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The Overreaction Hypothesis: An Examination in the Irish Stock Market

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1. INTRODUCTION

The ability of financial markets to interpret information quickly and accurately has been the subject of considerable academic and professional debate for over thirty years. Initially, the Efficient Market Hypothesis (EMH) was widely accepted and any dissenting opinion was considered heretical. General acceptance of the hypothesis lead to a fundamental change in professional investor behaviour away from active investment management and towards passive investment management.

However, the emergence of contradictory evidence, such as the existence of market anomalies and excess volatility, has in more recent times resulted in a critical re-examination of the EMH. More specifically, considerable evidence has emerged regarding idiosyncrasies in stock markets including the small firm effect, the turn-of-year effect, the weekend effect, a low-priced stock effect etc.

While these anomalies have been well documented it is by no means certain that they can be exploited by ordinary investors, due to increased transaction costs and the extra risk from pursuing an active investment strategy. One anomaly that appears to offer this potential is the 'overreaction effect'. As Power and Lonie (1993) point out, "the overreaction effect has a claim to be regarded as one of the most important anomalies investigated during the 1980s" (p.326). A number of reasons are put forward by the authors to support this: (i) the level of abnormal returns earned by this trading strategy is much larger than other anomalies, with significantly less transaction costs, (ii) whereas many of the other anomalies cannot be explained, the overreaction hypothesis is much more intuitively appealing, and (iii) the hypothesis is supported by evidence from cognitive psychology which shows that individuals will have a propensity to overreact to unanticipated information which affects their futures.

Essentially, the overreaction hypothesis states that market participants have a tendency to overreact to both good and bad news, with the consequence that prices of certain stocks temporarily depart from their underlying fundamental values. Given this tendency, positive abnormal returns can be earned by selling short those stocks

which have witnessed the largest increase in value (winners) and purchasing those stocks which have witnessed the most significant decrease in value (losers).

While, at times controversial, evidence exists of an overreaction effect in most of the major stock markets, this paper seeks to answer the question of whether or not investors in the Irish equity market tend to overreact to new information as indicated by a predictable reversal in returns.[1] In this regard, it is a study of market efficiency. While the concepts applied here are themselves not new and are based on investigations carried out by financial economists for over a decade, this paper is the first attempt to investigate the possibility of overreaction in the Irish equity market.[2]

The remainder of the paper is structured as follows: Section two details the background to the 'Overreaction Hypothesis' and places it in the context of studies in cognitive psychology. The section also examines the extensive and disputed evidence as to the existence of an 'overreaction effect' and whether the evidence is consistent with investor irrationality or can be explained by other factors. Section three presents the research design used to test for overreaction in the Irish market. This methodology is primarily based on the original work of De Bondt and Thaler (1985). Section four presents evidence on the overreaction effect in the Irish stock market. The results suggest that an economically significant overreaction effect is present, which can only partly be explained by other factors. Finally, Section five offers some conclusions and suggests some areas for further research.

2. AN OVERREACTION EFFECT?

The efficient market hypothesis has been of considerable interest to financial economists for over 30 years. Indeed, much of recent financial theory is based on the assumption that markets are efficient. This hypothesis in its simplest form states that is not possible to earn consistent abnormal returns by trading on the basis of available information.

[1] As will be noted later, evidence of a reversal in share returns is generally interpreted as being consistent with the overreaction effect. Therefore, throughout this paper, and in common with much of the existing literature, the term 'overreaction effect' is used interchangeably with the term 'returns reversal'.

[2] This paper concentrates on testing for long-term reversal in return patterns. However it is worth noting that short-term overreaction in security markets has also been the subject of considerable research (See Power and Lonie (1993) for a review).

Although initially almost universally accepted, a wide body of evidence has now emerged which has substantially weakened the rationale of this hypothesis. One such challenge has come from the body of work investigating the overreaction effect. In its most general form, the overreaction hypothesis states that investors have a tendency to display a systematic overreaction to new information, causing there to be predictable reversal in the price of the security as the information is correctly processed.

De Bondt and Thaler (1985*)* explain the effect as follows:

> *"If stock prices systematically overshoot, then their reversal should be predictable from past return data alone, with no use of any accounting data such as earnings. Specifically, two hypotheses are suggested: (1) Extreme movements in stock prices will be followed by subsequent price movements in the opposite direction. (2) The more extreme the initial price movement, the greater will be the subsequent adjustment."* (p.795).

2.1. The Link Between the Psychology of Individual Decision Making and Stock Market Returns

The motivation behind much of the initial research on overreaction was based on research in cognitive psychology which revealed that the decision making of investors can deviate from the assumption of perfect rationality. In several experiments, Tversky and Kahneman (1982) found 'that people tend to rely on a limited number of heuristic principles which reduce the complex task of assessing probabilities and predicting values to simpler judgmental operations"(p.3). In general, individuals base their decisions on the most striking, recent and available information instead of using all available information in a manner which conforms to rational behaviour. Thus individuals outweigh the relevance of current information and extrapolate too far into the future on the basis of the present.

Experiments have also show that judgement generally centres around the first few estimates of a particular problem or uncertainty rather than the 'true' value. Thus individuals 'anchor' their assessment and have difficulty changing from the initial judgement even when new information warrants it. Applied in the context of overreaction, 'winner' firms establish a reputation based on a history of prior excellent performance and loser firms suffer from the opposite 'stereotyping' based

on a past history of underperformance. Once these opinions are initially formed, 'anchoring' ensures that they are only gradually eradicated as information inconsistent with the stereotypes accumulates. As a result the share price moves slowly in the opposite direction, leading to a mean-reverting pattern in share returns.

Overall, the psychological explanation supports the belief that a general overreactive tendency may exist that gives rise to a mean reverting pattern in security returns. Although individuals make heuristic decisions that usually result in correct decisions, these heuristics can fail them at certain critical times leading to price changes that will overshoot, and then revert to correct values. As Tversky and Kahneman (1982) conclude, "in general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors" (p. 3).

Shiller (1984) has applied many of these ideas to the stock market. He argues that the more sophisticated investors react quickly to new information, causing the price of a security to change. Consistent with the efficient market hypothesis, the price rapidly rises or falls to its new correct level. Then, other investors react to the (no longer new) information. The later investors do not realise that the price change has already occurred and may very well already reflect a new equilibrium in an efficient market. As the euphoria escalates, the price subsequently rises to levels way above or below the fundamental value. Eventually, the price moves back to the 'correct' level as rationality returns to the market.[3]

The main objection to this behavioural perspective is that a few rational arbitrageurs would intervene to correct the mispricing of securities induced by traders not acting in a fully rational fashion. Undoubtedly, given the potential extent of the mispricing (as documented below) the inability of arbitrageurs to identify the anomaly is highly unlikely to explain the lack of intervention. However, De Bondt and Thaler (1985) formally address the issue of how the anomaly could survive the process of arbitrage. They argue that the existence of some rational agents is not sufficient to guarantee rational expectations equilibrium in an economy characterised by the presence of some quasi-rational agents. Indeed, they argue that this issue raises a more general question of what are equilibrium conditions for a market in which agents are not fully rational. Furthermore, Chopra et al. (1992) argue that periodic

[3] In an earlier paper, Shiller (1981) interpreted excessive volatility in stock prices as evidence of overreaction to news about dividends.

evaluation of institutional investors by their clients contributes to a general unwillingness to undertake long-term arbitrage positions. Consequently, resources will be devoted to short-term arbitrage strategies at the expense of long-term opportunities. As the trading strategies required necessitate the commitment of capital over long periods the opportunities may persist over time.

The motivation behind the initial research of De Bondt and Thaler (1985) was to investigate empirically the link between stock market behaviour and the psychology of individual decision making. Their objective was to show that a systematic relationship existed between the two phenomena. Using monthly data from the United States for the period 1926-1982, they began by examining extreme performers over periods of 36 months. 'Losers' and 'winners' were identified on the basis of their market-adjusted excess returns, and clustered into distinct portfolios (the portfolio formation period). The subsequent cumulative abnormal returns of the portfolios that were formed out of the extreme winners and the extreme losers were then examined (the test period). They found that on average the loser portfolios outperform the market by 19.6% in the 36 months after their formation. Winner portfolios by contrast exhibit a market relative underperformance of 5.0%. Hence the average cumulative residual from an arbitrage portfolio (formed by short selling winner portfolios and buying loser portfolios) is a statistically significant gain of 24.6%. Over a 5 year horizon the results are even stronger with the strategy yielding an average return of 31.9%.

De Bondt and Thaler also highlight a number of other observations that arose from their research, which have gained increased importance due to the subsequent academic debate. First, the results show a recurring asymmetric pattern with the contribution to the arbitrage portfolio being much larger for losers than winners. Second, nearly all of the reversal in returns seems to be concentrated in January. Third, they observe that the average betas in the winner portfolios are significantly larger than the betas of the loser portfolios, implying the losers not only outperform the winners but are less risky. In other words, after accounting for the lower risk of the past losers, the abnormal return differential with past winners would grow. Fourth, the overreaction phenomenon occurs mostly during the second and third year of the test period. Indeed they find insignificant abnormal returns for the arbitrage portfolio over a 2 year horizon period. However, this was not unexpected as they argue that the magnitude of the subsequent reversal would be conditional on

the extent of the initial overreaction (which generally increases as the portfolio formation periods lengthen).

The evidence that the reversal in returns is not immediate has been documented elsewhere. For example, Davidson and Dutia (1989) present evidence that using one year formation and test periods leads to a conclusion diametrically opposite to the one overreaction would predict.[4] Numerous studies have observed a similar pattern of initial continuation of performance (see for example, Ball and Kothari (1988) and Chopra et al (1992)). Furthermore, evidence from a study by Jegadeesh and Titman (1993) of relative strength strategies (buying winners and selling losers) supports continuation followed by subsequent reversal. The strategies initially yield abnormal returns over 3 to 12 months, followed by negative performance starting after approximately the first year and extending up to the third year. As a result the original gains dissipate.

De Bondt and Thaler's results clearly imply market inefficiency and it is perhaps not surprising that the findings have resulted in a proliferation of subsequent studies which argue both for and against the 'overreaction effect'. Most of the work has concentrated on what Fama (1991) describes as the 'joint-hypothesis problem' when interpreting evidence of return predictability: namely, does the return predictability reflect rational variation through time in returns, irrational deviations of prices from fundamental values, or some combination of the two?

2.2. Alternative Explanations of the Overreaction Effect

While De Bondt and Thaler (1985) suggest that their results are a reflection of irrational behaviour by investors, other potential explanations have been put forward. First, De Bondt and Thaler assume that risk levels do not change between the portfolio formation period and the test period. However, it can be argued that the level of risk in the winner and loser firms is likely to change as a direct result of their prior performance (Chan, 1988 and Ball and Kothari, 1989). Therefore any subsequent reversal in returns could be a rational reflection of the change in risk. Second, as prior performance has a pronounced effect on company size, as measured by market capitalisation, the excess returns are only another manifestation

[4] They find that "if an investor had purchased the top 10 percent of securities in year t-1 and held them through year t, the investor would have earned an annual average abnormal return across 21 years of 42.8%. An investor purchasing the worst ten percent of all securities (a contrarian strategy) and holding

of the 'size effect' (see for example, Chan, 1988 and Zarowin, 1990). And finally, as almost all of the abnormal returns from their strategy are earned in January, it is questionable whether the phenomenon is merely a reflection of stock market seasonality or is an anomaly in its own right. These issues are explored in more detail below.

The risk change explanation of De Bondt and Thaler's findings is based on the impact of prior performance on the market value of the firm's equity. As losers become losers, the market value of their equity inevitably falls, resulting in a pronounced change in the firm's debt-equity ratio. As the overall equity beta is a function of asset beta and leverage, a series of negative abnormal returns will increase the equity beta thus increasing the expected return on the stock, provided the firm does not alter it's capital structure. Therefore any subsequent changes in price would be larger than predicted in the absence of such a change in risk. Likewise, past winners become less risky since the past increases in the market value of equity cause the debt-equity ratios to decline.

Chan (1988) contends that if the beta estimates were updated throughout the analysis, the so-called evidence of overreaction as per De Bondt and Thaler would merely be consistent with rational investor behaviour whereby the pattern of returns varies as a result of changes in risk. Chan tests this risk change hypothesis by incorporating changes in beta over time and finds that the losers' betas increase after a period of abnormal loss, and the winners' betas decrease after a period of abnormal gain. Overall, he finds that the formation-to-test beta change is -.222 for the winners and .231 for the loser portfolios.

Confirmatory evidence is presented by Ball and Kothari (1989), who although using a different methodology, find that by allowing time varying expected returns the arbitrage strategy yields insignificant abnormal returns. In fact, they show more severe changes in betas, between the formation period and the test period, than those observed by Chan. Given the extent of the change in risk Chan concludes that 'if our risk adjustment is appropriate and adequate, we find only weak evidence of price reversals, even though the stocks in our sample have experienced very large abnormal gains or losses prior to the test period' (p.160).

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them a year would have earned a twenty-one-year annual average abnormal return of -55.8 percent" (p.247).

Much of the subsequent debate has concentrated on the joint impact of changes in risk and company size. Zarowin (1989, 1990) takes issue with De Bondt and Thaler on the basis of the size of the companies in the winner and loser portfolios. He argues that the overreaction effect is limited to smaller and lesser-known companies and accordingly is a reflection of the 'size effect' as observed by Banz (1981) and others.[5] When losers are matched against winners of equal size the monthly abnormal returns decline to negligible levels. Therefore, market efficiency is still thought to hold for larger companies (Dissanaike, 1997).

As a direct result of these issues, De Bondt and Thaler (1987) tested, using their original sample, whether after adjustment the overreaction effect disappears. In contrast to their initial results, they found that the past losers' betas were now larger than the past winners betas. Although this weakened the strength of their previous arguments, the change in risk was not sufficient to explain the abnormal performance of past losers over past winners. The authors also investigated the influence of other related anomalies on the overreaction hypothesis. By comparing the market values and asset rankings across all portfolio formations, they find that although there is some evidence of skewness, the winner and loser portfolios are not dominated by a particular firm size. Thus the winner-loser effect cannot be described as a small firm phenomenon.[6] Furthermore, as De Bondt and Thaler (1989) note while there is by necessity a mechanical link between prior performance and firm size it is unlikely that the firms in the loser portfolios in their original work are small enough for the 'small firm' effect to explain the abnormal performance.

A more direct means of assessing the impact of company size is provided in Dissanaike (1997) who test for reversal using a sample of 1,000 of the larger and better known UK companies. This sample minimises biases caused by bid-ask effects and infrequent trading and also reduces the possibility that reversals are primarily a small-firm phenomenon. Using holding period returns to calculate abnormal returns, he finds evidence largely consistent with the overreaction hypothesis. Also differential risk did not seem to be a possible explanation.

In a strong rebuttal of the risk change hypothesis, Chopra et al. (1992), using an empirically determined price of beta risk, find that after adjusting for risk changes

[5] The 'size effect' concerns the observation that the risk adjusted returns of small firms is greater than the returns from large firms.

extreme losers outperform extreme winners. Furthermore, based on evidence of overreaction around the time of earnings announcement, the authors point out time-varying risk patterns cannot completely explain the overreaction effect. This observation, combined with evidence of shorter term overreaction, leads to the conclusion that compensation for changes in risk cannot wholly explain the 'overreaction effect'. In addition, they argue that the methods used by others to adjust for size is inappropriate as they typically introduce a bias against finding an independent overreaction effect. In direct tests after adjusting for size, but not changes in risk, they find significant differences in performance. However, the authors still find the existence of a size effect in some form, which they attempt to explain by the shareholder make-up of small and large firms.[7] They argue that because shareholders in small firms are typically private client type investors who are less sophisticated / more nervous than institutional type investors, there is a tendency for prices in small firms to be more volatile than larger firms.

Finally, the results of De Bondt and Thaler have also been questioned as the majority of the excess returns are earned in January and as such the findings may be a reflection of the 'January effect'. A 'turn-of-year effect' has been documented for most major stock markets (Gultekin and Gultekin, 1983). The 'small firm effect' is often linked to the 'January effect' as most of the excess returns to small firms appears to occur in January (Keim, 1983).

Several explanations have been put forward as to why the January effect exists, the most popular of which is the tax-loss selling hypothesis. This argues that stocks experiencing large price declines are likely candidates for tax-loss selling at the end of the tax year to offset capital gains made elsewhere. In most countries the tax year ends in December implying that loss-making shares are sold heavily in December (causing the price to fall) and subsequently repurchased heavily in January (causing the price to rise), resulting in an abnormally high return in the month of January. It is also suggested that the pattern of returns for small firms is strongly associated with tax-loss selling as empirically their returns show the greatest volatility and as such would be more prone to this type of transaction (Roll, 1982). Empirical evidence, although not wholly conclusive, seems to support this hypothesis. For example, Gultekin and Gultekin (1983) found that for all countries with a January to December

[6] Similar results are noted in Albert and Henderson (1995) and others.

tax year, January returns are significantly larger than all other months. However, in the UK where the tax year starts in April, January still remained the best performing month. Similarly, in respect of Ireland, which also has an April tax year, both Donnelly (1991) and Kearney (1996) find that January offers the highest return. This would imply that apart from tax-loss selling other factors may influence the January effect.

Potentially there exists a link between taxation motivated transactions and the seasonal patterns observed in empirical studies of the overreaction effect. For loser stocks the excess returns in January would be broadly consistent with tax loss selling due to their prior performance. For winner shares the reversal may reflect what De Bondt and Thaler (1987) term the 'the capital gains tax lock-in effect'. Here the reverse argument applies. Investors will be unwilling to sell shares that have performed well on the market as the sale would lead to a higher capital gains tax liability. This reduction in supply leads to an increase in share price in December, however as potential tax worries dissipate in January supply increases and price falls.

Some evidence exists that the returns from the overreaction effect based contrarian strategy are linked to stock market seasonality. For example, Zarowin (1990) finds that once winner and loser shares are matched on the basis of firm size, all of the excess returns occur in January. Therefore he argues the anomaly is a reflection of the 'size' and 'January effects'. Chopra et al. (1992) also find that a disproportionate amount of the excess returns are earned in January. However regression analysis indicates it to be independent of a tax-loss selling effect. De Bondt and Thaler (1987) indicate that the overreaction and January effects are acting in tandem to explain the share price reversal at the beginning of the year for losers. However, their earlier work has highlighted one very important flaw with the tax-loss selling hypothesis as a complete explanation of the overreaction effect. Namely, why do prices rebound for losers by a greater magnitude than the price decline induced by the selling pressure? And also why do losers continue to rebound in subsequent Januaries, even after periods of outperforming the market?

[7] While overreaction is present in all groups, it is stronger for smaller companies, with extreme losers outperforming extreme winners by about 10% per year.

Furthermore, as a higher proportion of overall returns are earned in January, the evidence that loser firms earn a significant proportion of their excess returns in January does not provide a complete explanation of the overreaction effect (Clare and Thomas, 1995). Thus as De Bondt and Thaler (1987) note "Many puzzles remain, especially regarding the seasonality in excess returns. We have no satisfactory explanation, for the January effects, rational or otherwise" (p.579). Overall, they conclude that despite these puzzles the returns of winning and losing firms show reversal patterns that are consistent with overreaction.

2.3. International Evidence

So far much of the debate has concentrated on studies using US data, however the 'overreaction effect' has also been examined in a range of other international stock markets. Studies in the UK have found strong evidence that the arbitrage strategy can lead to significant excess returns. Power et al. (1991) show that over a five year test-period the loser and winner portfolios yield an average cumulative abnormal return (CAR) of 86% and minus 47% respectively. The performance of the UK arbitrage strategy falls significantly when the influence of changes in risk is taken into consideration. When adjusted the average CAR of the loser portfolio falls to just under 20% while the average CAR of the winner portfolio rises to slightly below zero.[8]

Another study of the UK market, MacDonald and Power (1991), tests for overreaction using eight 3 year test periods and find that the arbitrage strategy earned an average CAR of 30%. Clare and Thomas (1995) also find some evidence of overreaction in the UK for the period 1955-1990 with losers outperforming winners by a statistically significant 1.7% per annum. As they observe, this should be considered an upper bound as a potential survivorship bias exists as a result of the requirement that firms exist over the entire horizon periods examined. However, similar to Zarowin (1990), when firm size is controlled for there is no evidence of abnormal returns.

[8] Interestingly, the authors track six financial characteristics of the winner and loser portfolios during the formation and test periods. They find that although the winner firms outperform their loser counterparts over both periods in absolute terms, relatively speaking, the loser firms experience a more dramatic increase in profitability and growth. The subject of mean reversion in accounting ratios as an explanation of the overreaction effect is not directly addressed in this study. For a review of some of the evidence in this regard see Forbes (1996) or Power and Lonie (1993).

In general other international evidence offer mixed but mostly supportive evidence for the anomaly. For example, Stock (1990), Alonso and Rubio (1990), Wang et al. (1997) and Da Costa (1994) find significant evidence of reversals in returns consistent with overreaction in the German, Spanish, Far Eastern and Brazilian markets respectively. Some contradictory evidence is provided on the Australian market by Brailsford (1992) who finds no evidence consistent with reversal.[9] Also Kryanowski and Zhang (1992) find statistically insignificant reversal in returns in the Canadian market.

A number of observations with regard to the international studies reviewed are noteworthy. First, several of the studies show continuation in performance over shorter time periods (Stock (1990), Kryanowski and Zhang (1992), Brailsford (1992)). Second, none of the studies find that seasonality, size or changes in risk significantly alter the results. Third, Wang et al. (1997) find that winners contribute more to the arbitrage strategy than losers, whereas Da Costa (1994) and Alfonso and Rubio (1990) find a symmetrical pattern to the results. Finally, Da Costa (1994) notes that while his results are significant over all time periods, during periods of extreme market volatility the abnormal performance is more pronounced. This concurs with Wang et al. (1997) who argue that the extreme levels of abnormal performance they observe are due to Far Eastern markets being more volatile than their western counterparts.[10]

Thus we can see that while evidence for the existence of the overreaction effect is widespread, the results differ in a number of regards. Methodological differences invariably play a part in explaining how such differences can arise. Indeed, as Ball and Kothari (1989) note, considerable care needs to be taken when constructing appropriate research designs. However, the characteristics of the individual markets can also bear some influence.

The evidence of reversals in stock returns fits with more general evidence of predictability in both index and individual stock returns (see for example, Fama and French, 1989; Jegadeesh, 1990; and Campbell, Lo and McKinlay (1997) for a review). Proterba and Summers (1988) investigate whether prices are mean

[9] While the winners subsequently underperform the market by 69.6%, the losers continue as losers and underperform by 52.6%.

[10] They report that over 36 months the arbitrage strategy yields 151.33%, 184.81% and 89.01% for Japan, Taiwan and Hong Kong respectively.

reverting in 18 countries. They find that most of the countries tested display negative serial correlation at long horizons. Interestingly, in light of the argument presented in Chopra et al (1992), they state that there "is some tendency for more mean reversion in less broad-based and sophisticated equity markets" (pg. 45).

The existence or not of the reversal phenomenon is still open to question. Furthermore, where studies have found evidence of such an effect, the degree to which the effect can be explained by other market anomalies or rational adjustments to other factors is open to debate. The remainder of this paper examines these issues in the context of the Irish equity market in an attempt to add to the growing body of international evidence.

3. DATA AND RESEARCH METHODOLOGY

The methodology applied in this paper differs from standard event studies as no single company specific event is identified (such as an earnings announcement) which potentially causes the value of a sample of stocks to change. Here we are only concerned with examining (i) stocks which have had significant abnormal returns and (ii) the direction and extent of any subsequent return. Indeed, in the case of the overreaction hypothesis, the sample of firms examined during the testing period cannot be determined until the portfolio formation period is actually observed.

Several aspects of the nature of the overreaction hypothesis and the design of this study are worthy of note. First, the hypothesis is concerned principally with 'extreme' rather than general movements in stock prices. It is not preoccupied with secular trends in stock markets but in trends driving the 'best' and 'worst' performing stocks. Second, consideration is given only to historic returns data with no use of other information. In this regard, overreaction is a test of weak-form efficiency. Third, no specific time frame for the returns reversal to occur is immediately suggested. That is, the price change interval could be several days or several years. Fourth, no formal 'overreaction model' exists. The hypothesis does not attempt to mathematically "explain" the excess volatility in stock prices; it only attempts to prove its existence and offer a heuristic explanation. The approach in some ways resembles tests of filter rules, in which a trading strategy is specified to see if it works. However, the overreaction strategy is more than a simple ad hoc trading strategy. With an ad hoc trading strategy, the only concern is whether or not the strategy is profitable net of transaction costs. In contrast the overreaction effect is

based on an actual hypothesis, i.e. that individuals tend to overreact to important information. Finally, as has been noted, a number of alternative theories have been suggested as to why overreaction by investors might arise. This paper does not attempt to differentiate between the various psychological or institutional explanations but rather is concerned with whether their is evidence of returns reversal in the Irish equity market.

Stock price data for all firms quoted on the Irish Stock Exchange, except those listed on the Exploration Securities Market, was taken from the Datastream database for the period 1979 - 1996.[11] The 18 year period used here is comparable in length to other studies (e.g. Stock,1990; Alonso and Rubio, 1990). In line with De Bondt and Thaler, the number of stocks in the sample varies over the time period. There is currently over 80 companies listed on the main Irish market. This is significantly lower than most of the other major exchanges and restricts the data to a relatively small sample. Furthermore, of the stocks currently quoted, only 22 have data dating back to 1979. Thus, the early horizon periods are based on a smaller sample than the later periods.

Rather than using the ISEQ index or a similar index as a proxy for market returns, an *equally* weighted index was constructed to proxy for the market index. It was felt that an equally weighted index would be more appropriate in this study for a number of reasons. First, Brown and Warner (1980) found that using an equally weighted index leads to more powerful tests than using a value-weighted index**.** Specifically, they show that the use of a value weighted index can erroneously reject the null hypothesis of no abnormal performance and also that the use of an equally weighted index is more likely to pick up abnormal performance when it exists. Second, given the nature of the Irish market, value weighted indices such as the ISEQ or the Goodbody Index are heavily weighted towards specific stocks or sectors. For example, the financial sector accounts for approximately one third of the total market while the top 10 stocks account for over two thirds of total capitalisation. Hence the market index can be unduly influenced by particular companies or sectors.

The equally weighted index was calculated by arithmetically averaging the returns of those stocks that are included in the initial database and therefore the index will not

[11] Specifically, the total returns index for each company was extracted, which incorporates dividends and capital events in calculating total returns.

wholly represent the market return over the sample period.[12] However, the stocks that are included in this sample are primarily those that would have been the principal drivers of the market over the 18 year period under investigation. Admittedly, this index will be survival biased since the firms that make up the index (by definition) survive the period. It is therefore possible that if delisted firms are characterised by inferior performance, the equally weighted index will be biased upwards. Furthermore, as Brailsford (1988) highlights, the market returns from the use of an equally weighted index may be biased upwards due to the abnormally high returns of smaller companies. Given that such a firm size effect has been observed in the Irish Stock Market (Colgan; 1988; McKillop and Hutchinson,1988) we would expect the observed returns to exceed the 'true' returns. These taken together have the potential to reduce (increase) the possibility of finding a reversal in performance for the loser (winner) firms. The overall extent/direction of the bias is impossible to ascertain but it is possibly neutral as regards an arbitrage portfolio.

The methodology used to capture the overreaction effect is adopted from that used by De Bondt and Thaler in testing for the existence of overreaction in the US stock market. The abnormal returns are calculated based on a market adjusted (*zero-one*) model. This assumes that the expected return on each stock should equal that of the market as a whole, i.e. $E(R_{jt}) = E(R_{mt})$. Abnormal returns are thus calculated as the actual difference between the returns on the stock and the market in any month, t.

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

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

By using this model no attempt is made to specify which is the correct asset pricing model for generating abnormal returns.[13] Thus, effectively this study concentrates more on testing market efficiency rather than a joint hypothesis of whether market

[12] Brailsford (1988) and Da Costa (1994) use a similar technique to proxy market returns in the Australian and Brazilian Markets respectively.

[13] Thus the abnormal results presented in the next section reflect the excess return over the market as a whole with no specific adjustment for risk. As such they represent 'trading profits' from exploiting the

efficiency and a specific asset pricing model explain returns in the Irish market. Also, as demonstrated by Brown and Warner (1980), mean-adjusted and market-adjusted models perform as well as more complex models in correctly identifying abnormal performance.[14]

The effect was tested for over horizon periods of two years, four years and six years duration. In the case of two year horizon periods, it was possible to run seventeen tests for overreaction. For each separate test, the horizon period is equally split between the formation period and the testing period. For example, the first test in the two year horizon period will use data for the period 1979-1980. Data for 1979 was used to form the winner-loser portfolios while data for 1980 was used to test for any subsequent reversal in abnormal returns and so on. For four and six year horizon periods, it was possible to run eight and five non-overlapping tests for overreaction respectively.

We calculate the cumulative abnormal returns (CAR) for each stock over the various formation periods, as follows:

$$CAR_j = \sum_{t=1}^{T} U_{jt}$$

Various studies of overreaction have used a number of different methods to assign firms to the winner and loser portfolios. For example, De Bondt and Thaler specify the best 35, 50 or top 10% stocks (i.e. those with the greatest abnormal returns) as winners and the worst 35, 50 or bottom 10% stocks as losers. The approach taken here is more straightforward and involves specifying the top 15% performers as winners and the bottom 15% as losers. A 10% figure was considered too low as given the size of the overall sample, the winner and loser portfolios would be extremely small.

Having formed winner and loser portfolios, we calculate the monthly abnormal returns for each portfolio for each month over the testing periods as

$$AR_k = \frac{\sum_{n=1}^{n} U_{kt}}{n}$$

suggested strategies over and above market returns, before transaction costs. As will be noted below the results were also estimated using a risk-adjusted market model.

[14] In fact they note that when securities are not randomly selected and sample security systematic risk estimates are systematically clustered simpler models are superior to an explicit risk adjustment.

where: n = number of firms in portfolio

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

The abnormal returns for each portfolio were then cumulated over the entire test period, T

$$CAR_k = \sum_{t=1}^{T} AR_k$$

Having calculated the CAR for the winner and loser portfolios over each test period we compute the average cumulative abnormal return, (ACAR), for the winner and loser portfolios.

$$ACAR_k = \frac{\sum_{p=1}^{P} CAR_k}{P}$$

where: P = number of test periods

We also compute the average cumulative abnormal returns ($ACAR_{WL}$) for an arbitrage portfolio (which corresponds to buying the loser portfolio and selling the winner portfolio) as

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

Formally, if market efficiency holds, then:

H_O: $ACAR_{WL} = ACAR_L = ACAR_W = 0$

If not then:

H_A: $ACAR_W < 0$

H_B: $ACAR_L > 0$

H_C: $ACAR_{WL} > 0$

The null hypothesis states that an individual should not earn excess returns by investing in a portfolio of past loser stocks and short selling a portfolio of past winner stocks, as past return patterns give no indication as to future return prospects. In accordance with the EMH, this implies that the expected abnormal return for both the loser and winner portfolios is zero. The alternative hypothesis predicts $ACAR_L$ to be greater than zero, $ACAR_W$ to be less than zero and the combination of the two to be

positive. In other words, since past losers should outperform past winners the null hypothesis would be rejected.

The following test statistic was used to formally test the first two hypotheses, H_A and H_B

$$t = \frac{ACAR_k}{S / \sqrt{N}}$$

where: S = sample standard deviation

N= sample size

The test statistic for the third hypothesis, H_C, is given by the formula:

$$t = \frac{ACAR_{WL}}{\sqrt{2S_{WL}^2 / N}}$$

where: S_{WL} is the standard deviation of the pooled sample (and both samples are of equal size (N))

One potential source of bias with respect to the returns for the test period portfolios comes from the requirement that only companies still listed on the Irish Stock Exchange are included in the sample. This form of survivorship bias, with companies who delisted being excluded, may result in firms who would potentially have been classified as loser firms continuing to underperform and eventually failing. By excluding these companies the test period returns for loser portfolios are potentially biased upwards. On the other hand, as Power et al. (1991) highlight, delistings can also occur due to mergers or acquisitions. Since well-documented evidence exists that the majority of companies subject to takeover are characterised by low growth, poor profitability and even financial distress, most would also have conceivably been included in the loser portfolio(s). Moreover, as significant premiums generally accrue to target firms, the exclusion of firms delisting due to takeover could lead to a downward bias in estimated loser portfolio returns. Therefore it is difficult to ascertain the direction of survivorship bias introduced by the data requirements imposed.

One of the strongest methodological criticisms of De Bondt and Thaler's original study, and therefore implicitly of this study, is presented in Conrad and Kaul (1993). The authors argue that the results found in De Bondt and Thaler and other studies of contrarian investment strategies are biased upwards as a result of cumulating single-period (monthly) returns over long periods. Not only are the 'true' returns cumulated

but also measurement errors, due to non-synchronous trading, price discreteness and most importantly bid-ask errors, are cumulated.[15] Using holding period returns, rather than cumulative abnormal returns, they document a reduction in the excess returns on the arbitrage portfolio. When January returns are excluded they find no evidence of overreaction. Furthermore, using regression analysis they show that the excess returns in January are a reflection of excess returns to low-price stocks with little connection to past performance.

Lougrhan and Ritter (1995) take issue with the statistical methodology employed by Conrad and Kaul (1993) and argue that their results are primarily due to a confounding of cross-sectional patterns and aggregate time-series mean reversion. Secondly, they argue that a survivorship bias is introduced These procedures, they argue, increase the influence of price at the expense of prior returns**.** They also suggest that the cumulative abnormal returns technique does not does not benefit from compounding, which would increase the 'true' returns from investing in the arbitrage portfolio.[16] Furthermore, they argue that as price is a direct proxy for prior returns it is exceptionally difficult to definitively say which is connected to the subsequent excess returns. Their study, using a different methodology to control for these factors, provides direct evidence that the use of cumulative abnormal returns instead of buy and hold returns does not drive De Bondt and Thaler's results.

In addition, it is by no means certain that this methodological criticism applies in the context of an Irish study of overreaction. As Power and Lonie (1993) note the problem of bid-ask spreads should not be as serious for tests of long-run overreaction since recording errors are less likely to occur in low-frequency data such as the monthly returns employed in this study. They also note that several sources of bias may offset rather than reinforce each other. Finally, the criticism may not apply to studies using data drawn from Datastream, which uses mid-market share prices and therefore is not subject to the same bid-ask bias as US data. This is supported by Power et al. (1991) who find more impressive results for an arbitrage portfolio using buy and hold returns than the portfolio using cumulative abnormal returns. Similarly Dissanaike (1997) documents significant overreaction using holding period returns.

[15] Dissanaike (1994) provides a similar argument although it is by no means clear from his study the direction of the potential bias.

4. RESULTS AND ANALYSIS

Table 1 summarises the extent of the overreaction effect in the Irish equity market for each of the three horizon periods.[17] As can be seen, the strategy of buying extreme losers and short selling extreme winners in the two year horizon period is not significant but instead leads to an average loss of 1.9%. In the case of the four year period, the profitability of the strategy increases substantially to 24.2% while in the six year period this declines marginally to 23.0%.

Table 1: Profitability of Arbitrage Strategy over Three Horizon Periods

Horizon Period	Profitability of Arbitrage Strategy
2 Years	-1.9%
4 Years	24.2%
6 Years	23.0%

The evidence shows that while the extent of overreaction is negligible in the two year horizon period, it is certainly evident in the other two horizon periods. This is consistent with much of the existing international evidence.

The results for the arbitrage strategy are not statistically significant at normal confidence levels. However, given the extent of the profitability of the strategy in the longer horizon periods, the economic significance of the results cannot be ignored. Before a more detailed analysis can be carried out as to the exact nature of overreaction in the Irish equity market, a detailed description of the results found for each of the horizon periods is provided.

Table 2 details the extent of the overreaction effect over a two year horizon period and is divided into 3 sections. Table 2a presents the cumulative abnormal returns for the loser portfolio for the each of the formation and testing periods. Table 2b does the same for the winner portfolios, while Table 2c presents the profitability of the arbitrage strategy. The average CARs for each of the winner and loser portfolios are based on a total of 17 formation and test periods. The number of stocks that make

[16] Interestingly, they reinforce this argument by using evidence that studies of mean reversion, without recourse to performance, show higher reversal over 5 years than those detailed in De Bondt and Thaler (1985).

[17] The results were also estimated using a risk-adjusted market model. Apart from a reduction in the excess return for losers in the 6 year horizon period, the results are similar to those reported for the market-adjusted returns. A copy of these results are available from the authors on request.

up the winner and loser portfolios varies for each horizon period and increases from 3 stocks in 1979-80 to 7 stocks in 1995-96.[18]

Table 2: Cumulative Abnormal Returns based on a Two Year Horizon Period

Table 2a: Cumulative Abnormal Returns for **Loser** Portfolios Using the **Market Adjusted Model** Based on a **Two Year** Horizon Period

Formation period	**CAR (Losers)**	**Testing Period**	**Subsequent CAR (Losers)**
CAR '79	-0.3382	CAR '80	-0.0281
CAR '80	-0.5153	CAR '81	0.2066
CAR '81	-0.3548	CAR '82	-0.0819
CAR '82	-0.2953	CAR '83	0.5123
CAR '83	-0.6529	CAR '84	0.0806
CAR '84	-0.3921	CAR '85	-0.0791
CAR '85	-0.3473	CAR '86	-0.2183
CAR '86	-0.6638	CAR '87	0.1752
CAR '87	-0.5041	CAR '88	0.0111
CAR '88	-0.4831	CAR '89	-0.0374
CAR '89	-0.6261	CAR '90	-0.0693
CAR '90	-0.5049	CAR '91	-0.2344
CAR '91	-0.6629	CAR '92	0.0296
CAR '92	-0.4058	CAR '93	0.0519
CAR '93	-0.4641	CAR '94	0.3036
CAR '94	-0.4032	CAR '95	-0.1297
CAR '95	-0.4720	CAR '96	-0.0475
Mean	**-0.4756**		**0.0262**
t Stat			*0.5732*

[18] The number of stocks in each of the winner and loser is comparable to many of the international studies. For example, Wang et al. (1997) and Alonso and Rubio (1990) use an average of five stocks while Stock (1990) selects his portfolios based on three stocks. Appendix 1 details the exact number of stocks for each horizon period.

Table 2b: Cumulative Abnormal Returns for **Winner** Portfolios Using the **Market Adjusted Model** Based on a **Two Year** Horizon Period

Formation period	**CAR (Winners)**	**Testing Period**	**Subsequent CAR (Winners)**
CAR '79	0.37155	CAR '80	0.3480
CAR '80	0.64922	CAR '81	-0.0551
CAR '81	0.49003	CAR '82	0.2241
CAR '82	0.42582	CAR '83	-0.0955
CAR '83	0.71280	CAR '84	-0.1578
CAR '84	0.54491	CAR '85	-0.0594
CAR '85	0.58426	CAR '86	0.1085
CAR '86	1.19822	CAR '87	-0.1693
CAR '87	0.41557	CAR '88	-0.1022
CAR '88	0.47125	CAR '89	0.0545
CAR '89	0.56267	CAR '90	0.2277
CAR '90	0.53228	CAR '91	0.2597
CAR '91	0.54500	CAR '92	-0.0127
CAR '92	0.35750	CAR '93	-0.0649
CAR '93	0.38483	CAR '94	0.0465
CAR '94	0.50566	CAR '95	0.1433
CAR '95	0.35839	CAR '96	0.0766
Mean	**0.5359**		**0.0454**
t Stat			*1.2100*

Table 2c: **Arbitrage Strategy** Using the **Market Adjusted Model** Based on a **Two Year** Horizon Period

Testing Period	**CAR of Losers**	**CAR of Winners**	**Arbitrage Strategy**
CAR '80	-0.0281	0.3480	-0.3761
CAR '81	0.2066	-0.0551	0.2618
CAR '82	-0.0819	0.2241	-0.3060
CAR '83	0.5123	-0.0955	0.6079
CAR '84	0.0806	-0.1578	0.2384
CAR '85	-0.0791	-0.0594	-0.0197
CAR '86	-0.2183	0.1085	-0.3268
CAR '87	0.1752	-0.1693	0.3445
CAR '88	0.0111	-0.1022	0.1133
CAR '89	-0.0374	0.0545	-0.0919
CAR '90	-0.0693	0.2277	-0.2969
CAR '91	-0.2344	0.2597	-0.4941
CAR '92	0.0296	-0.0127	0.0422
CAR '93	0.0519	-0.0649	0.1168
CAR '94	0.3036	0.0465	0.2571
CAR '95	-0.1297	0.1433	-0.2729
CAR '96	-0.0475	0.0766	-0.1241
Mean	**0.0262**	**0.0454**	**-0.0192**
t Stat			*-0.3247*

Note: t Stats not significant

The results show that the cumulative abnormal return of the loser portfolios, CAR_L, and the winner portfolios, CAR_W, are substantially different in the *formation* period:

the losers on average underperform the market index by 47.6% while the winners outperform by 53.6%. This divergence narrows substantially during the *test* periods due to a turnaround in the performance of these portfolios. For both winners and losers, the results show a reversal of some degree in every test period. The loser portfolios show reversal with an average abnormal return of 2.6%. However, the winner portfolios continue to remain winners, implying a loss of 4.5% on the short selling strategy.

As these results may be driven by very extreme market behaviour during a relatively small part of the sample period, it is worth investigating the subperiods to see if the mean CAR is overly influenced by specific years. In the case of CAR_L, nine of the seventeen portfolios remain losers with the most extreme period being 1991 with a loss of 23%. The highest reversal in CAR_L occurred in 1983 at a level of 51%. With regard to CAR_W, nine of the seventeen portfolios remained winners with the most extreme period being 1980 when this portfolio continued to win a further 35%. The best performing winner portfolio (from the perspective of the short seller) was in 1984 when a reversal of 15% occurred. Generally, however, it can be noted that no specific test period exerted an overt influence on the average CAR for both the winners and losers.

The net position of the arbitrage strategy is a loss of 1.9%. This is due to the average continuation in performance of the winners, as the loss on the short-selling position outweighs the marginal gain from buying past losers. However, it should be noted that the arbitrage strategy yielded positive returns in eight of the test periods.

Table 3 presents evidence for the existence of the overreaction effect over a four year horizon period. This is based on eight formation and testing samples, with the number of stocks in each winner and loser portfolio again rising from three to seven stocks over the period.

Table 3: Cumulative Abnormal Returns based on a Four Year Horizon Period

Table 3a: Cumulative Abnormal Returns for **Loser** Portfolios Using the **Market Adjusted Model** Based on a **Four Year** Horizon Period

Formation period	**CAR (Losers)**	**Testing Period**	**Subsequent CAR (Losers)**
CAR '79-'80	-0.4491	CAR '81-'82	-0.0844
CAR '81-'82	-0.5933	CAR '83-'84	0.9288
CAR '83-'84	-0.7109	CAR '85-'86	-0.0033
CAR '85-'86	-0.8421	CAR '87-'88	0.2001
CAR '87-'88	-0.6529	CAR '89-'90	0.1406
CAR '89-'90	-0.9331	CAR '91-'92	-0.1419
CAR '91-'92	-0.8463	CAR '93-'94	0.3541
CAR '93-'94	-0.4649	CAR '95-'96	-0.1284
Mean	**-0.6866**		**0.1582**
t Stat			*1.2540*

Table 3b: Cumulative Abnormal Returns for **Winner** Portfolios Using the **Market Adjusted Model** Based on a **Four Year** Horizon Period

Formation period	**CAR (Winners)**	**Testing Period**	**Subsequent CAR (Winners)**
CAR '79-'80	0.7999	CAR '81-'82	-0.2467
CAR '81-'82	0.7141	CAR '83-'84	-0.1749
CAR '83-'84	0.8188	CAR '85-'86	-0.3729
CAR '85-'86	0.8208	CAR '87-'88	0.2563
CAR '87-'88	0.6437	CAR '89-'90	-0.0612
CAR '89-'90	0.8746	CAR '91-'92	-0.0823
CAR '91-'92	0.6797	CAR '93-'94	-0.1141
CAR '93-'94	0.6301	CAR '95-'96	0.1257
Mean	**0.7477**		**-0.0837**
t Stat			*-1.1857*

Table 3c**: Arbitrage Strategy** Using the **Market Adjusted Model** Based on a **Four Year** Horizon Period

Testing Period	**CAR of Losers**	**CAR of Winners**	**Arbitrage Strategy**
CAR '81-'82	-0.0844	-0.2467	0.1622
CAR '83-'84	0.9288	-0.1749	1.1038
CAR '85-'86	-0.0033	-0.3729	0.3696
CAR '87-'88	0.2001	0.2563	-0.0562
CAR '89-'90	0.1406	-0.0612	0.2019
CAR '91-'92	-0.1419	-0.0823	-0.0596
CAR '93-'94	0.3541	-0.1141	0.4681
CAR '95-'96	-0.1284	0.1257	-0.2541
Mean	**0.1582**	**-0.0837**	**0.2420**
t Stat			*1.6734*

Note: t Stats not significant

The average CAR for the winner and loser portfolios during the formation period comes to 75% and minus 69% respectively. This is higher than in the two year horizon period and is hardly surprising given the longer period for which abnormal returns are allowed to accumulate. Again a reversal trend can be witnessed for all portfolios as we move from the formation period to the test period. In the case of the loser portfolios, four of the eight show a subsequent positive CAR. Because the extent of these positive returns is much higher than that of the portfolios that remain losers, the average CAR_L comes to 15.8%. Noticeably, the test period 1983-84 makes a strong contribution to the overall positive return of the loser portfolios with a CAR of 92.9%. If this period had been neutral (i.e. CAR = 0) the average CAR would have fallen to a less substantial figure of 4.8%.

In the case of the winner portfolios, six of the eight test periods show a turnabout in returns indicating a more comprehensive trend for winners to revert over a four year horizon period. The extent of this reversal varies from minus 37% to minus 6% and averages at an overall figure of minus 8.4%. The net result from selling winners and buying losers is a positive average CAR of 24.2%, with five of the eight test periods being profitable. Loser portfolios contribute almost twice as much to the overall position as the winners, implying an asymmetric pattern in returns.

Table 4 presents the evidence for overreaction over a six year horizon and is comprised of five sample periods. In the case of losers, the reversal in returns from the formation period to the test period is again significant, rising from a loss of 90.4% to a profit of 16.6%. Four of the five subsequent CARs of loser portfolios during the test period are positive while the exception is only mildly negative at 3.6%.

Winners also display a strong reversal in returns over the formation and testing periods, declining from 83.3% to minus 6.4%. However, the subsequent performance of the winner portfolios during the test periods are more volatile than their loser counterparts. Three of the five portfolios continue to remain winners in the testing period, albeit two at relatively low levels. It is only due to the extent of the reversal of the two reverting portfolios that the average CAR of winners is negative overall.

Table 4: Cumulative Abnorma Returns based on a Six Year Horizon Period

Table 4a: Cumulative Abnormal Returns for **Loser** Portfolios Using the **Market Adjusted Model** Based on a **Six** Year Horizon Period

Formation period	**CAR (Losers)**	**Testing Period**	**Subsequent CAR(Losers)**
CAR '79-'81	-0.6049	CAR '82-'84	0.0866
CAR '82-'84	-0.8526	CAR '85-'87	0.2972
CAR '85-'87	-0.8857	CAR '88-'90	0.2085
CAR '88-'90	-1.1716	CAR '91-'93	-0.0359
CAR '91-'93	-1.0058	CAR '94-'96	0.2729
Mean	**-0.9041**		**0.1659**
t Stat			*2.66**

Table 4b: Cumulative Abnormal Returns for **Winner** Portfolios Using the **Market Adjusted Model** Based on a **Six** Year Horizon Period

Formation period	**CAR (Winners)**	**Testing Period**	**Subsequent CAR (Winners)**
CAR '79-'81	0.9058	CAR '82-'84	0.3108
CAR '82-'84	0.6822	CAR '85-'87	-0.4062
CAR '85-'87	0.8139	CAR '88-'90	0.0894
CAR '88-'90	0.9407	CAR '91-'93	0.0380
CAR '91-'93	0.8225	CAR '94-'96	-0.3506
Mean	**0.8330**		**-0.0637**
t Stat			*-0.4661*

Table 4c: **Arbitrage Strategy** Using the **Market Adjusted Model** Based on a **Six** Year Horizon Period

Testing Period	**CAR of Losers Testing Period (As above)**	**CAR of Winners Testing Period (As above)**	**Arbitrage Strategy**
CAR '82-'84	0.0866	0.310771422	-0.2241
CAR '85-'87	0.2972	-0.406188644	0.7034
CAR '88-'90	0.2085	0.089427792	0.1190
CAR '91-'93	-0.0359	0.038004854	-0.0739
CAR '94-'96	0.2729	-0.350566147	0.6234
Mean	**0.1659**	**-0.063710145**	**0.2296**
t Stat			*1.5285*

* indicates significant t-tests

The net profitability of the arbitrage strategy comes to 23.0%. Again, losers make a greater contribution to the strategy accounting for almost three quarters of the total return.

The results documented are for the most part statistically insignificant. The only exception being the loser portfolio over the six year horizon period. However, given the strong degree of economic significance it is probable that the relatively small sample size explains the lack of statistical significance.

While a direct comparison with results in other countries is not entirely feasible due to significant differences in methodologies used, it is worth surveying how this figure compares against the international norm. The Far Eastern markets offer by far the most substantial return (Wang et al. (1997)). If we ignore these markets, the average CAR for most other countries is between 15% to 30%. Thus it would appear that the degree of overreaction in the developed markets does not vary substantially by country and that the extent of overreaction in the Irish market is not significantly different from its Western peers.

Although most studies find evidence of overreaction, as has been previously noted, the symmetry of returns from the arbitrage strategy has varied substantially. The findings reported here indicate that losers contribute almost 75% of the average CAR over the six year horizon period. Therefore, the contribution from the various portfolios in an Irish context is clearly asymmetrical. Furthermore, as the length of the horizon period increases, the evidence for the presence of overreaction in the Irish equity market generally increases. This is especially so as we move from a two year to a four year horizon period. International studies generally reach the same conclusion. Thus it would appear that the extent of the overreaction effect is heavily dependent on the horizon period chosen and that reversion in prices typically takes at least 12-24 months.[19] The gradual reversal is in line with the psychological phenomenon of 'anchoring', as discussed in section 2.1.

[19] It is interesting to note that in 1959 Benjamin Graham put forward a similar contention, based on his observations of market behaviour rather any empirical evidence. He claimed that "the interval required for a substantial undervaluation to correct itself averages 1 1/2 to 2 1/2 years," (as cited in De Bondt and Thaler (1985)).

Finally, if as Chen and Sauer (1997) contend a true test of a contrarian strategy is that the results are time consistent, then the results presented here clearly fail the test. In each horizon period examined, subperiods existed in which a trading strategy based on the overreaction hypothesis would have proved unprofitable. However, despite the probability that consistent results would not be available from a trading strategy there is evidence of a degree of market inefficiency.

The evidence, presented to date, appears to support the contention that the Irish equity market exhibits a pattern of reversal in share returns. However, as has been previously noted, a number of other explanations have been offered which would present these results as a reflection of other market anomalies or as a rational adjustment to changes in risk. We therefore turn our attention to the extent to which our results can be explained by other factors.

To test for the influence of company size on the results, market capitalisation figures for the entire sample were taken from the Datastream database for the period 1979-1996. For each year the sample was ranked by company size and grouped into quartiles. Firms ranked in the upper quartile were classified as 'large firms' and similarly firms within the bottom quartile were designated as 'small firms'. The stocks that make up the winner and loser portfolios in each period were then examined to see if the portfolios are systematically composed of large or small firms.[20] This procedure was carried out for all three horizon periods. Table 5 reports the results of this analysis over each of the three horizon periods.

In the case of the two year period (Table 5a), there are in total 84 stocks that make up the winner and loser portfolios over the 17 test periods. With regard to loser stocks, 40% of the sample are characterised as small, 13% as large and 46% intermediate. Winner stocks also show a similar pattern with 31% being small, 19% large and 50% intermediate. Thus we can see that loser portfolio are not disproportionately made up of small firms. Generally, the bulk of stocks that make up the winners and losers are predominantly medium sized.

Although the number of observations is lower for the four year horizon period, a broadly similar pattern is observed for the make-up of the winner and loser portfolios.

[20] Size is measured at the end of the formation period which is consistent with De Bondt and Thaler (1987) and Zarowin (1990).

Losers are not totally dominated by small firms, although they account for a more substantial 47% of the total. It is in the six year horizon period that there is a notable increase in the number of small firms (57%) that make up the loser portfolios. At this level, it is probable that size differentials, as well as investor overreaction, may be responsible for losers outperforming winners in the test period. Thus, over a six year horizon period we cannot rule out the possibility of an influential size effect.

Table 5: Size of Winner and Loser Portfolios over Three Horizon Periods.

Table 5a : **Loser** Portfolios based on a **2 year** horizon period			
Total Number of Observations	84	% of Total	100%
Small Firms	34	Small Firms	40%
Large Firms	11	Large Firms	13%
Other	39	Other	46%
Winner Portfolios based on a **2 year** horizon period			
Total Number of Observations	84	% of Total	100%
Small Firms	26	Small Firms	31%
Large Firms	16	Large Firms	19%
Other	42	Other	50%

Table 5b : **Loser** Portfolios based on a **4 year** horizon period			
Total Number of Observations	38	% of Total	100%
Small Firms	18	Small Firms	47%
Large Firms	5	Large Firms	13%
Other	15	Other	39%
Winner Portfolios based on a **4 year** horizon period			
Total Number of Observations	38	% of Total	100%
Small Firms	10	Small firms	26%
Large Firms	7	Large Firms	18%
Other	21	Other firms	55%

Table 5c : **Loser** Portfolios based on a **6 year** horizon period			
Total Number of Observations	21	% of Total	100%
Small Firms	12	Small Firms	57%
Large Firms	3	Large Firms	14%
Other	6	Other	29%
Winner Portfolios based on a **6 year** horizon period			
Total Number of Observations	21	% of Total	100%
Small Firms	3	Small Firms	14%
Large Firms	4	Large Firms	19%
Other	14	Other	67%

The fact that the loser firms are smaller (with respect to market capitalisation) is not surprising given the extent of their prior underperformance, as documented in Table 4. As a result it is difficult to disentangle the respective influence of the small firm effect and a more general tendency towards reversal in share returns. Of course it is possible that the small firm effect is in itself merely a reflection of an overreaction effect.

The effect of seasonality is examined by repeating the test procedure for overreaction but excluding the month of January from the analysis. This procedure is carried out for the six year horizon period. This was considered the most appropriate horizon period as it is the one which is most frequently examined in the literature.

The results in Table 6 show that by excluding this month the profitability of the overreaction strategy falls substantially to 9.7%. This indicates that January exerts a strong influence on the extent of overreaction. Nevertheless, there is still a positive and substantial difference between the performance of winner and loser portfolios.

Table 6: The Influence of Seasonality on the Overreaction Effect

Arbitrage Strategy using a Six Year Horizon Period excluding January			
Testing Period	**CAR of Losers**	**CAR of Winners**	**Arbitrage Strategy**
CAR '82-'84	-0.2498	0.3141	-0.5640
CAR '85-'87	0.4506	-0.3077	0.7584
CAR '88-'90	-0.1116	-0.1602	0.0486
CAR '91-'93	-0.1938	-0.2081	0.0143
CAR '94-'96	-0.0107	-0.2394	0.2287
Mean	**-0.0231**	**-0.1203**	**0.0972**

When all months are included the losers contribute most to the arbitrage portfolio (as per Table 4). The reverse case arises for the sample exclusive of January where the winners now make the more significant contribution (see Table 6). The results clearly show that the losers earn all of their abnormal returns in January and in fact underperform the market over the remainder of the year. Furthermore, the winners also outperform the market in January with all of their contribution to the arbitrage portfolio being earned in the other 11 months. While the results for the loser portfolio are consistent with the international evidence, the results for the winner portfolio are contrary to previous studies.

To some extent, these results support the mounting evidence of seasonality in the Irish equity market (McKillop and Hutchinson, 1988; Donnelly, 1991 and Kearney, 1996). It is possible that the results presented here are consistent with the tax-loss selling hypothesis. Donnelly (1991) notes that although the tax year end for private investors is in April, a significant proportion of the holdings in the Irish Stock Market are held by corporate bodies and institutions many of whom have December accounting year ends and consequently December tax year ends. Therefore the realisation of loser returns in January could be consistent with tax-loss selling, where due to their prior performance the losers would be sold in December and re-bought in January. However, the findings are also broadly consistent with the portfolio rebalancing hypothesis, especially due to (as will be noted later) the increasing risk of the companies.[21]

The fact that winners earn all of their positive returns in January is however not consistent with De Bondt and Thaler's 'capital gains tax lock-in effect'. It is possible that the results may indicate the sale in December of shares which have previously gained in value and their subsequent re-purchase in January, to avail of capital gains tax allowances. However, this type of transaction would be more generally associated with private investors whose tax year end is in April. Thus no concrete explanation can be offered as to why January has such an influential effect.

[21] Ritter and Chopra (1989) suggest the 'portfolio rebalancing hypothesis' as a possible explanation for the 'January effect'. They propose that institutional investors sell off risky stocks at the end of the financial year (usually December) so that they are not reported on the balance sheet. Subsequently when the new year begins these risky stocks are repurchased.

To test whether there was a significant change in risk between the formation period and the test period, we estimate risk coefficients, using the market model, for each share in the respective portfolios for the six-year horizon period. Table 7 presents the results of this analysis. Consistent with the risk explanation, we observe changes in risk coefficients from the formation to the test period. The direction of change is as expected with losers becoming more risky and winners less risky. The overall risk coefficient of losers rises by 9.2% to 1.31 with a general upward trend evident in each subperiod. Similarly, the risk coefficient of winners decreases in each sub period leading to an overall decline of 18.4% to 1.02. Overall, there is a combined change in risk coefficients of 27.6%.

Table 7: Changes in Risk Coefficients for Winner and Loser Portfolios over a Six Year Horizon Period

Table 7a: Change in risk coefficients for **Loser** Portfolios

Horizon period	**Formation Period**	**Test Period**
	1979-1981	1982-1984
1	**1.269**	**1.373**
	1982-1984	1985-1987
2	**1.368**	**1.388**
	1985-1987	1988-1990
3	**0.756**	**1.016**
	1988-1990	1991-1993
4	**1.121**	**1.220**
	1991-1993	1994-1996
5	**1.4710**	**1.5552**
Overall Average (1-5)	**1.197**	**1.310**

Table 7b: Change in risk coefficients for **Winner** Portfolios

Horizon period	**Formation Period**	**Test Period**
	1979-1981	1982-1984
1	**1.367**	**0.830**
	1982-1984	1985-1987
2	**1.066**	**0.824**
	1985-1987	1988-1990
3	**1.333**	**1.300**
	1988-1990	1991-1993
4	**1.382**	**1.198**
	1991-1993	1994-1996
5	**1.1130**	**0.9650**
Overall Average (1-5)	**1.252**	**1.023**

While not inconsequential, this is nowhere near the change in risk observed by Ball and Kothari (1989) who, on the basis of their CAPM methodology, find almost a

100% swing in betas between the formation and test period. Our results are more in line with De Bondt and Thaler who conclude that the "difference in risk is insufficient to explain the return on the arbitrage strategy". Furthermore, somewhat surprisingly, the average risk change for loser shares is much lower than those for winner shares despite the losers making a more significant contribution to arbitrage portfolio. Also an examination of Tables 4 and 7 indicates an absence of a direct link between the change in risk for the various individual subperiods and the observed abnormal returns. Thus it appears that changes in risk can only partly explain the abnormal returns from the contrarian strategy in the Irish market.

5. CONCLUSIONS

The results presented in this paper provide some evidence of long-term returns reversal and hence evidence against weak-form efficiency in the Irish equity market. By focusing purely on past price information (which is the essence of the overreaction strategy) it is shown that abnormal returns can be earned. The magnitude of overreaction varies with the length of the horizon period examined, and as we move from a two year to a six year horizon, the average cumulative abnormal returns earned from the arbitrage strategy increases from -1.9% to 23.0%. While these results are statistically insignificant they are economically significant especially over the longer horizon periods.

However, an extremely strong seasonal pattern is exhibited with all the returns from losers earned in January and the contribution of the winner firms to the arbitrage portfolio realised over the other 11 months. Also the winner and loser portfolios are somewhat skewed with respect to company size, with a larger percentage of loser firms being from the small firm cohort. This, while not providing a complete explanation, potentially contributes to the observed levels of excess returns. In addition, while the risk of the portfolios changes in line with predictions, the extent of the change is insufficient to fully explain the profitability of the contrarian strategy. Therefore, taken individually, it would appear that firm size and changes in risk cannot fully explain the documented results.

We conclude that the results from this study indicate a degree of inefficiency in the Irish stock market. This evidence is consistent with a growing body of literature which details other anomalies in the Irish market. Furthermore, Lucey (1994) documents a degree of serial dependence in daily returns of the ISEQ index and

Nugent (1996) finds evidence, although inconclusive, of speculative bubbles. These observations would support the idea that there is a least some level of predictability in returns on the Irish market.

The results of this paper suggest many avenues for future research. First, a closer examination of the links between seasonality, firm size and the 'overreaction effect' is suggested. It is conceivable that shareholder type may have some influence. For example, does the presence of private, less sophisticated investors provide some explanation for seasonality and the impact of firm size on returns? Second, does the overall volatility of the market have an influence on the extent of overreaction? Kearney (1996) documents that the Irish equity market occupies the middle ground internationally with respect to market volatility. This may explain, given previously noted research, the less significant degree of reversal in comparison to some other markets. Finally, an investigation based on the type of events which investors overreact to would be informative. For example, are there any other common characteristics between extreme stocks which make them winners and losers? And do investors overreact more often to one type of announcement compared to another?

Essentially, these questions offer suggestions for further research into the overreaction hypothesis. Unlike most of the previous research, which had the goal of simply proving its existence, these questions attempt to explore why the phenomenon of overreaction actually occurs. Such investigations will help in the achievement of De Bondt and Thaler's original objective, that is, to explain the link between stock market behaviour and the psychology of individual decision making.

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APPENDIX 1

Two Year Horizon Period

Number of Horizon Periods: 17

Number of Stocks in Winner and Loser Portfolios for each horizon period:

79-80 (3 stocks)	85-86 (4 stocks)	91-92 (6 stocks)
80-81 (3 stocks)	86-87 (4 stocks)	92-93 (6 stocks)
81-82 (3 stocks)	87-88 (4 stocks)	93-94 (7 stocks)
82-83 (3 stocks)	88-89 (5 stocks)	94-95 (7 stocks)
83-84 (4 stocks)	89-90 (5 stocks)	95-96 (7 stocks)
84-85 (4 stocks)	90-91 (6 stocks)	

Four Year Horizon Period

Number of Horizon Periods: 8

Number of Stocks in Winner and Loser Portfolios for each horizon period:

79-82 (3 stocks)

81-84 (3 stocks)

83-86 (4 stocks)

85-88 (4 stocks)

87-90 (5 stocks)

89-92 (6 stocks)

91-94 (6 stocks)

93-96 (7 stocks)

Six Year Horizon Period

Number of Horizon Periods: 5

Number of Stocks in Winner and Loser Portfolios for each horizon period:

79-84 (3 stocks)

82-87 (3 stocks)

85-90 (4 stocks)

88-93 (5 stocks)

91-96 (6 stocks)