with which to construct the equally weighted index.

It is more prudent to construct an equally weighed index in this study for a value weighted market index such as the Irish stock market as it is heavily weighted on particular sectors and stocks. Up to the financial crisis the financial sector would have accounted for approximately 30 per cent of the total market and the top ten stocks would cover around 70 per cent of the total market capitalisation. Therefore, the use of the market index could mean that there is undue influence from specific companies or industries.

Equally weighed indices have been used in other studies to proxy for the market, for example, in Australia, Brailsford (1988) and in Brazil, Da Costa (1994). The equally weighted index was constructed by arithmetically averaging the returns of the stocks by month for the entire review period. The stocks that are included in the sample are the main drivers of the Irish market over the eighteen-year examination period.

The monthly return was calculated on each stock over the review period. Then the abnormal returns were calculated following a market adjusted or zero-one model. Under this model the expected return on each stock should be equal to the total market. Therefore, the abnormal returns are calculated as the actual difference between the return on the stock and the market in any month t. This can be expressed mathematically as follows:

$$E\ (R_{jt}) = E(R_{mt})$$

where:

$E(R_{jt})$ =   The expected return on a stock in time t

$E(R_{mt})$ =   The expected return on the market

This then becomes the following:

$$U_{jt} = R_{jt} - R_{mt}$$

where:

U_{jt} =   the market adjusted abnormal return of stock j in month t

R_{jt} =   the return of stock j in month t

R_{mt} =   the return on the equally weighted index in month t

The use of the market adjusted model means that the objective is not to define what is the correct asset pricing model for producing abnormal returns. This paper is focused more on testing if the Irish market is efficient instead of hypothesising if the Irish market is efficient as a result of using a specific asset pricing model.

The contrarian effect was tested for two horizon periods of two years and six years. For the two-year horizon period, seventeen tests were run and for the six-year horizon period five tests were possible.

For the two-year period, each of the tests were split equally between the formation period and the testing period. Therefore, the first test will take the market data for the period 2001-2002. Data for 2001 was used to construct the winner-loser portfolio and then data from 2002 was used to test if there were any subsequent reversals and so on for each of the following periods.

Likewise, for the six-year horizon the formation period for the first test used the data for 2001-2003 and to test for the subsequent reversal the period 2004-2006 was used and so forth.

The cumulative abnormal returns (CAR) for each stock over the formation periods were calculated as follows:

$$CARj = \sum_{t=1}^{T} Ujt$$

The construction of the winner and loser portfolios was adapted from De Bondt and Thaler (1985). They used firms from the top 50, 35 or top decile stocks to construct their winner portfolios and then for the loser portfolios they took the worst 50, 35 or bottom ten percent. The approach used here is in line with Ryan and Donnelly (2000) and involved taking the top 15 percent for the winners and the bottom 15 percent for the loser portfolios. It is suggested that to use the ten percent figure is too low for a study of the Irish market as the total constituents are less numerous in comparison to a US market and thus could make the portfolios too small.

Survivorship bias was considered. Delisted stocks were included at some point over the horizon periods, for example Greencore PLC which delisted from the ISEQ in 2012 would have had a chance of being included in the winner-loser portfolio selection process in the earlier formation and testing periods. However, firms that were missing data in the formation period were excluded. These potentially were firms that had significant gaps in their trading days and their returns would have obscured the result.

Several major firms failed in the post financial crisis period, for example Anglo Irish Bank was acquired by IBRC in 2008 and Waterford Wedgwood and McInerney Holdings delisted due to bankruptcy in 2008 and 2010 respectively. These firms again would have had a chance of selection in the earlier formation periods.

Power *et al.* (1991) find that companies also delist due to mergers and acquisitions. A lot of companies targeted for takeover can be characterised by poor performance, low growth or financial distress and as such many of these companies could be part of the loser portfolios.

Equally, there were several newcomers to the ISEQ in the later periods, for example Aryzta in 2008, Green REIT in 2013 and IRP Reit in 2014.

The winners and losers were selected based on their average returns over the formation period and then ranked on the 15 percent criteria for best and worst performers. There are between five and seven stocks in each portfolio.

The abnormal returns of the portfolios were then calculated for the testing periods as follows:

$$ARk = \sum_{\substack{n=1 \\ \overline{n}}}^{n} Ukt$$

where:

n = number of firms in portfolio

k = winner (W) and loser (L) portfolios respectively

Ukt = the market adjusted abnormal return of stock k in month t

The cumulated abnormal returns for each of the portfolios over the whole test period T were calculated as follows:

$$CARk = \sum_{t=1}^{T} ARk$$

Following this, the average cumulative abnormal return (ACAR) were then calculated for the winner and loser portfolios:

$$ACARk = \sum_{\substack{p=1 \\ \overline{P}}}^{p} CARk$$

where:

P = number of test periods

An arbitrage portfolio will also be established which will buy the loser and sell the winner portfolios.

The average cumulative abnormal returns of this arbitrage portfolio ($ACAR_{WL}$) will be calculated as follows:

$$ACAR_{WL} = ACAR_L - ACAR_W$$

The hypothesis will thus be as follows, if the market is efficient:

Null Hypothesis:- $\qquad H_0 : \qquad ACAR_{WL} = ACAR_L = ACAR_W = 0$

Alternative Hypotheses:-

$\qquad\qquad\qquad H_1 : \qquad ACAR_W < 0$

$\qquad\qquad\qquad H_2 : \qquad ACAR_L > 0$

$\qquad\qquad\qquad H_3: \qquad ACAR_{WL} > 0$

If the null hypothesis holds then an investor should not be able to earn abnormal returns by buying past loser stocks and then short selling past winner stocks as the historic return patterns do not give any signal of potential future returns. This would be in line with the Efficient Market Hypothesis implying that the expected abnormal returns for both portfolios is zero.

The alternative hypothesis states that the average cumulative abnormal return for the loser portfolio $ACAR_L$ will be greater than zero, the average cumulative abnormal return for the winner portfolio $ACAR_W$ will be less than zero and the arbitrage portfolio which is a combination of the two $ACAR_{WL}$, will be positive. This latter part of the hypothesis means that when the past losers outperform the past winners the null hypothesis will be rejected.

Due to the limited number of tests required (only t-test) in this study, to formally test the hypotheses, the Excel data analysis toolpak was used to perform the t-test statistic. If a significant number of statistical

tests were required to be performed, it could be better to use a more powerful statistical package such as SPSS.

De Bondt and Thaler (1985) pointed out that the t-statistics are not representative of independent evidence.

There has been plenty of criticism of the De Bondt and Thaler (1985) study. Conrad and Kaul (1993) found that studies of this type are biased upwards due to cumulating monthly returns over the long term. In addition to the real returns being cumulated, measurement errors as a result of non-synchronous trading and also bid-ask errors are cumulated. They find when using buy and hold periods instead of cumulative abormal returns that the excess returns on the arbitrage portfolio is reduced.

However, the Conrad and Kaul (1993) methodology was criticised by Loughran and Ritter (1995). They argue that the buy-and-hold methodology impacts their results caused by a confusion in cross-sectional patterns and an aggregation of time series mean reversion. They also put forth that as price is directly linked to previous returns it is not easy to say with some finality what exactly is connected to the ensuing excess returns. The methodology which they employ controls for these factors and provides strong support that the use of cumulative abnormal returns as opposed to buy and hold returns is not the main driver of the De Bondt and Thaler (1985) results.

Power and Lonie (1993) note that bid-ask spread issues should not be a significant problem for long run overreaction tests as recording errors should not occur as much in low frequency data like the monthly returns used in this paper. They also highlight that many sources of bias could offset instead of strengthen each other.

Chapter 5: Analysis and Discussion

The results were estimated using the market adjusted model only , that is, using cumulative abnormal returns. Other studies have found that a risk adjusted market model yielded broadly the same results (Ryan and Donnelly, 2000).

Da Costa (1994) found for the Brazilian market that in periods of extreme market volatility, the abnormal returns seem to be more noticeable and that differences in risk when measured using CAPM-betas are not responsible for the overreaction effect.

Several other international studies for Germany, Australia and Canada found that there was no evidence that changes in size, seasonality or risk materially altered the results (Stock (1990), Brailsford (1992), Kryanowski and Zhang (1992)).

Table 1 highlights the results for the Arbitrage strategy $ACAR_{WL} = ACAR_L - ACAR_W$. An overreaction effect was present over the two horizon periods. In the two-year horizon the strategy of buying the extreme losers and short selling the extreme winners is insignificant yielding a small profit of 2.3%. At the six-year horizon the level of profitability increases dramatically to 31.4%.

Overall, these results would reject the null hypothesis.

Table 1: Arbitrage Strategy Profitability over two horizon periods

Profitability of Arbitrage Strategy over two Horizon Periods			
Horizon Period	**Number of tests**	**Total Length of Testing Period**	**Profitability of Arbitrage Strategy**
2 Years	17	2002-2018	2.3%
6 Years	5	2004-2018	31.4%

The results for the two horizon periods will be presented in the following sections.

5.1 The two-year horizon:

The next section gives the results of the overreaction effect for the two-year horizon period and consists of six tables. The mean of the cumulative abnormal returns is based on a total of seventeen formation and test periods. The number of stocks that make up the winner and loser portfolios range from seven stocks in 2001-2002 decreasing to five stocks in 2017-2018. This is to be expected given the test period spans the financial crisis beginning in 2008 and a number of companies delisted from the Irish stock market in the following few years.

Table 2 exhibits the cumulative abnormal returns for the loser portfolio split between the formation and the testing periods. Table three presents the results of the paired samples *t* test for the loser portfolio. The paired samples *t* test was used as a comparison between means from the same group but at different times which in this case is one year apart (the formation and the test period). Table four presents the cumulative abnormal returns for the winner portfolio, Table five contains the results of the paired samples *t* test from the winner portfolio and the final tables six and seven present the results from the arbitrage strategy and the *t* test respectively which for this part is a two sample *t* test assuming unequal variances.

For both the loser and winner portfolios, the cumulative abnormal returns in the formation periods are very different. The losers underperform the market index by an average of 71.9% while the winners outperform by 79.2%. This difference reduces significantly during the test periods where the results of both portfolios mostly show some signs of reversal in each test period.

The mean abnormal return for the loser portfolio increases to 3.4% whereas the winner portfolio over the entire test period continue to outperform the market index albeit by a much lower amount which means a loss on the short selling strategy of 1.03%.

These results are likely to be driven by the period under review which covers the financial crisis when there would have a been some extreme market movements in certain periods.

In the loser cumulative abnormal returns, eight of the seventeen test periods remain as losers with the worst result recorded in 2011 where the loser portfolio actually deteriorated with the loss increasing from 59.0% to 74.2%. The highest reversal is recorded in 2009 at 74.0%. Regarding the winner cumulative abnormal returns, nine of the seventeen portfolios remained as winners with 2005 being the most extreme where the winner portfolio continued to outperform by 46.7%. The biggest reversal which is that with the best performance from a short seller viewpoint occurred in 2009 at 41.2%.

The extreme periods observed above occurred in the preceding and subsequent periods around the financial crisis.

The *t* tests were performed at the 95% confidence level.

Table 2: Cumulative Abnormal Return Loser Portfolio: 2Y Horizon

Cumulative Abnormal Returns for the Loser Portfolios			
Formation Period	**CAR (Losers)**	**Testing Period**	**Subsequent CA (Losers)**
CAR 2001	-1.1087	CAR 2002	0.1071
CAR 2002	-1.0922	CAR 2003	0.300
CAR 2003	-0.7170	CAR 2004	-0.2344
CAR 2004	-0.5589	CAR 2005	0.2093
CAR 2005	-0.4919	CAR 2006	-0.0835
CAR 2006	-0.2768	CAR 2007	0.2777
CAR 2007	-0.6154	CAR 2008	-0.0649
CAR 2008	-1.0104	CAR 2009	0.7403
CAR 2009	-0.6332	CAR 2010	0.0862
CAR 2010	-0.5890	CAR 2011	-0.7415
CAR 2011	-1.2913	CAR 2012	-0.0292
CAR 2012	-0.8281	CAR 2013	0.1889
CAR 2013	-0.8447	CAR 2014	-0.2581
CAR 2014	-0.6823	CAR 2015	-0.7510
CAR 2015	-0.6507	CAR 2016	0.4024
CAR 2016	-0.4400	CAR 2017	-0.0597
CAR 2017	-0.3877	CAR 2018	0.4517
Mean	**-0.7187**		**0.03361**
t Stat			*6.1893*

Table 3: T-Test Average Cumulative Abnormal Return Loser Portfolio: 2Y Horizon

	ACAR L	ACAR L
Loser Portfolio		
t-Test: Paired Two Sample for Means		
Mean	0.002802	-0.059894
Variance	0.001055	0.000535
Observations	17	17
Pearson Correlation	-0.102884	
Hypothesized Mean Difference	0	
Df	16	
t Stat	6.189331	
P(T<=t) one-tail	0.000006	
t Critical one-tail	1.745884	
P(T<=t) two-tail	0.000013	
t Critical two-tail	2.119905	

The *t* statistic for the loser portfolio is much greater than the critical value at the 95% confidence level meaning that the alternative hypothesis H_2 could be accepted as there are clearly reversals in the test period as can be seen in Table 2.

Table 4: Cumulative Abnormal Return Winner Portfolio: 2Y Horizon

Cumulative Abnormal Returns for the Winner Portfolios **Two-Year Horizon Period**			
Formation Period	**CAR (Winners)**	**Testing Period**	**Subsequent CAR (Winners)**
CAR 2001	0.6986	CAR 2002	-0.0347
CAR 2002	0.6310	CAR 2003	-0.1936
CAR 2003	0.8948	CAR 2004	0.2875
CAR 2004	0.7841	CAR 2005	0.4674
CAR 2005	0.8483	CAR 2006	0.2311
CAR 2006	0.5357	CAR 2007	-0.3008
CAR 2007	0.7886	CAR 2008	0.3789
CAR 2008	0.7206	CAR 2009	-0.4167
CAR 2009	1.4513	CAR 2010	0.0222
CAR 2010	0.8244	CAR 2011	0.0665
CAR 2011	0.8340	CAR 2012	-0.2215
CAR 2012	0.6943	CAR 2013	-0.1101
CAR 2013	1.2831	CAR 2014	0.2160
CAR 2014	0.5812	CAR 2015	-0.3161
CAR 2015	0.5697	CAR 2016	-0.0737
CAR 2016	0.6784	CAR 2017	0.0823
CAR 2017	0.6450	CAR 2018	0.0905
Mean	**0.7919**		**0.0103**
t Stat			*-11.5721*

Table 5: T-Test Average Cumulative Abnormal Return Winner Portfolio: 2Y Horizon

	ACAR W	ACAR W
Winner Portfolio		
t-Test: Paired Two Sample for Means		
Mean	0.000859	0.065996
Variance	0.000448	0.000406
Observations	17	17
Pearson Correlation	0.369886	
Hypothesized Mean Difference	0	
Df	16	
t Stat	-11.57211	
P(T<=t) one-tail	0.00000	
t Critical one-tail	1.74588	
P(T<=t) two-tail	0.00000	
t Critical two-tail	2.11991	

The *t* statistic for the winner portfolio is less than the critical value at the 95% confidence level and this means that the null could be accepted as overall the winners remain winners even though just very marginally as can be seen in Table 4.

Table 6: Arbitrage Strategy: 2Y Horizon

Arbitrage Strategy Two Year Horizon Period			
Testing Period	**CAR (Losers)**	**CAR (Winners)**	**Arbitrage Strategy**
CAR 2002	0.1071	-0.0347	0.1418
CAR 2003	0.3300	-0.1936	0.5236
CAR 2004	-0.2344	0.2875	-0.5219
CAR 2005	0.2093	0.4674	-0.2581
CAR 2006	-0.0835	0.2311	-0.3146
CAR 2007	0.2777	-0.3008	0.5785
CAR 2008	-0.0649	0.3789	-0.4438
CAR 2009	0.7403	-0.4167	1.1570
CAR 2010	0.0862	0.0222	0.0640
CAR 2011	-0.7415	0.0665	-0.8080
CAR 2012	-0.0292	-0.2215	0.1923
CAR 2013	0.1889	-0.1101	0.2990
CAR 2014	-0.2581	0.2160	-0.4741
CAR 2015	-0.7510	-0.3161	-0.4349
CAR 2016	0.4024	-0.0737	0.4761
CAR 2017	-0.0597	0.0823	-0.1420
CAR 2018	0.4517	0.0905	0.3612
Mean	**0.0336**	**0.0103**	**0.0233**
t Stat			*0.2066*

Table 7: T-Test Arbitrage Strategy: 2Y Horizon

Loser-Winner Portfolio		
t-Test: Two-Sample Assuming Unequal Variances		
	ACAR L	*ACAR W*
Mean	0.002802	0.000859
Variance	0.001055	0.000448
Observations	17	17
Hypothesized Mean Difference	0	
Df	28	
t Stat	0.206612	
P(T<=t) one-tail	0.418904	
t Critical one-tail	1.701131	
P(T<=t) two-tail	0.837808	
t Critical two-tail	2.048407	

Finally, for the arbitrage strategy, the p value at the $\alpha = 0.05$ level implies that there is profit to be made from the contrarian strategy. As can be seen in Table 6 there is a profit.

5.2 The six-year horizon:

Moving on to the six-year horizon period, which is represented in Table 8 to Table 13. The six-year horizon is made up of five sample timeframes. For the losers, the formation period on average gives a loss of 109.0% but then transforming into a subsequent profit of 28.8%. Three out of the five cumulative abnormal returns of loser portfolios are positive in the test periods with the greatest reversal recorded in the test period 2013-2015 at 83.2%. This could be regarded as a recovery period post financial crisis.

There are two test periods where the portfolios remain in the loser position with the period 2010-2012 moving from a 79.6% loss in the formation period to a loss of 21.0% in the test period. Again, this time frame could be regarded as almost the worst time of the financial crisis.

The winners record similar significant reversals moving from a profit of 130.0% to a loss, albeit small, of 2.5%. Only two of the five individual test periods record reversals with the largest in period 2013-2015 moving from a positive 113.7% in the formation period to a loss of 133.6% in the test period. The test period 2004-2006 is the one where the winner portfolio continued to outperform the market index at the highest level of 66.0%.

Table 8: Cumulative Abnormal Return Loser Portfolio: 6Y Horizon

Cumulative Abnormal Returns for the Loser Portfolios Market Adjusted Model Six-Year Horizon Period			
Formation Period	**CAR (Losers)**	**Testing Period**	**Subsequent CAR (Losers)**
CAR 2001-2003	-1.2982	CAR 2004-2006	-0.0355
CAR 2004-2006	-0.3795	CAR 2007-2009	0.0425
CAR 2007-2009	-0.7957	CAR 2010-2012	-0.2054
CAR 2010-2012	-1.7520	CAR 2013-2015	0.8329
CAR 2013-2015	-1.2260	CAR 2016-2018	0.8076
Mean	**-1.0903**		**0.2884**
t Stat			*3.3272*

Table 9: T-Test Average Cumulative Abnormal Return Loser Portfolio: 6Y Horizon

Loser Portfolio		
t-Test: Paired Two Sample for Means		
	ACAR L	**ACAR L**
Mean	0.008012	-0.030286
Variance	0.000188	0.000211
Observations	5	5
Pearson Correlation	-0.662638	
Hypothesized Mean Difference	0	
Df	4	
t Stat	3.327260	
P(T<=t) one-tail	0.014590	
t Critical one-tail	2.131847	
P(T<=t) two-tail	0.029180	
t Critical two-tail	2.776445	

The t statistic is outside the critical value meaning that H_2 holds.

Table 10: Cumulative Abnormal Return Winner Portfolio: 6Y Horizon

Cumulative Abnormal Returns for the Winner Portfolios Market Adjusted Model Six-Year Horizon Period			
Formation Period	**CAR (Winners)**	**Testing Period**	**Subsequent CAR (Winners)**
CAR 2001-2003	1.0750	CAR 2004-2006	0.6600
CAR 2004-2006	1.4929	CAR 2007-2009	0.5327
CAR 2007-2009	1.2379	CAR 2010-2012	0.5771
CAR 2010-2012	1.1376	CAR 2013-2015	-1.3364
CAR 2013-2015	1.5545	CAR 2016-2018	-0.5593
Mean	**1.2996**		**-0.0252**
t Stat			*-3.2393*

Table 11: T-Test Average Cumulative Abnormal Return Winner Portfolio: 6Y Horizon

Winner Portfolio		
t-Test: Paired Two Sample for Means		
	ACAR W	**ACAR W**
Mean	-0.000699	0.036100
Variance	0.000607	0.000035
Observations	5	5
Pearson Correlation	-0.009153	
Hypothesized Mean Difference	0	
Df	4	
t Stat	-3.239390	
P(T<=t) one-tail	0.015846	
t Critical one-tail	2.131847	
P(T<=t) two-tail	0.031692	
t Critical two-tail	2.776445	

The t statistic is within the critical value which means that H_1 holds.

Table 12: Arbitrage Strategy: 6Y Horizon

Testing Period	CAR (Losers)		CAR (Winners)	Arbitrage Strategy
Arbitrage Strategy				
Market Adjusted Model Six-Year Horizon Period				
CAR 2004-2006	-0.0355		0.6600	-0.6955
CAR 2007-2009	0.0425		0.5327	-0.4901
CAR 2010-2012	-0.2054		0.5771	-0.7825
CAR 2013-2015	0.8329		-1.3364	2.1693
CAR 2016-2018	0.8076		-0.5593	1.3669
Mean	**0.2884**		**-0.0252**	**0.3136**
t Stat				*0.6907*

Table 13: T-Test Average Cumulative Abnormal Return Winner Portfolio: 6Y Horizon

Loser-Winner Portfolio		
t-Test: Two-Sample Assuming Unequal Variances		
	ACAR L	*ACAR W*
Mean	0.008012	-0.000699
Variance	0.000188	0.000607
Observations	5	5
Hypothesized Mean Difference	0	
Df	6	
t Stat	0.690718	
P(T<=t) one-tail	0.257780	
t Critical one-tail	1.943180	
P(T<=t) two-tail	0.515560	
t Critical two-tail	2.446912	

The net profit of the arbitrage strategy is 31.4%. The losers are the driver for the majority of this result accounting for over 90%. This implies that there is asymmetry in the Irish market.

It is difficult to make a direct comparison with other countries due to differences in the methodologies used (Ryan and Donnelly, 2000).

However, as noted throughout this paper, many previous studies have found evidence of overreaction.

It can be seen that as the duration of the horizon period increased, the evidence of the presence of an overreaction effect increased moving from a two-year horizon period to a six-year horizon.

The results could be different if different horizon periods were used. Equally, if we look at some of the periods within the overall test period a contrarian trading strategy would not have been profitable.

While the tests undertaken in this paper can be considered preliminary, at this level there is existence of a contrarian trading strategy or an overreaction effect thereby implying that the Irish market is somewhat inefficient.

There are several other tests that could be performed to seek explanation for the results. These can include tests for the impact of company size using market capitalisation. Additionally, seasonality may also play a part, a lot of the literature noted a January effect. Although how much of this would apply in the Irish context is unclear as private individuals report tax returns in October. However, a portfolio rebalancing explanation has also been put forth for this (Ritter and Chopra, 1989). They argue that institutional investors who mainly have December yearends, sell their risky stocks so they do not have to report them on their balance sheet and buy them back in January.

The CAPM could be used to test for changes in risk between the formation and the test periods. Ryan and Donnelly (2000) performed this test and in line with De Bondt and Thaler (1985) found that the change in risk is insufficient to explain the abnormal return in the arbitrage strategy in the Irish context.

Chapter 6: Conclusions

In conclusion, this study finds that there is evidence of a contrarian strategy or overreaction effect in the Irish Stock Market seen through the long-term return reversals. It follows then that there is evidence of weak-form market inefficiency. It can be gleaned that security returns may not be as random as the efficient market hypothesis expects.

This result was achieved by identifying abnormal returns in historic price information thus leading to a profit. The degree of the reversal depends on the length of time under investigation. The average cumulative abnormal returns earned on the arbitrage strategy increases from 2.3% in the two-year horizon to 31.4% in the six-year horizon.

While other factors such as size, seasonality and risk were not examined in this study, Ryan and Donnelly (2000) found that these elements did not fully explain the reversals.

There are many further studies that could be undertaken on this subject. The test used here could be further expanded to include firm size, seasonality and risk to check for their impact on the overreaction effect. An event study could be undertaken to check for evidence of what type of announcement investors may overreact to.

Other assets classes could be examined for overreaction as has been done in the international context (Avramov and Chordia, 2006).

The other anomaly of momentum could also be explored further in the Irish context either alone or linking it with the contrarian effect. This has also been tested elsewhere (Chan *et al.* 1996), it has been recorded that momentum is usually followed by reversals.

Additional more sophisticated models could be used such as the three-factor model based on Fama and French (1993) or introduce different factors such as based on Carhart's four factor model.

Of all the many studies that have gone before, while there is certainly more information on these anomalies today there is still no agreement on why momentum gains and reversals continue to exist.

Figure 1: ISEQ Index 1998-2008

Figure 2: ISEQ Index and S&P 500 Index 1998-2008

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