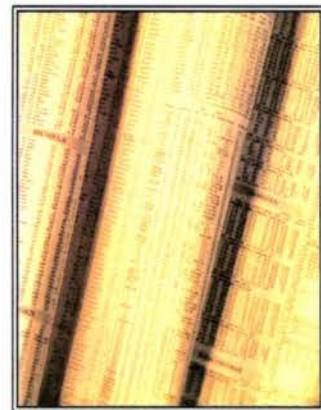


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An Empirical Analysis of the Market Response to Earnings Warning Announcements



A research **Thesis** report for partial fulfilment of the requirements for the degree of
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Abstract

A review of the recent literature surrounding market efficiency identifies two families of pervasive regularities: the underreaction of stock prices to new information events, such as earnings announcements or warnings, and the overreaction of stock prices to a series of negative or positive news. This study provides an empirical analysis of the market's stock price response to earnings warning announcements. Traditional event study methodology is employed to examine the stock price response of a sample of 372 companies issuing earnings warning announcements over a two-year period (1998 to 1999). The study finds evidence of a systematic stock price underreaction to the news content of an earnings warning announcement resulting in negative post-event 'drift' over the short to medium term for the majority of companies in the sample. The exception to this general finding is the group of stocks that have experienced the worst performance in the year leading up to the earnings warning announcement. This group of stocks displays post-event returns significantly higher than the rest of the sample, possibly as a correction of previous overreaction to a series of negative news events.

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Introduction

In an efficient capital market security prices rapidly adjust to fully reflect all available information. The fact that markets react quickly to new information is a generally accepted principle of financial research. Patell and Wolfson (1984) provided evidence that the majority of the stock price adjustment to an earnings announcement takes place in the first five to ten minutes following the announcement. The extent to which these adjustments 'fully reflect' the new information has, however, been a point of contention in financial research for over thirty years, giving rise to what Fama (1991) describes as the event study 'research industry' (p.1599).

Since the initial investigation into post-event returns surrounding stock splits (Fama, Fisher, Jensen and Roll, 1969), stock price responses to almost every aspect of corporate activity have been examined for evidence relative to the efficient markets hypothesis. Bernard (1993) notes:

"The question left unanswered by this research, however, is whether this initial quick response is too large or too small" (p. 305).

The purpose of this study is to add to this body of research by examining the response of security prices to a particular type of information event, that being a management disclosure (warning) of a forthcoming negative earnings surprise. If the initial response can be shown to represent a systematic over-, or under-, reaction, that is corrected over time (possibly as expectations of future earnings fail to materialise) then the possibility exists to profit from the existence of abnormal returns.

The rationale for focusing this study specifically on earnings warnings is twofold. First, the increasing use of short-horizon earnings guidance (warnings) by management is a relatively recent practice and, as such, has until recently attracted limited academic attention. Second, recent research (see Libby and Tan, 1999) has found that the stock price response to an earnings warning is significantly larger than the stock price response to a negative earnings surprise of the same magnitude.

In order to achieve these aims the project has the following objectives:

- a) To use event study methodology to examine security price movements before and after an earnings warning is announced for evidence relevant to the efficient markets model.
- b) To analyse the difference (if any) in the stock price behaviour surrounding an earnings warning between stocks listed on the New York Stock Exchange (NYSE) versus those listed on the National Association of Securities Dealers and Automated Quotations (NASDAQ).

- c) To analyse the relationship which exists (if any) between the size of a firm issuing an earnings warning and the post-event returns subsequent to that warning.
- d) To analyse the relationship which exists (if any) between a firm's past earnings performance and the post-event returns subsequent to an earnings warning.
- e) To analyse the difference (if any) in the stock price behaviour surrounding an earnings warning between growth versus value stocks.
- f) To analyse the relationship which exists (if any) between the size of an earnings warning and the post-event returns subsequent to that warning.
- g) To analyse the relationship (if any) between the pre-, and post-warning stock price behaviour of firms issuing an earnings warning.

The rationale as to why an earnings warning announcement should impact on the stock price of the firm is based on the generally accepted financial principle that the value of an asset is the present value of its expected returns/earnings (Reilly, 1989). As Corrado (2000) notes:

“The essential canon of valuation is: The value of a company is based on the value of its future cashflows” (p.16)

As an earnings warning provides new information about both a firm's current and future cashflows this new information will be incorporated into an investor's valuation of a company. As cashflows effect a company's ability to pay dividends, both now and in the future, this new information will be reflected in the company's stock price. The question for investors and analysts is how to value the information content of an earnings warning announcement. The way in which an earnings warning is interpreted can have a significant impact on an analysts' valuation of the company's stock. To illustrate this principle a simple pricing model is presented below.

$$P_j = \left\{ D_0(1 + g) \right\} / (k - g)$$

where P_j = the price of stock j
 D_0 = the dividend in the current period
 g = the constant growth rate of dividends
 k = the required return on stock j

In this model the price of a stock is determined by its current dividend, D_0 , expected growth rate of dividends, g , and the investor's required return on investment, k . If we assume the current dividend to be \$1.00, the investors required return to be 12% and an analyst's pre-warning expected growth rate in dividends to be 9%, the analyst would value the stock at \$36.33 under the model above.

$$\text{i.e } \$1.00 \times (1 + 0.09) / (0.12 - 0.09) = \$1.09 / 0.03 = \$36.33$$

However if an earnings warning caused the analyst to revise the dividend growth expectation downward, to say 6.5%, this would see the value of stock *j* drop to \$19.36 under the same model.

$$\text{i.e. } \$1.00 \times (1 + 0.065) / (0.12 - 0.065) = \$1.065 / 0.055 = \$19.36$$

To further extend the example above, if the analyst were to again revise his estimation of stock *j*'s expected growth rate of dividends at some point subsequent to the initial earnings warning (possible in response to stock *j*'s price behaviour) back up to 7.5%, this would see the valuation of stock *j* increase to \$23.89 under the model prescribed above.

$$\text{i.e. } \$1.00 \times (1 + 0.075) / (0.12 - 0.075) = \$1.075 / 0.045 = \$23.89$$

The problem for the investor is to try and determine what effect the new information contained in the earnings warning will have on the firm's future cashflows and, therefore, ability to pay dividends. The investor needs to consider whether the earnings warning is a 'one-off' occurrence, or marks the beginning of a period of lower earnings. The purpose of this report is to examine how the market addresses these questions and to find if there is evidence that the market is efficient in the way in which it interprets the new information contained in an earnings warning, or, conversely, evidence to suggest a systematic mis-specification of this new information which is corrected over time.

PART ONE

LITERATURE REVIEW

1.1 Market Efficiency

In his review of the theoretical and empirical literature surrounding the efficient markets model, Fama (1970) described the semi-strong form of the model as being one in which “current prices “fully reflect” all obviously publicly available information”(p.404). The initial major work in support of the efficient markets model was conducted by Fama, Fisher, Jensen and Roll (1969) and examined the cumulative residual returns surrounding stock splits. The residual returns were estimated by use of the market model (below) initially suggested by Harry Markowitz (1959).

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt}$$

Studies employing, or adapting and extending, the Fama, Fisher, Jensen and Roll (FFJR) methodology have become known as event studies and form the cornerstone of recent

research into market efficiency. Event study methodology has not only been used to provide evidence in support of the efficient market hypothesis, but also to generate results that challenge the validity of the hypothesis. A number of anomalies in the efficient markets model have been identified, with most relating to a particular type of corporate event. These events include dividend initiations and omissions (Michaeli, Thaler and Womack, 1995), stock splits (Desai and Jain, 1997), proxy contests (Ikenberry and Lakonishok, 1993), mergers (Jensen and Ruback, 1983) and repurchase tender offers (Lakonishok and Vermaelen, 1990). In general the anomalies identified can be categorised into two broad groups, those that indicate the market underreacts to new information and those that suggest market overreaction.

1.2 Market Overreaction to New Information

Events that provide evidence of abnormal post-event returns consistent with the idea of market *overreaction* include; seasoned equity offerings (Mitchell and Stafford, 1997), new exchange listings (Dharan and Ikenberry, 1995) and returns to acquiring firms in mergers (Asquith, 1983). These studies do not so much suggest a market overreaction to a specific event but rather that post-event abnormal returns are the result of the market correcting stock prices which were caused by pre-event overreaction to a series of news events. De Bondt and Thaler (1985) and Lakonishok, Shleifer and Vishny (1994) have put forward behavioural theories to explain this initial overreaction in stock prices. These theories revolve around the idea that investors apply representativeness bias when buying stock. Representativeness bias is based on Bayesian psychological research which demonstrates that people tend to *overact* to unexpected or dramatic news (see Kahneman

and Tversky, 1982). In revising their beliefs individuals tend to overweight recent information and underweight prior information. The result is that if a stock experiences a series of good (bad) news events investors extrapolate this good (bad) news information into future earnings estimates and erroneously incorporate this expectation into stock prices. Once the market realises this overreaction has occurred excessive returns are generated as prices adjust to their correct level.

1.3 Market Underreaction to New Information

In apparent contradiction of the research outlined above a number of recent studies have found evidence to suggest market *underreaction* to specific corporate events. Cusatis, Miles and Woolridge (1993) found initial underreaction in post-event returns experienced by divesting firms and the firms they divest. Desai and Jain (1997) and Ikenberry, Rankin and Stice (1996) also found evidence of an initial underreaction to the positive information signalled by companies undertaking stock splits. Other examples include; firms tendering for their own stock (Lakonishok and Vermaelen, 1990), open market share repurchases (Ikenberry, Lakonishok and Vermaelen, 1995) and dividend initiations and omissions (Michael et al., 1995). While the majority of researchers have been content to document evidence of apparent market underreaction to new information, few have put forward explanations as to why this underreaction occurs. Two notable exceptions have been Barberis, Sheilfer and Vishney (1998) and Daniel, Hirshleifer and Subrshmanyam (1998). Barberis et al. present a model based on the psychological phenomenon of *Conservatism* (see Edwards, 1968). The theory of Conservatism states that individuals are slow to change their beliefs in the face of new information. An

investor may disregard the full information content of a public announcement (warning) believing that the information indicates a temporary situation and therefore only partially adjust their valuation of the relevant security. The theory put forward by Daniel et al is based on the idea of *self-attribution bias* and investor *overconfidence*¹. Daniel et al argue that overconfidence is a natural human trait and that an overconfident investor overestimates their ability to generate, or identify the significance of, information relative to the market. An overconfident investor therefore, does not incorporate the full information content of new publicly available information into his or her security valuations. The full incorporation only occurs over time as the investor realises that their initial private information or analysis was erroneous.

1.4 Earnings Announcements and Post-Event Drift

Accounting earnings are more widely reported, closely followed and thoroughly analysed than any other firm-specific performance measure. As such it is not surprising that a significant portion of the research into market efficiency over the last thirty years has centred on earnings announcements. The majority of investigation into this area has provided evidence consistent with an initial underreaction to earnings reports, with at least 20 studies reporting evidence of 'post-event drift'. Ball and Brown (1968) found that, subsequent to an earnings announcement, cumulative abnormal returns (CARs) continue to drift upward for positive news, and downward for negative news. Jones and Litzenberger (1970), Joy, Litzenberger and McEnally (1977), and Rendleman, Jones and Latane (1982) have further documented this same phenomenon.

¹ For a summary of empirical research in overconfidence see Odean, 1998.

Bernard and Thomas (1989) conducted a study representative of this literature. In their study Bernard and Thomas assigned stocks to one of ten portfolios based on their standardised unexpected earnings (*SUEs*). The procedure for calculating *SUEs* is based on the model developed by Foster (1977) and is described further in section 2.3. Bernard and Thomas found that post announcement abnormal returns increased monotonically across the ten *SUE* deciles to form a spread of approximately 3% over 60 days, and up to 10% over 240 days subsequent to the earnings announcement.

Another interesting finding of the Bernard and Thomas study was that the size of the abnormal returns was correlated to the size of the firm issuing the warning. This result supported earlier work by Foster, Olsen and Slevin (1984) which found the absolute magnitude of abnormal returns to be almost three times greater for small firms than for large.

A further area of research relevant to this study concerns Price/Earnings (P/E) ratios. As noted by Bernard (1993), "If stock prices underreact to earnings information, or if prices reflect valuation errors that are unrelated to earnings and corrected over time, the earnings-price ratios should stand as positive predictors of abnormal returns"(p323). Earlier work by Latane and Tuttle (1967), Latane, Tuttle and Jones (1969) and Basu (1977) provided evidence that stocks with high P/E ratios generate higher returns than stocks with low P/E ratios. Further work by Basu (1983) and Cook and Rozeff (1984) examined the relationship between the 'P/E effect' and the 'size effect', and provide the

rationale for including both market capitalisation and P/E ratios as conditioning factors in this study.

1.5 Earnings Warnings and other Negative News Events

While the body of literature surrounding earnings announcements is extensive, the limited extent to which earnings warnings have been employed by management in the past has meant that this area has attracted less academic attention. However, as noted by Libby and Tan (1999),

'Both the popular press and research literature report increasing use of short-horizon earnings guidance (warnings) primarily before negative earnings surprises'(p.415).

While this body of research surrounding earnings warnings is increasing, there has been limited reported research into the firm's post-warning performance in the context of the efficient markets model. Previous work has focused on: the reasons management choose to issue warnings (Skinner, 1994), the relationship between management disclosures and stockholder litigation (Francis, Philbrick and Schipper, 1994), the association between firm attributes and disclosure policies (Lang and Lundholm, 1993) and analysts' reaction to warnings (Libby and Tan, 1999). One finding to come out of the research to date is that firms which issue warnings experience larger negative stock price reactions than firms who do not warn of negative earnings surprises (Kasznik and Lev, 1995). However, Hayn (1995), Basu (1997) and Lipe et al. (1998) all found that stock prices are less responsive to unexpected negative earnings news than unexpected positive news.

These studies suggest that the reason for this muted response may be due to the earnings decrease being associated with complementary information (regarding restructuring or liquidation of options etc). Beaver and Engel (1996) put forward an explanation for this asymmetrical price response consistent with the conservatism principles discussed earlier, suggesting that investors may consider unexpected losses as short-lived or discretionary and therefore discount their relevance for security valuation. This finding is similar to that of Docking et al. (1997) who indicated that security price responses to loss provisions and non-reoccurring write-offs are dependant on whether the market emphasises past performance or future profitability in determining stock valuations.

1.6 Literature Review Conclusions

What is clear from the literature review conducted above is that security price responses to new information vary depending on the nature of the new information and characteristics of the firm. As noted by Griffen et al. (2000).

'the markets response varies in ways that tend to be information or context specific' (p.9).

As noted above, the aim of this study is to examine the market response to new information in the specific context of a negative earnings warning.

PART TWO

DATA & METHODOLOGY

2.1 Primary and Secondary Data

The primary source of warnings information employed is Briefing.com. Briefing.com is a leading Internet provider of market analysis on the US stock and US fixed income markets and provides details and a brief description of individual earnings warnings and the corresponding market expectation. Briefing.com defines an earnings warning as, “any earnings preannouncement in which a company reports that revenues and/or earnings will be below analysts' estimates. Only companies that are covered by at least one Wall Street analyst will be listed”. The market estimate of expected earnings is the consensus earnings per share (EPS) estimate of equity analysts, as surveyed by Zacks Investment Research. Security prices and index levels are obtained from the Yahoo!Finance website. The Yahoo!Finance website sources its quote data from Reuters.

Prices used are the adjusted closing price, which is the security closing price adjusted for all splits and dividends.

Secondary data refers to the historical earnings, market capitalisation, P/E information and market to book ratios required to condition the overall results by company size, past earnings performance, growth versus value stocks and the size of the earnings warning, as measured by standardised unexpected earnings (*SUE*). All secondary data is sourced from Bloomberg L.P.

2.2 Sample Population

The sample examines the stock price movements for 1 year prior to, and 1 year after, an earnings warning is announced for all securities which meet the following criteria:

- Stocks are listed on either the NYSE or NASDAQ exchanges;
- Quantitative warning details are available on the Briefing.com website for the security for the period 1st quarter 1998 to 2nd quarter 2000;
- 4 Years of historical prices prior to the warning announcement, and 1 year (251 business days) after the warning announcement, are available through the Yahoo!Finance website. The requirement for 4 years history prior to the announcement is to ensure that there is at least 3 years of price history prior to the start of the event horizon with which to estimate the companies' security betas relative to the market;

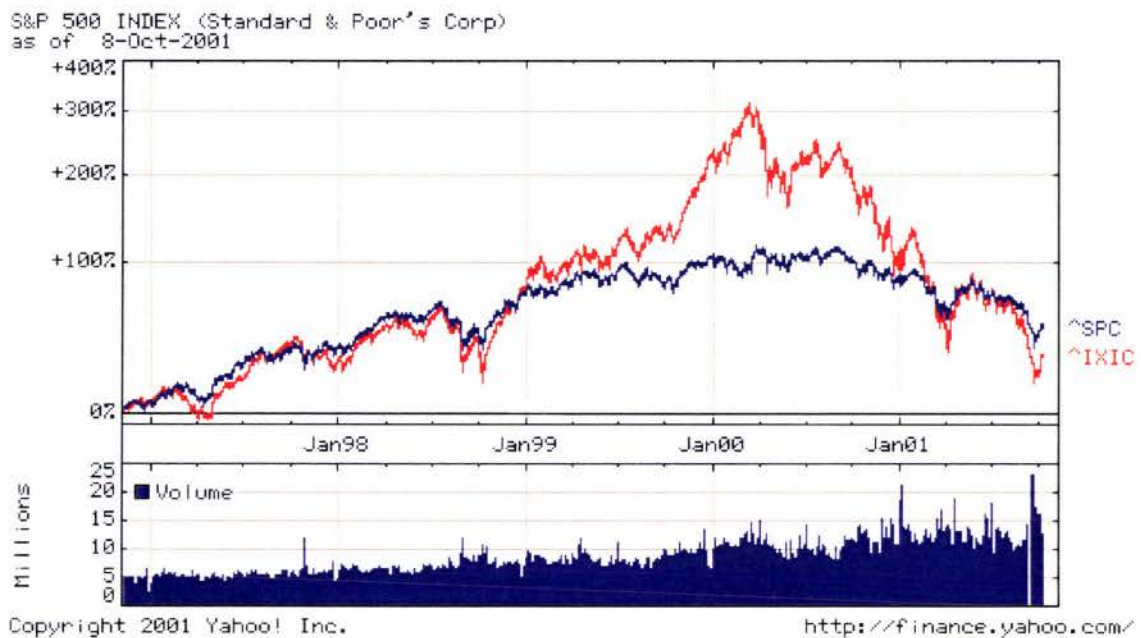
- A minimum of 4 years earnings history (16 quarterly earnings figures) is available through Bloomberg L.P. Earnings history is required for calculating the historical volatility of returns, which is an important component in the formula used to determine the Standardised Unexpected Earnings of the warning;
- Historical P/E ratio, market capitalisation, and market to book information from the time of the warning is available through Bloomberg L.P.

Using the criteria above puts two main limitations on the sample. The first is that the sample may be biased in favour of larger firms as only firms that have analysts' coverage are included on the Breifing.com list of warnings and as Bloomberg L.P tends not to store historical data for smaller companies. This means firms that are particularly small and/or are not covered by broker analysts will not be captured in the sample. Secondly, the period examined (1998 – 2000) was one of extremely high market returns, particularly for NASDAQ stocks (see figure 2.2 – following page), as such the behaviour of stocks over this period may not be representative of general price response in periods of lower market growth.

NB: Subsequent to the analysis being completed a bias was identified in the sample. Specifically, the Bloomberg History tool used to identify firms' P/E ratios immediately prior to the warning announcement does not display negative P/E data. Firms which had a negative P/E ratio immediately prior to the warning announcement were therefore inadvertently omitted from the sample providing a bias toward stocks which had experienced positive earnings in the 12 months prior issuing an earnings warning. 13

warning announcements were omitted in this manner. The P/E ratios for these stocks have been calculated using earnings information from the main Bloomberg L.P database. The behavior of these 13 stocks over the event period is discussed in Appendix 1.

Figure 2.2 : NADAQ and NYSE performance 1997 – 2001, Source Yahoo!Finance



The initial sample population included 2,008 individual warning events identified from the Briefing.com database. Of the initial 2,008 warnings identified:

- 47 were discounted for failing to provide a consensus estimate of expected earnings (pre-warning);
- 539 were discounted for not providing a specific management estimate of expected earnings i.e. the warning announcement referred to earnings being 'below estimate', or 'loss expected' (these announcements were discounted as part of the secondary

analysis involves conditioning the warning by size. Without a specific management estimate of expected earnings the size of the warning cannot be accurately measured);

- 105 were discounted as multiple warnings i.e. the same company issued earnings warnings for more than one of quarter included in the 2 years of the sample period. In this instance the only first warning to be issued was considered for inclusion in the sample;
- 2 earnings warnings were discounted as it was unclear which exchange the stocks were listed on;
- 25 more earnings warnings were discounted as they were listed on the American Stock Exchange (AMEX) which did not have historical index data available through the Yahoo!Finance website;
- 409 earnings warnings were discounted due to historical price information being unavailable through the Yahoo!Finance website;
- 419 were discounted as their price history did not go back 4 years prior to the warning announcement (the requirement for 4 years history prior to the announcement is to ensure that there is at least 3 years of price history prior to the start of the event horizon with which to estimate the companies' security betas relative to the market);
- A final 90 earnings warnings were discounted, as the secondary data required was unavailable through Bloomberg L.P.

Table 2.2 : Summary of warnings discounted from full sample

Total no# of warnings identified	2,008	NYSE	NASDAQ
Discounted			
No estimate provided	47		
Lack of detailed warning information	529		
Previous warning issued	105		
Index unknown	2		
AMEX listed stocks	25		
Price histories unavailable	409		
Price histories incomplete	419	125	294
Secondary data incomplete	90	44	46
Full criteria met	372	221	151
(warning included in sample)			

A final sample population of 372 individual earnings warning events were included for analysis in the study, 221 of the companies issuing these warnings were listed on the NYSE; the remaining 151 were NASDAQ listed stocks. Table 2.2 displays a breakdown of the sample selection process. A database was constructed which included company and warning specific details of each of the earning warnings in the sample. For each warning event the database included:

1. The earnings period (quarter) the warning related to.
2. The date the warning was issued.
3. The date of the actual earnings announcement.
4. The stock name.
5. The stock ticker.
6. The exchange the stock was listed on.

7. The analyst consensus EPS estimate.
8. The Pre-announcement (warning) estimate issued by firm management.
9. The eventual earnings figure announced for the period.
10. Each company's market capitalisation immediately prior to the earnings warning being announced.
11. Each company's market to book ratio immediately prior to the earnings warning being announced.
12. Each company's P/E ratio immediately prior to the earnings warning being announced.
13. Each company's earnings history for 4 years (16 quarters) prior to the warning announcement.
14. Each company's price history for 4 years prior to, and 1 year (251 business days) subsequent to, the earnings warning being announced.

From this raw data an additional five descriptive statistics were calculated for each firm/warning event as follows:

1. Earnings per share standard deviation (across the 16 quarters prior to the earnings warning being issued).
2. The Standard Unexpected Earnings ratio (*SUE*, see section 2.3 for a detailed description).
3. The pre-event period abnormal return (for the period $t-250$ to $t-1$, see section 2.3 for a detailed description).

4. The event window abnormal return (for the period t_0 to t_{+1} , see section 2.3 for a detailed description).
5. The post-event period abnormal return (for the period t_{+2} to t_{+251} , see section 2.3 for a detailed description).

The database constructed forms the basis for the testing and analysis of the hypotheses described below in section 3.

2.3 Methodology

As noted earlier, this study is based around the event study methodology introduced by Fama et al. (1969). As with most event studies the analysis revolves around the identification of abnormal security returns surrounding the event window. For the purposes of this study the initial event window is set as two days (t_0 to t_{+1}) to allow time for the 'full' effect of the warning to be absorbed by the market. The rationale for the two-day window is due to the data available being unable to provide a time at which the earnings warning announcements were made. As such, while an earnings warning may have been made on t_0 it may have been made after trading hours, meaning t_{+1} was the first day the market had the opportunity to respond to the new information available.

Abnormal returns are calculated by subtracting the expected return from the actual return observed. Obviously before we can calculate a security's abnormal return for a given period it is necessary to develop an estimate as to what the security's expected return

should be. In calculating a security's expected return the market model (discussed in the literature review above) is utilised.

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt}$$

where, R_{jt} = expected return of security j on day t

R_{mt} = return on the market index m on day t

$\alpha_j + \beta_j$ = parameters for security j , β_j is the regression coefficient, the parameter that measures the sensitivity of R_{jt} to the market index

ε_{jt} = the error or disturbance term, a random variable expected to be normally distributed with a mean of zero

The model parameters for each security are obtained by regressing past security returns against the corresponding market return. The Standard and Poor's 500 index is used as a proxy for the NYSE market return and the NASDAQ composite index for as a proxy for the NASDAQ return. The regression period used covers the 3-year period beginning 4 years prior to the date of the earnings warning announcement through to 250 days prior to the announcement (the beginning of the pre-event period). 3 years worth of historical price information provides sufficient data with which to produce a robust estimate of the model parameters for each security.

Once the regression parameters for each security have been calculated they can then be used to estimate the daily expected returns for each day of the event period (250 trading days prior to the warning, a two-day event window, and a subsequent 250 trading days to

the end of the event period). The expected daily returns calculated by use of the market model are subtracted from the daily observed returns to identify the abnormal return for each security for each day. The abnormal return for stock j on day t (A_{jt}) can be defined as:

$$A_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt})$$

To calculate the average abnormal return for a given day the abnormal returns for each security for each day are summed together and divided by the number of securities. The daily average abnormal return for on day t can be defined as:

$$AAR_t = \frac{\sum_{j=1}^N A_{jt}}{N}$$

To calculate the cumulative average abnormal return over an interval of two or more trading days the daily average abnormal returns for each day over the period are summed. The cumulative average abnormal return over the period beginning T_1 and ending T_2 ($CAAR_{T_1, T_2}$) can be defined as:

$$CAAR_{T_1, T_2} = \frac{1}{N} \sum_{j=1}^N \sum_{t=T_1}^{T_2} A_{jt}$$

The cumulative average abnormal return represents the mean return for a group of stocks, relative to the market return, over a specified period. Under the null hypothesis, each A_{jt} , AAR_t , and $CAAR_{T_1, T_2}$ is normally distributed around a mean of zero. To test the

hypotheses put forward in section 3 the *CAAR*'s for various groups of stocks are calculated over different time periods. Standardised test statistics are calculated to determine whether the cumulative average abnormal returns are statistically different from zero. The standardised test statistic, t , can be defined as:

$$t = \frac{CAAR_{T1,T2}}{(s/\sqrt{n})}$$

Where, s , equals the standard deviation of the cumulative abnormal returns comprising the sample and, n , equals the number of observations in the sample. In other words the test statistic is equal to the Cumulative Abnormal Average Return of the sample divided by the standard error of the sample. The standard error of the sample is equal to the standard deviation of the population divided by the square root of the sample size. This calculation is more formally referred to as the *standard error of the mean* and can be given as:

$$SE = \frac{\sigma}{\sqrt{n}}$$

Where, σ , equals the standard deviation of the population. However, the population standard deviation is not known, so the sample standard deviation, s , is taken to be the estimate. Thus the standard error becomes:

$$SE = \sqrt{\frac{s^2}{n}} = \frac{s}{\sqrt{n}}$$

The central limit theorem states that the mean of a large sample is approximately normally distributed with a mean equal to the population mean and a standard deviation equal to the standard error of the mean, formally:

$$\xi \sim N(\mu, s/\sqrt{n})$$

As previously noted the semi-strong form of the efficient market hypothesis suggests that market prices should fully reflect all publicly available information at all times, therefore if abnormal returns are observed they should be evenly distributed around a mean of zero. If the cumulative average abnormal return can be found to be statistically different from zero then this can be seen as evidence of an anomaly in the efficient markets model.

In addition to the standardised test statistic, for each group of cumulative abnormal returns examined the ratio of positive to negative observations is recorded and the cumulative binomial probability calculated. The cumulative binomial probability assumes that there is an equal likelihood of an individual stock recording a positive *CAR*, over a given period, as recording a negative *CAR*. Based on this assumption cumulative binomial probability provides the mathematical likelihood of the positive versus negative ratio observed occurring randomly.

The formula for the binomial probability of j positive outcomes can be given as:

$$p(x = j) = \frac{n!}{j!(n-j)!} p^j (1-p)^{(n-j)}$$

where, x = the binomial random variable representing the expected number of “successes” recorded from a number of independent trials

j = the number actual number of “successes” recorded from a number of independent trials

n = the number of independent trials performed

p = the probability of success

$p(x = j)$ = the probability of x equalling j

The “!” after the n and the j is the factorial notation meaning that, in the case of n , for example, n is multiplied by $(n-1)(n-2)(n-3)$, etc. If $n = 4$, $n!$ equals $4 \times 3 \times 2 \times 1 = 24$.

The *cumulative* binomial probability of j positive outcomes can be given as:

$$B(x;n,p) = \sum_{j=0}^N b(j;n,p)$$

Which is simply the sum of the binomial probability of success for outcome j and each potential value between 0 and j .

Also, in some instances daily, and/or cumulative, average abnormal returns have been regressed against time in order to highlight possible trends that may exist within the data. Linear or polynomial trendlines may be fitted to the data, with the coefficient of variation from the regression equation being used as a proxy for the strength of the relationship observed.

In addition to considering the statistical difference from zero of the observed results, the study also considers the difference which may, or may not, exist within the sample when it is split into portfolios based on firm, and warning-specific variables. As noted in the literature review above, there appear to be three main firm, and warning-specific variables identified in previous research that influence the occurrence and size of any abnormal post-event returns surrounding earnings announcements (and potentially earnings warnings). The three main variables identified are:

(a) Relative size of the warning.

One of the key variables for this study will be Standardised Unexpected Earnings (*SUE*) which will serve as a proxy for the size of the negative information content encapsulated in the earnings warning. The calculation of *SUEs* is based on the model proposed by Foster (1977). The model involves producing a statistical forecast of earnings based on the firm's historical earnings data. The difference between the actual earnings and the forecast is then scaled by the historical standard deviation of the forecast errors. This study differs from the model proposed by Foster in two respects. First, the study will use the consensus EPS estimate of equity analysts, as surveyed by Zacks Investment Research, as the proxy for the market expectation of returns rather than the statistical

forecast approach as taken by Foster. This is as the analysts' estimates are more likely to provide a 'true picture' of the market estimation of the firms' expected returns than an estimation based solely on historical data. The second difference is that the difference between the warning and the market estimate will be scaled by the historical standard deviation of earnings rather than by the standard deviation of earnings forecast errors. This will greatly reduce the time required to calculate, and complexity of, the *SUE* calculations while still allowing for the *SUEs* to be conditioned in response to the historical variability of firm earnings.

(b) Firm size

Results will also be conditioned by firm size as measured by the market capitalisation recorded on Bloomberg L.P immediately prior to the warning being issued (note: Bloomberg L.P provides capitalisation figure for most US stocks on a weekly, rather than daily basis, though this is not expected to have a significant influence on the results generated).

(c) Past Earnings Performance

The third main conditioning variable to be considered is the firms past earnings performance as measured by the firm's P/E ratio prior to the earnings warning. The P/E ratio will be sourced from Bloomberg L.P (which provides capitalisation figures for most US stocks on a weekly basis).

As well as the three variables identified in previous research, other variables by which the sample will be conditioned include:

- (d) The exchange the firm issuing the earning warning is listed on (NYSE versus NASDAQ).
- (e) The market to book ratio of the firm issuing the earnings warning immediately prior to the issuance of the warning announcement.
- (f) The pre-event period returns of the firm issuing the earnings warning i.e. the full sample will be formed into portfolios based on observed pre-event returns of each firm in order to determine the relationship which exists (if any) between pre-, and post-, warning returns.

To determine whether there is any evidence of a statistically significant difference between the observed returns of the various portfolios constructed Analysis of Variances were carried out using the Microsoft Excel ANOVA function. This analysis tool performs simple analysis of variance to test the hypothesis that means from two or more samples are equal (drawn from populations with the same mean). The model for the one-way ANOVA employed can be written as:

$$y_{ij} = \mu + \alpha_j + \varepsilon_{ij}$$

where y_{ij} = observation of warning i in portfolio j

μ = an overall mean, an unknown constant, and $\mu_j = \mu + \alpha_j$

α_j = an effect due to conditioning variable j (portfolio characteristic tested)

ε_{ij} = the random error term associated with warning i , portfolio j , assumed to be independently $N(0, \sigma^2)$ distributed, with σ^2 being the common variance of the population.

The ANOVA methodology is used to test the hypotheses,

$$H_N = \mu_a = \mu_b = \mu_c = \mu_p (= \mu) \text{ or } H_N = \alpha_a = \alpha_b = \alpha_c = \alpha_p (= 0)$$

against the alternate hypothesis H_A , that at least one pair of portfolio returns are different. The procedure for testing H_N against H_A is based on the comparison of two independent estimates of sample variance. The first estimate is of the *within* portfolio variance, estimated by the sample pooled variance,

$$\sigma_w^2 = \frac{(n_j - 1)\sigma_j^2 + \dots + (n_p - 1)\sigma_p^2}{(n - p)}$$

and the *between* portfolio variance which is estimated as:

$$\sigma_b^2 = \sum_j (\mu_j - \mu)^2 / (n - p)$$

If H_N were true then the ratio $F = \sigma_w^2 / \sigma_b^2$ would be approximately equal to 1. For the purposes of analysis the computed significance level, or *p-value*, associated with each ANOVA F-ratio is also calculated and displayed.

PART THREE

HYPOTHESES & RESULTS

Part three presents the hypotheses tested in this study, the results generated, analysis of these results and draws conclusions based on the stock price behaviour observed. In all, this study tests 20 individual null and alternative hypotheses grouped into seven sections numbered from section 3.1 through to section 3.7. The intention is to gain an understanding of the stock price behaviour of companies issuing earnings warnings, prior to, immediately after, and in particular over the period subsequent to an earnings warning event. Section 3.1 considers 6 hypotheses that are tested against the behaviour of the full sample of 372 observations. Sections 3.2 to section 3.7 each focus on a hypothesis, or group of hypotheses, related to a particular warning, or firm-specific variable and considers the influence that variable may have on the stock price behaviour of a firm issuing an earnings warning. A summary of conclusions drawn are presented and discussed in section 3.8.

3.1 Preliminary Analysis

The preliminary data analysis considers the *CAAR*'s of the full sample of 372 observations over the pre-event period, the event window and the post-event period. Three pairs of null and alternate hypotheses are tested using the standardised test statistic and binomial distribution described in section 2.3.

Hypothesis H_{N1} : The *CAAR* over the pre-event period is equal to 0, versus

Hypothesis H_{A1} : The *CAAR* over the pre-event period is not equal to (is greater than / less than) 0.

Hypothesis H_{N2} : The *CAAR* over the event window is equal to 0, versus

Hypothesis H_{A2} : The *CAAR* over the event window is not equal to (is greater than / less than) 0.

Hypothesis H_{N3} : The *CAAR* over the post-event period is equal to 0, versus

Hypothesis H_{A3} : The *CAAR* over the post-event period is not equal to (is greater than / less than) 0.

Each of these three pairs of null and alternate hypotheses are examined in more detail in sections 3.1.1 to section 3.1.3, however an initial analysis of the results from testing these hypotheses is given below.

Figure 3.1 and table 3.1 display the *CAAR*'s for the full sample of 372 observations from the period t_{-250} to t_{+251} . Initial analysis would indicate that the pre-event *CAAR*'s are approximately 31.7% below the average market return for this period (significant at 0.001), with a binomial distribution probability of less than 0.0001. This result supports

hypothesis H_{A1} , that the *CAAR* over the pre-event period is not equal to 0 and presents two possible scenarios: the first that the market to some degree ‘anticipates’ the earnings warning is likely to be forthcoming and incorporates this expectation into a company’s stock price. The second scenario is that companies whose stock price is underperforming the market are more likely to make a warning announcement. Each of these scenarios is considered further in section 3.1.1.

Figure 3.1 : Cumulative Average Abnormal Return for the full sample N=372

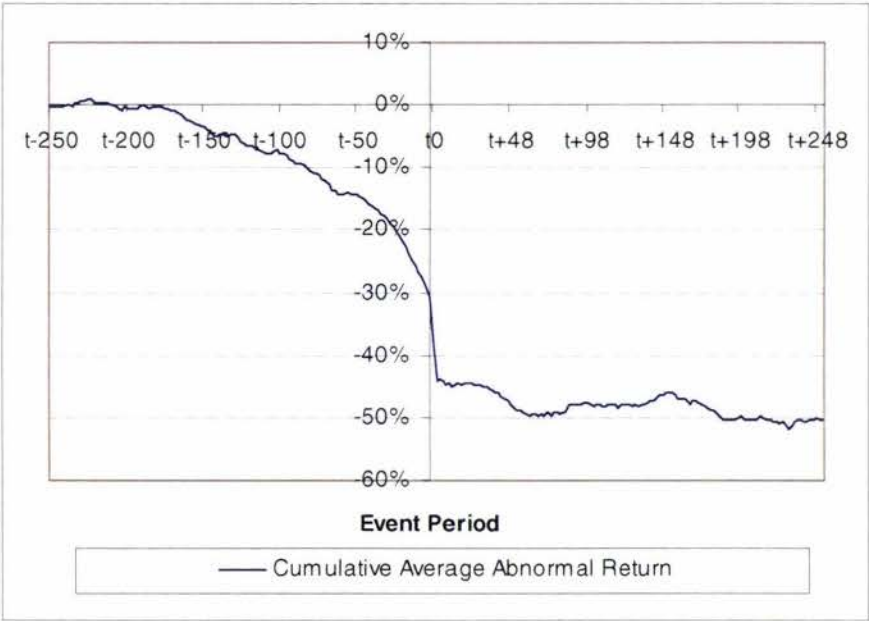


Table 3.1 : Cumulative Average Abnormal Returns for full sample N=372

Period		CAAR	t-statistic	N	Pos:Neg	Prob
Pre-event period	t-250 to t-1	-31.7%	13.93***	372	68:304	>.0001
Event period	t0 to t+1	-13.4%	18.33***	372	55:317	>.0001
Post-event period	t+1 to t+251	-6.1%	2.12**	372	154:218	.0004
***significant at 0.001						
**significant at 0.01						
*significant at 0.05						

The results also show a clear and sharp drop in the *CAAR* of the full sample immediately subsequent to the announcement of an earnings warning (t_0 to t_{+1}). The *CAAR* for this two-day period is negative 13.4% (significant at 0.001), with a binomial distribution probability of less than 0.0001. This is a fairly predictable result and is discussed further in section 3.1.2, however at this point it is fair to say that there is very strong evidence to reject hypothesis H_{N2} , that the *CAAR* over the event window is equal to 0, and to support the alternate hypothesis H_{A2} , that the *CAAR* of the sample over the event window is not equal to (specifically, is less than) 0.

The third result to be examined in this section relates to the *CAARs* observed over the post-event period. During this period the *CAAR* of the full sample is negative 6.1% (providing evidence of post-event drift). While the statistical significance of this result (significant at 0.01) is not as strong as for the pre-event period and the event window results (significant at 0.001), it still provides strong evidence to reject the null hypothesis H_{N3} , that the *CAAR* over the post-event period is equal to 0, in favour of the alternate hypothesis H_{A3} that the *CAAR* over the post-event period is not equal to 0 (specifically that the return for this period is less than 0). In addition to the results of the *t*-test it is also worth noting that each stock examined is 41.6% more likely to experience a negative return over the post-event period (154 versus 218, significant at 0.0004). These results are discussed further in section 3.1.3.

Conclusions: Three main conclusions are drawn from the results and analysis above:

- There is very strong evidence to suggest that companies issuing earnings warnings have significantly underperformed the market in the year prior to the warning being announced;
- There is also very strong evidence to suggest that there is an immediate and significant negative impact on the stock price of companies issuing earnings warnings;
- There is strong evidence to suggest the existence of negative post-event drift in the stock price reactions of companies issuing earnings warnings, subsequent to the initial impact of the warning event.

3.1.1 The Pre-Event Period

In the previous section it was shown that companies issuing earnings warnings significantly underperform the market in the year prior to the warning being announced. In this section we look more closely at the timing of this negative performance. Figure 3.1.1 displays the *CAAR* of full sample over the pre-event period ($t-250$ to $t-1$). For approximately the first 70 to 80 days of the pre-event period the *CAAR* of the sample remains around zero i.e. the stock prices of the firms, which will eventually issue warnings, are at this stage effectively tracking the average market return. However as the event date approaches the stock prices of these firms begin to significantly fall away relative to the market. By breaking the pre-event period down into five sub-periods of 50

consecutive days (figure 3.1.1a) it is clear that the size of the negative return increases with each subsequent period from $t-250$ to $t-1$.

Figure 3.1.1 CAAR of full sample for pre-event period ($t-250$ to $t-1$)

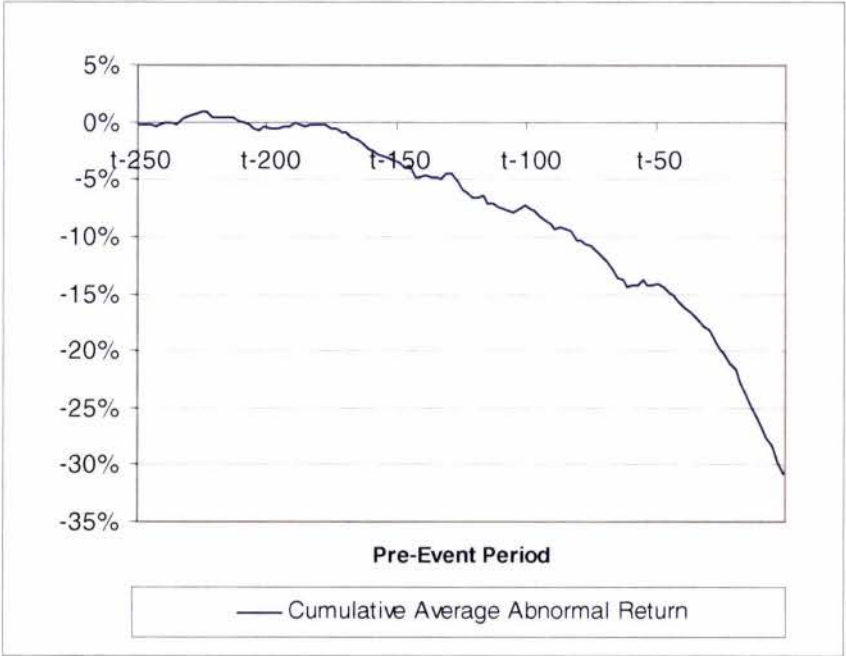


Figure 3.1.1a: CAAR for 50-day sub-event periods

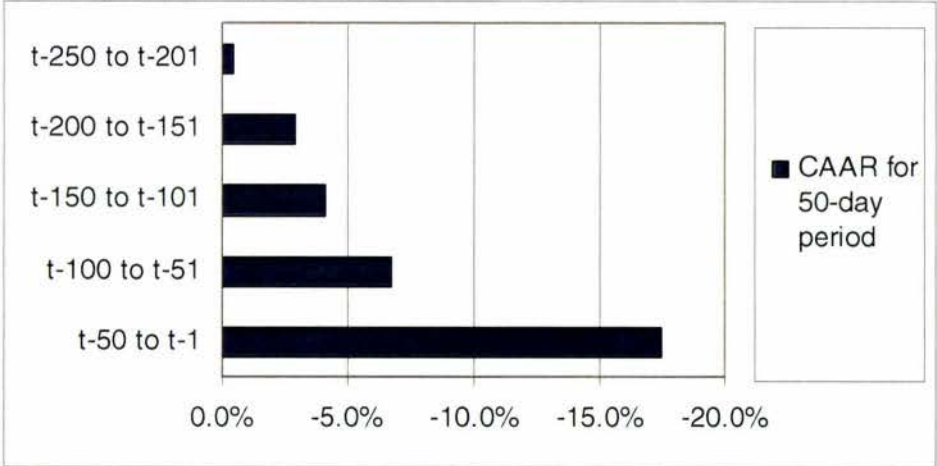


Table 3.1.1 displays the *CAAR*, associated *t*-statistic and binomial distribution for each of the five sub-periods. For the first 50 days of the pre-event period the *CAAR* of the sample

is just -0.4% below the market return and not statistically significant, with an even 186 versus 186 split between firms displaying positive *CAR*'s and those with negative *CAR*'s. However as time progresses the size of the *CAAR* for each period, as well as the corresponding statistical significance, increases steadily until the final 50-day period immediately prior to the earnings warning being announced in which the *CAAR* recorded is -17.4% (significant at 0.001). In this final sub-period individual firms with negative *CAR*'s outweigh those with positive *CAR*'s by a ratio of more than 4:1 i.e. a firm is four times more likely to experience a negative return, relative to the market, in the month prior immediately preceding an earnings warning than a positive return.

Table 3.1.1 : Cumulative Average Abnormal Return for 50-day sub-periods

Period	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-201	-0.4%	0.41	372	186:186	0.500
t-200 to t-151	-2.9%	2.61**	372	149:223	>.0001
t-150 to t-101	-4.2%	3.66***	372	160:212	0.004
t-100 to t-51	-6.8%	6.60***	372	131:241	>.0001
t-50 to t-1	-17.4%	13.49***	372	73:299	>.0001
Total	-31.7%				
***significant at 0.001					
**significant at 0.01					
*significant at 0.05					

Figure 3.1.1 displays the relationship between the stock price performance of companies issuing an earnings warning and the event date expressed by regressing the daily average abnormal return against the log of the number of days prior to warning announcement.

While the R-square of the regression is not overwhelming (0.3803), it does provide some evidence of a significant linear relationship between the two variables.

Figure 3.1.1b : Regression of Daily Average Abnormal Return and log of no# of days prior to an earnings warning announcement

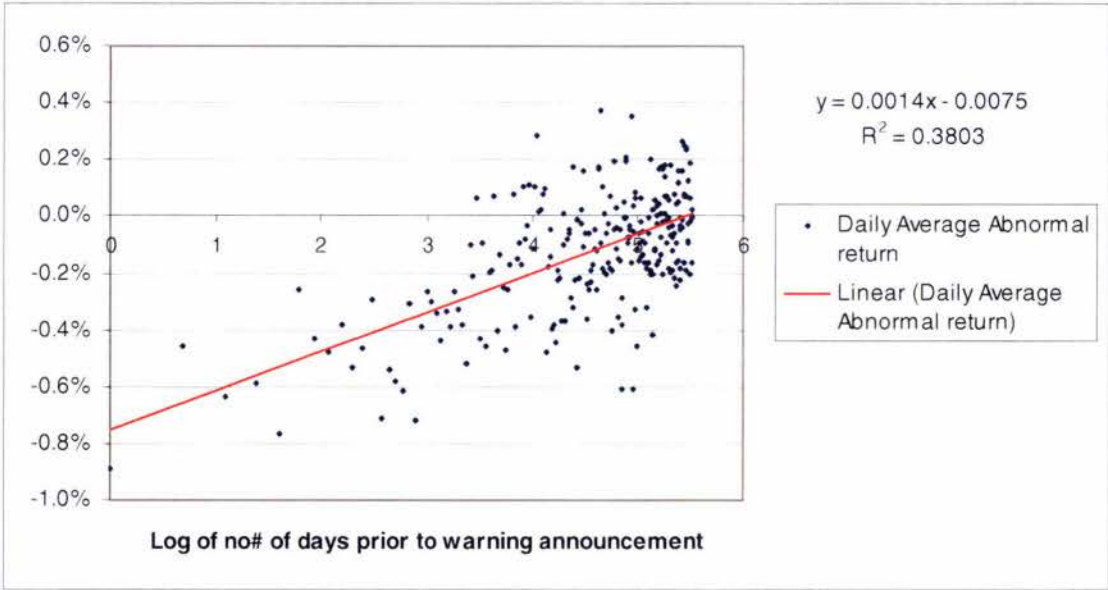


Figure 3.1.1c : Time series relationship between Daily Average Abnormal Return and event date

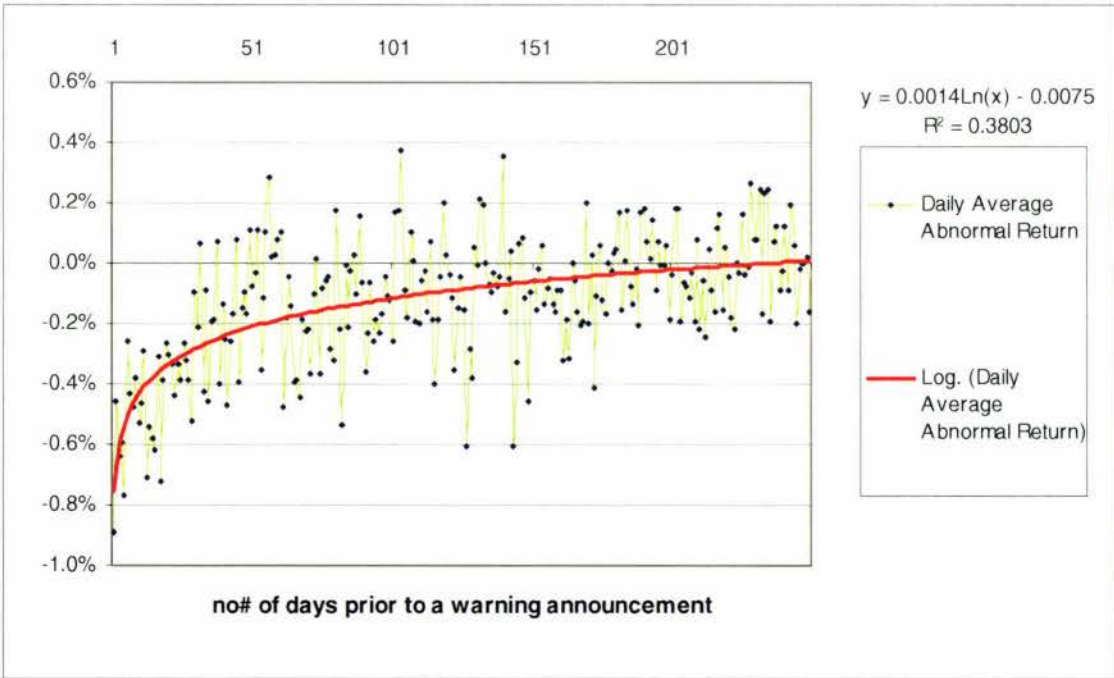
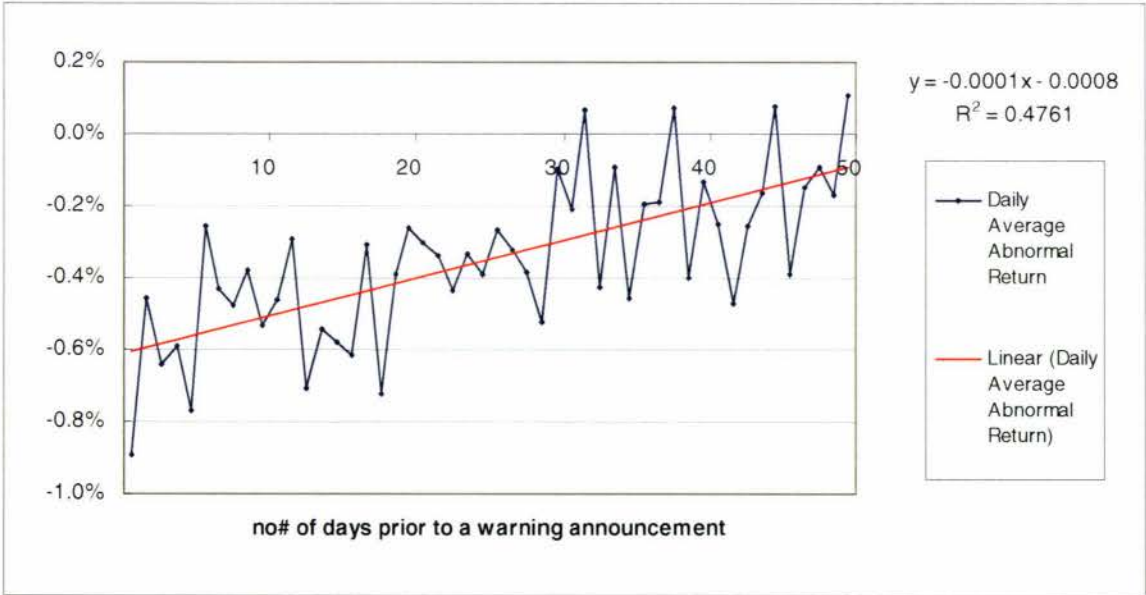


Figure 3.1.1c displays the same relationship as a time series. Fitting the logarithmic trendline highlights the way in which the daily average abnormal returns grow increasingly negative at an almost exponential rate prior to the event date. By examining figure 3.1.1c it becomes clear that the bulk of the negative CAAR experienced by the sample group throughout the 250-day pre-event period occurs in the period from approximately t_{-50} to t_{-1} . However, by focusing on this final 50-day period it appears that the relationship between time and the increasingly negative daily average abnormal return it becomes clear that the relationship is more linear than exponential. Figure 3.1.1d displays the relationship over the period t_{-50} to t_{-1} . Fitting a linear regression trendline provides evidence of strong negative relationship between abnormal returns and time over this period ($R\text{-square} = 0.4761$).

Figure 3.1.1d : Relationship between Daily Average Abnormal Returns and time over the period t_{-50} to t_{-1}



The two scenarios put forward to explain this relationship:

- a) *The market to some degree 'anticipates' that an earnings warning is likely to be forthcoming and incorporates this expectation into a company's stock price.*

Exactly what form this 'anticipation' takes is an interesting question. It may be the result of insider trading or the 'leaking' of the warning prior to the official announcement date (this would to some extent explain the sharp decrease in stock price immediately prior to the warning announcement). However it is more likely that it is not so much the warning itself that is anticipated, rather the negative price performance observed is the result of analysts interpreting the publicly available information and revising their earnings forecasts downward. If this is the case the warning announcement itself could be seen simply as the company confirming what is already known, or has been surmised, by a significant proportion of market participants. Alternatively the warning can be seen as providing a clear message to 'ordinary', non-institutional, investors who may not be in a position to interpret the information which is already publicly available.

- b) *Companies whose stock price is underperforming the market are more likely to make a warning announcement.*

This scenario may be somewhat more abstract than scenario a), but does deserve consideration. A company whose stock price has been performing solidly relative to the market, may feel that although their earnings are likely to be below market estimates, they are in a relatively strong position and do not need to issue a

warning to which the market may potentially overreact. Alternatively a company whose stock price performance has been poor may feel compelled to issue an earnings warnings as their poor performance coupled with an unexpected negative earnings surprise has the potential to cause investors to sell off their stock excessively.

Conclusions: Three main conclusions are drawn from the results and analysis above:

- The stock price underperformance relative to the market, which is observed in the pre-event period for companies issuing earnings warnings (identified in section 3.1) begins approximately 175 business days prior to the warning announcement being made;
- The size of the underperformance observed increases over this period and is concentrated in approximately the final 30 to 50 days prior to the warning announcement being made;
- The results suggest that the market to some extent anticipates the earnings warning announcement and incorporates this expectation into the stock prices of companies issuing earnings warnings prior to the warning announcement being made.

3.1.2 The Event Window

Section 3.1 identified a sharp drop in the *CAAR* of the full sample of 372 observations immediately following the announcement of the earnings warning over the event window, t_0 to t_{+1} . Table 3.1.2 considers an extended event window displaying the daily average abnormal returns for the period t_{-10} to t_{+10} . Analysis of this data shows that while for 8 of the 10 days prior to the event date display significant daily abnormal returns, by far the largest negative daily abnormal returns occur on days t_0 and t_{+1} .

Table 3.1.2 : Daily Average Abnormal Returns over the extended event window t_{-10} to t_{+10}

Period	DAAR	t-statistic	N	Pos:Neg	Prob
t-10	-0.53%	2.64**	372	142:230	>.0001
t-9	-0.38%	1.84	372	149:223	>.0001
t-8	-0.48%	2.30*	372	141:231	>.0001
t-7	-0.43%	2.17*	372	149:223	>.0001
t-6	-0.26%	1.22	372	170:202	0.0540
t-5	-0.77%	3.79***	372	137:235	>.0001
t-4	-0.59%	2.78**	372	143:229	>.0001
t-3	-0.64%	2.90**	372	146:226	>.0001
t-2	-0.46%	2.16*	372	169:203	0.0435
t-1	-0.89%	3.45***	372	130:242	>.0001
t-0	-6.38%	12.47***	372	87:285	>.0001
t+1	-6.12%	9.96***	372	99:273	>.0001
t+2	0.51%	1.54	372	177:195	0.1891
t+3	-0.41%	1.61	372	146:226	>.0001
t+4	-0.17%	0.71	372	154:218	0.0005
t+5	-0.27%	1.09	372	151:221	0.0002
t+6	-0.10%	0.42	372	157:215	0.0015
t+7	0.01%	0.05	372	158:214	0.0021
t+8	0.04%	0.21	372	166:206	0.0215
t+9	-0.24%	1.02	372	146:226	>.0001
t+10	-0.25%	1.14	372	170:202	0.0539
***significant at 0.001					
**significant at 0.01					
*significant at 0.05					

Over these two days the *CAAR* of the sample displays consecutive decreases of -6.38% and -6.12% respectively. These negative returns are approximately 7 times larger than any other one-day price abnormal return experienced in the pre-event period and correspondingly record the highest *t*-statistics. It is also worth noting that on each of these two days the number of individual stocks experiencing negative abnormal returns outweighed those with positive abnormal returns by a ratio of approximately 3:1. Another interesting point to note from Table 3.1.2 is that throughout the extended event window period for each day, including those that exhibit positive daily abnormal returns the number of individual stocks experiencing negative abnormal returns outweighed those with positive abnormal returns. This finding means that, while in some instances the daily mean abnormal return may be positive, the daily median abnormal return remains negative, indicating a positive skewness in the distribution of abnormal returns. The significance of the abnormal returns observed immediately following the warning announcement (t_0 to $t+1$) can be clearly seen in figures 3.1.2 and 3.1.2c.

Figure 3.1.2 : Daily Average Abnormal Returns over the extended event window $t-10$ to $t+10$

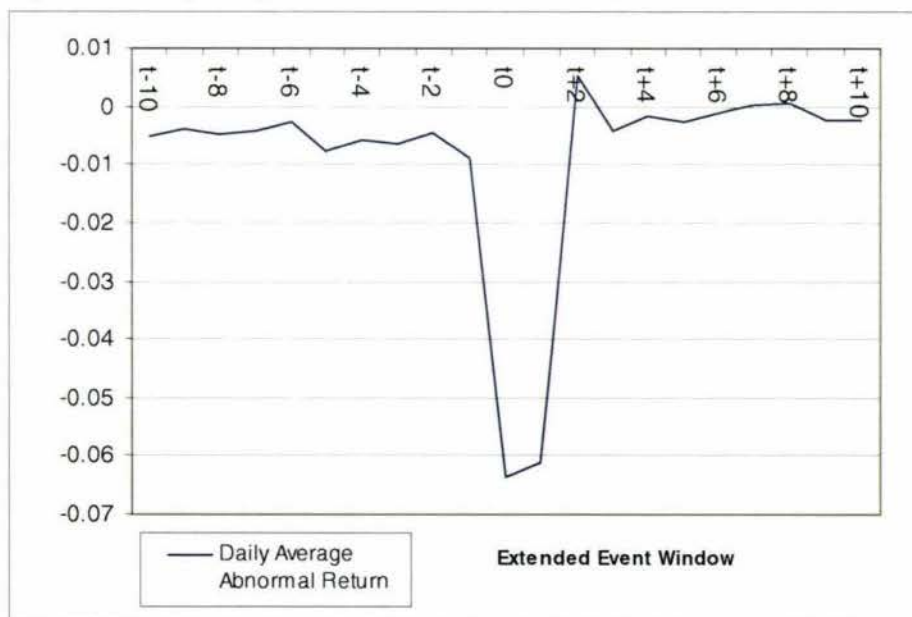
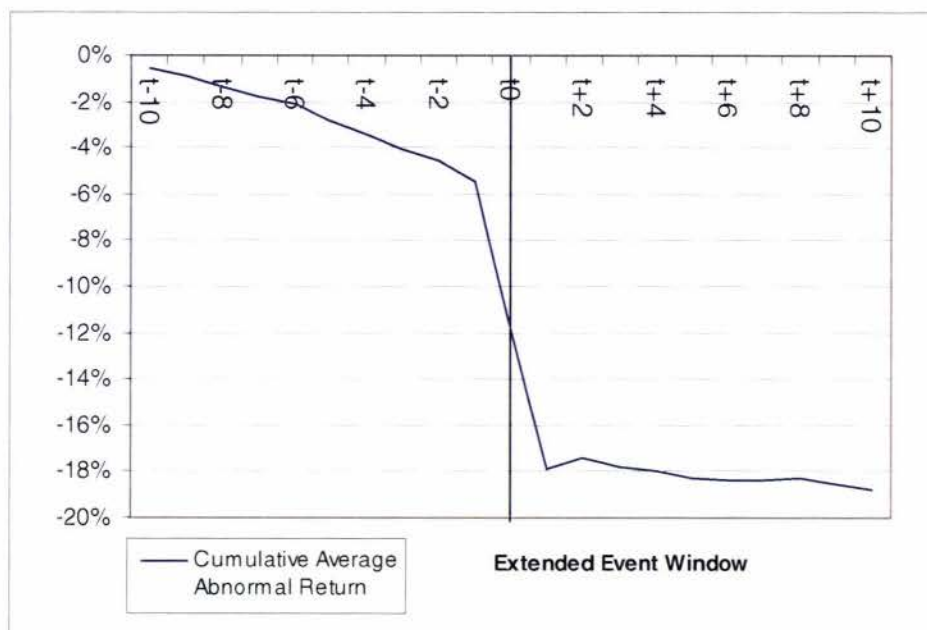


Figure 3.1.2a : CAAR over the extended event window $t-10$ to $t+10$



In figure 3.1.2, a sharp decrease in the *daily* average abnormal return of the sample on days t_0 (the Event Date) and $t+1$ (the day immediately following the announcement) are clearly evident. This observation is mirrored in Figure 3.1.2a, which displays the *cumulative* average abnormal returns for the sample over the same period.

The finding of a sharp decrease in a company's stock price immediately following the issuance of an earnings warning is not overly surprising. This finding is consistent with the efficient markets hypothesis, which asserts that, "An efficient capital market makes *immediate* and efficient use of all information available to it" Corrado (2000, p 15). The reaction can be assumed to be immediate even though it appears to occur over a 2-day period t_0 to $t+1$, this is due to the data available being unable to provide the time at which the earnings warnings announcement were made. As these announcements may be made after the close of trading it is fair to assume that the abnormal negative returns witnessed

on day t_0 occurred to firms issuing their warning announcement during or before trading hours, while the abnormal negative returns witnessed on day $t+1$ relate to firms who announced after the close of business and the resulting stock price reaction occurred the following trading day. The fact that the response is negative is also not surprising given the established positive correlation between company earnings and the firms stock price outlined in the introduction to this report.

Conclusion:

- The market response to the negative news content in an earnings warning announcement is both immediate and significant.

3.1.3 The Post-Event Period

The post-event period is the key area of focus for this study. The objective is to determine how the market values the stock of a company issuing an earnings warning once the initial 2-day event window has passed. Section 3.1 identified a statistically significant negative *CAAR* over the post-event period of -6.1% . This section takes a closer look at the timing and composition of this negative performance over the post-event period. Figure 3.1.3 displays the cumulative average abnormal returns observed over the post-event period. The *CAAR* of the sample has been linearly regressed against the number of days following the end of the 2-day event window and the trendline added.

Figure 3.1.3 : Cumulative Average Abnormal Returns over the post-event period (t+1 to t+251)



Table 3.1.3 : Five Phases of post event drift

Period	CAAR	t-statistic	N	Pos:Neg	Prob
t+1 to t+22	-0.4%	0.41	372	160:212	0.0041
t+23 to t+61	-5.1%	2.25*	372	136:236	>.0001
t+62 to t+152	3.6%	1.36	372	178:194	0.8109
t+153 to t+230	-5.6%	1.95*	372	163:209	0.0098
t+231 to t+251	1.3%	0.49	372	180:192	0.2843
Total	-6.1%				

***significant at 0.001
**significant at 0.01
*significant at 0.05

The negative trend observed over the post-event period is both clear and significant ($R\text{-square} = 0.547$), however, it is also clear that this overall underperformance relative to the market is not homogenous over time but rather is made up of a number of distinct periods of under, over, and neutral performance.

In figure 3.1.3 the post event period has been broken-down into five separate ‘phases’, which are discussed below.

Phase 1 ($t+2$ to $t+22$) : CAAR = -0.4%

Figure 3.1.3a : Cumulative Average Abnormal Return for the post-event period $t+2$ to $t+22$

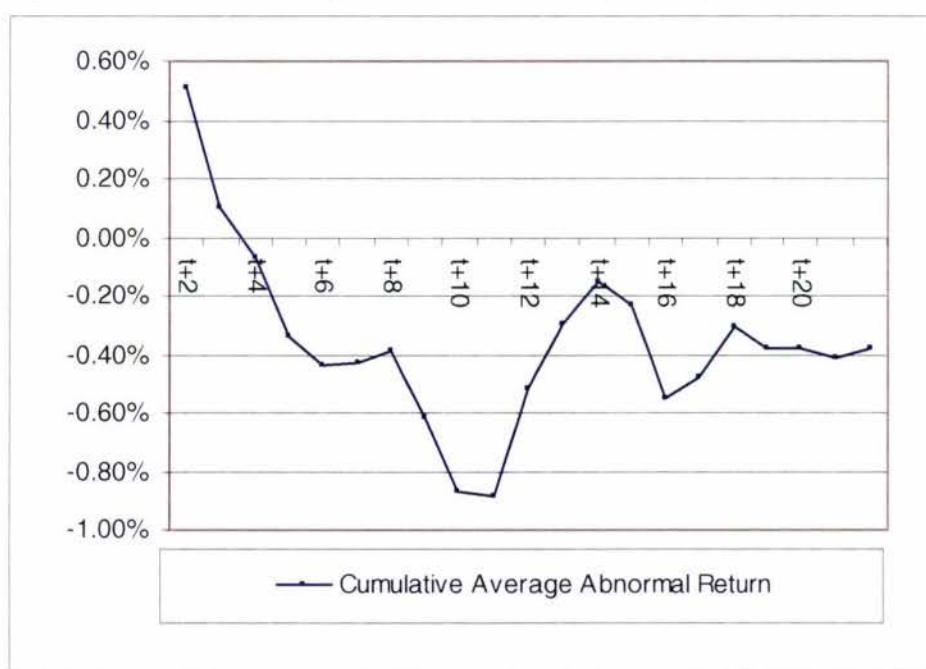
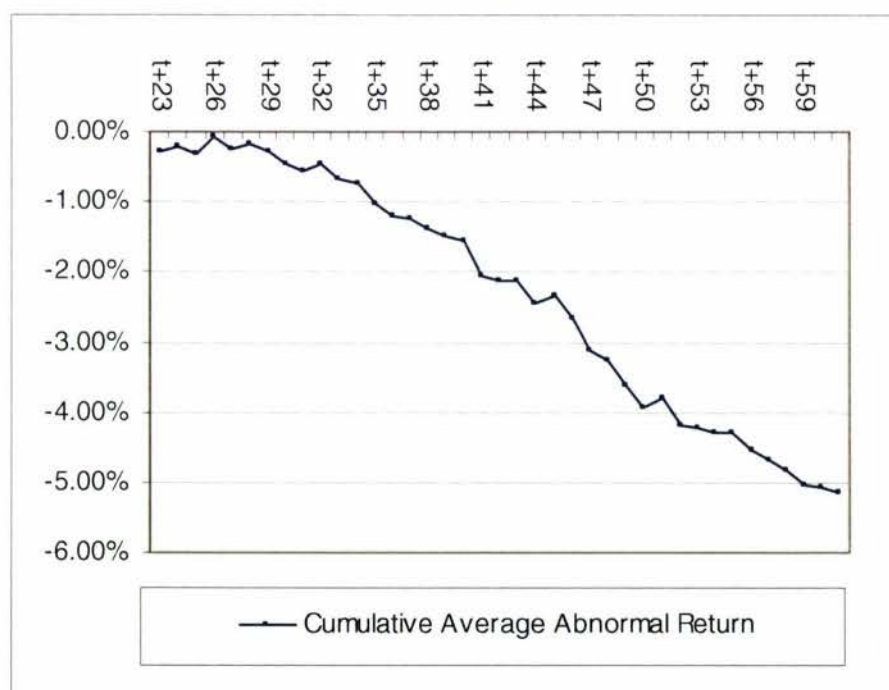


Figure 3.1.3a displays the cumulative average abnormal return for the post-event period $t+2$ to $t+22$, or approximately the first month of the post-event period. It is interesting to note that for the sample examined there is an observed AAR of approximately +0.5% on the first day following the end of the event window as the stock prices on average ‘bounce back’ from the initial sharp drop observed during the event window. However, this gain is almost entirely reversed the following day, with companies in the sample continuing to display negative abnormal returns for most of the following two weeks. The stock prices observed then recover somewhat to finish the first month of the post-event

period recording a *CAAR* of approximately -0.38% . The volatility over this period combined with the relatively small size of the overall *CAAR* for the month means the observed return is not significantly different from zero. On average the stock price of companies issuing an earnings warning effectively performs in line with the market for the first month following the warning event. It would seem the market believes the initial correction to the stock prices, which has occurred during the event window, has fully incorporated the negative news contained in the warning announcement. Alternatively the lack of selling pressure may be due to investors waiting to see if there may be any mean-reversion resulting from the initial sharp price fall associated with the earnings warning announcement.

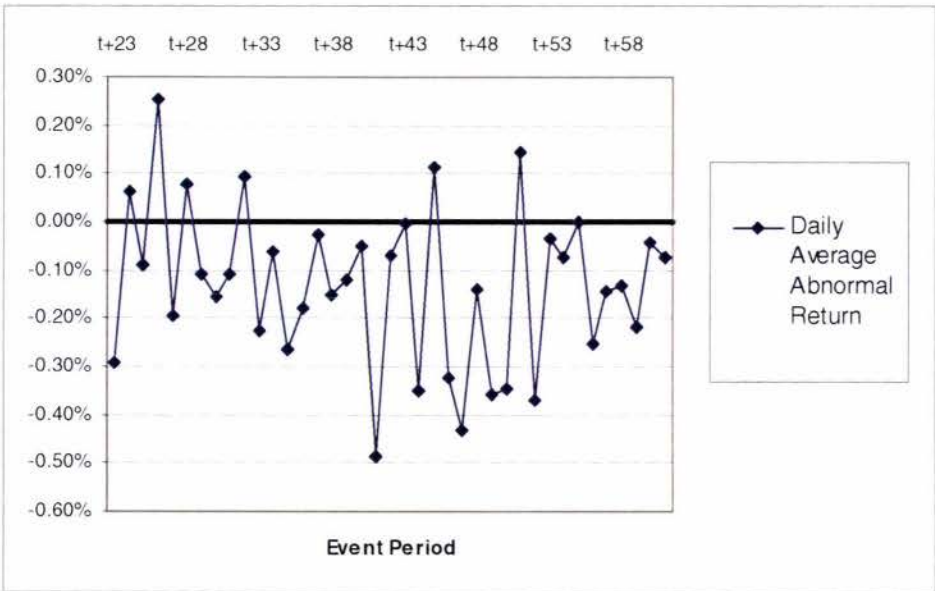
Phase 2 (t_{+22} to t_{+61}) : *CAAR* = -5.11%

Figure 3.1.3b : Cumulative Average Abnormal Return for the post-event period t_{+23} to t_{+61}



It is in the second and third months following the earnings warning announcement that the bulk (approximately 83%) of the post-event drift observed in section 3.1 occurs. As can be seen from figure 3.1.3b (previous page) the occurrence of a negative CAAR throughout this period is clear, persistent and statistically significant (at 0.05). There are only 6 of the 38 days in this sub-period where the daily average abnormal return for the sample is observed to be positive (see figure 3.1.3c).

Figure 3.1.3c : Daily Average Abnormal Return for the post-event period t+23 to t+61



This delayed price response to the negative information content of an earnings warning announcement is consistent with both the Conservatism model present by Barberis et al. (1998) and the self-attribution theory put forward by Daniel et al. (1998) which are described in the literature review above.

Phase 3 (t_{+62} to t_{+152}) : $CAAR = 3.61\%$

In the third sub-period examined the sample begins to exhibit some mean-reverting tendencies, with the $CAAR$ recovering 3.6% over a period of approximately 3 to 4 months, however this result is not statistically significant at 0.05. This upswing may be the result of 'bargain-hunters' purchasing what they see as undervalued stocks (at this stage the stocks in the sample have on average fallen by approximately 50% in a year, relative to the market).

Phase 4 (t_{+153} to t_{+230}) : $CAAR = -5.61\%$

In this the fourth post-event period examined the stocks in the sample record the lowest $CAAR$ observed in the study, -7.57% as measured from the start of the post event period, and -51.77% from the start of the pre-event period. The -5.61% decrease in the $CAAR$ over this approximately 4-month sub-period is significant at 0.05. It is difficult to determine how much of the observed decrease in the samples $CAAR$ over this period can be attributed to a protracted incorporation of the negative news contained in the earnings warnings issued some 7 to 8 months early and how much may be due to 'profit-takers' selling their holdings to take advantage of the positive abnormal returns experienced by the sample stocks over the preceding 3 to 4 months. The fact that the fall relative to the market in this sub-period was greater than the rise in the previous sub-period would indicate that it is probably the result of a combination of the two factors described.

Phase 5 (t_{+231} to t_{+251}) : $CAAR = 1.35\%$

In this the final phase of the post event period the stocks in the sample recover somewhat to finish with a $CAAR$ of -6.1% for the 250 days following the end of the event window.

Conclusions:

While the possible existence of mean-reversion or contrarian trends within the data over the post-event period provides interesting grounds for theoretical discussion, it remains difficult to quantify what proportion of this activity can be attributed to the earnings warning event and how much can be associated with other market factors, or otherwise ill-defined aspects of market psychology. However, what does seem apparent from the results and analysis above are the three following conclusions:

- There is strong evidence of negative post-event drift in the stock prices of companies issuing an earnings warning for a period lasting for up 1 year subsequent to the warning being issued;
- On average the stock prices of companies issuing an earnings warning perform in line with the market for the first month subsequent to the warning being issued;
- The majority of the post-event drift in the stock prices of companies issuing an earnings warning is concentrated in the 2nd and 3rd months subsequent to the warning being issued.

To clarify these points it may be helpful to consider a smaller section of the post-event period, specifically the period 4 months immediately following the end of the event window.

Figure 3.1.3d : Cumulative Average Abnormal Return for the post-event period t+2 to t+80.

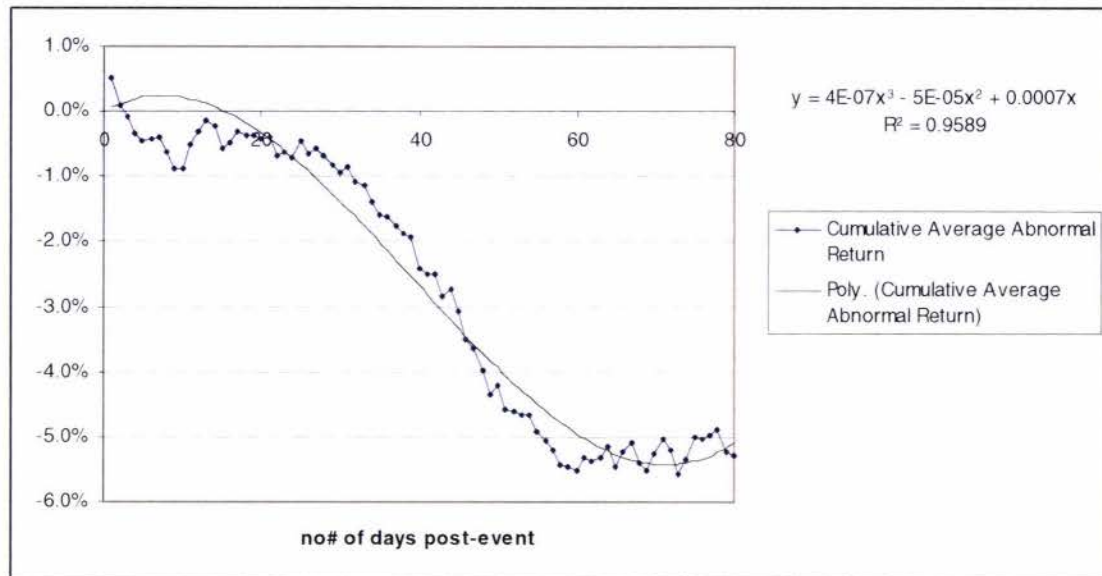
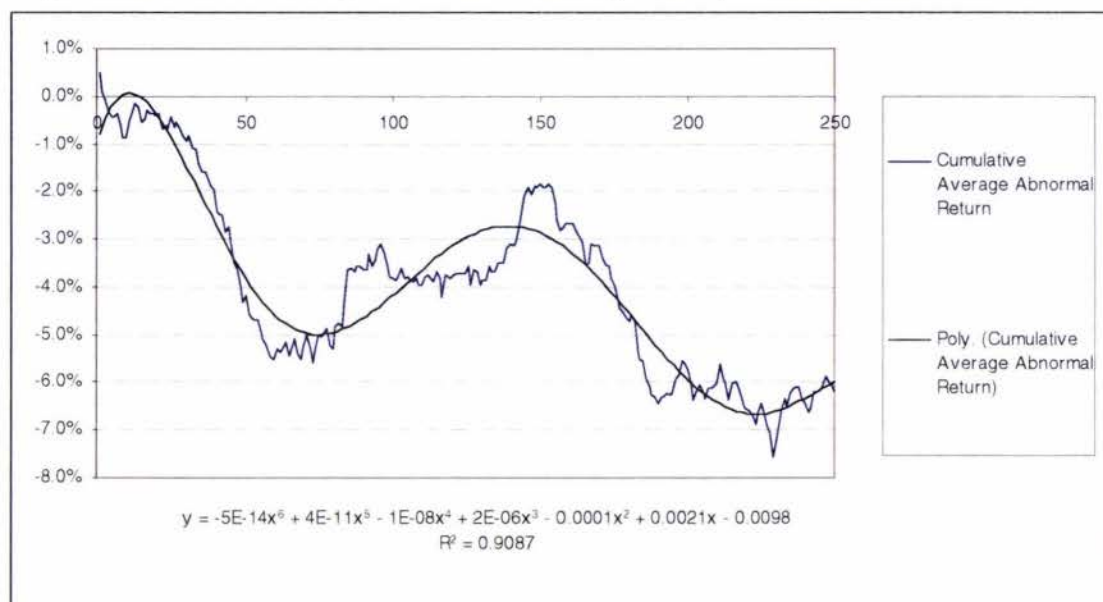


Figure 3.1.3d highlights the key points of the discussion above, it reiterates: the first month following an earnings warning announcement the stock prices of firms issuing an earnings warnings effectively track the market return, then drop away steadily for a period of approximately 2 months, before stabilising. It is possible to fit a 3rd order polynomial trendline to the regressed data which displays a very strong 'fit', recording an R-square = 0.9589.

By way of comparison figure 3.1.3e (following page) displays the full post-event period CAAR for the sample regressed against time fitted with a 6th order polynomial trendline (R-square = 0.9087).

Figure 3.1.3e : Cumulative Average Abnormal Return for the post-event period t+2 to t+250.



3.2 Comparison of Exchange (NYSE v NASDAQ)

Section 3.2 splits the sample into two portfolios, the first comprised of stocks within the sample that are listed on the NYSE, and the second with those which are listed on the NASDAQ. The purpose is to examine the stock price behaviour of the two portfolios surrounding the earnings warning events in order to determine if there is any statistically significant difference which may be attributed to the exchange on which a company's stock is listed. The null and alternate hypotheses tested are as follows:

Hypothesis H_{N4} : There is no significant difference in the stock price reaction to an earnings warning of companies listed on different exchanges.

Hypothesis H_{A4} : The stock prices of companies listed on different exchanges react differently to an earnings warning event.

The CAAR of each of the two exchange-based portfolios are displayed in figure 3.2 and the key statistics in table 3.2.

Figure 3.2 : NYSE v NASDAQ Cumulative Average Abnormal Returns for event period t-250 to t+250

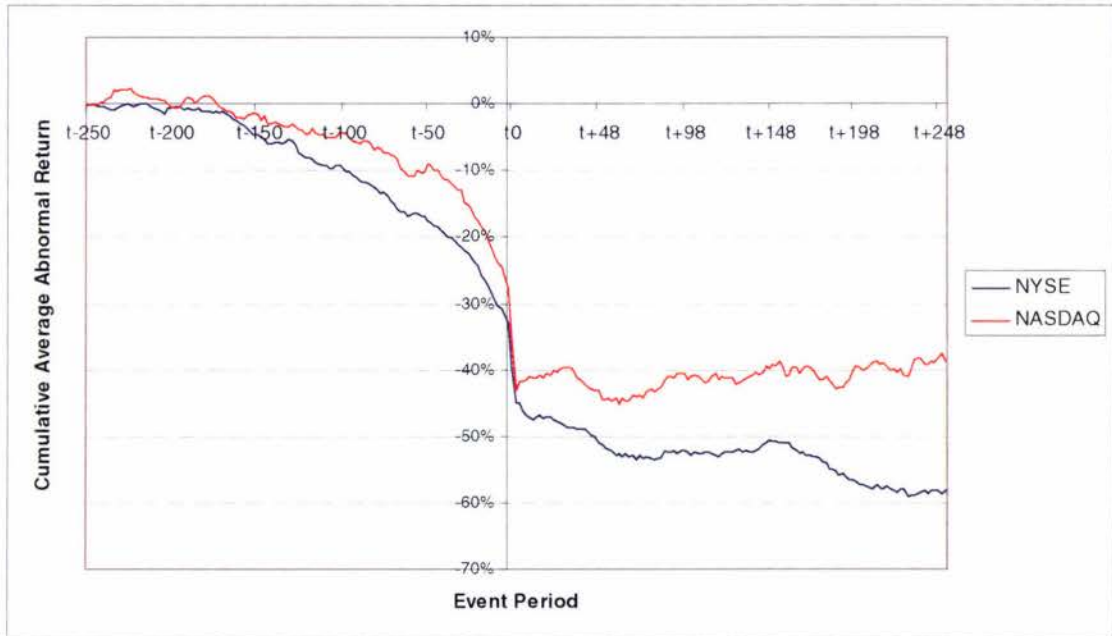


Table 3.2 : NYSE v NASDAQ Cumulative Average Abnormal Returns for event period t-250 to t+250

Period	NYSE					NASDAQ				
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-1	-32.8%	13.15***	222	36:186	>.0001	-29.0%	6.70***	151	34:117	>.0001
t 0 to t+1	-11.1%	14.31***	222	29:193	>.0001	-14.5%	11.79***	151	23:128	>.0001
t+2 to t+251	-13.6%	4.06***	222	76:146	>.0001	4.8%	0.96	151	80:71	0.79207
Total	-57.6%					-38.7%				
Rsize	-19.5%					-15.9%				
P/E	21.27					25.36				
***significant at 0.001 **significant at 0.01 *significant at 0.05										

Analysis of the results displayed in table 3.2 indicates that both stocks listed on the NYSE and the NASDAQ display similar behaviour over the pre-event period, each producing CAAR's of approximately -30% (significant at 0.001). Through the event window the behaviour of the two portfolios is also similar, NYSE listed stocks record a

CAAR of -11.1% and NASDAQ listed stocks a CAAR of -14.5%. The most interesting result observed in this section relates to the post-event behaviour of the two portfolios. Over the post-event period the portfolio comprised of NYSE listed stocks recorded a *negative* CAAR of -13.6% (significant at 0.001), while NASDAQ listed stocks recorded a *positive* CAAR of +4.8%, although there was no evidence to suggest that this result was significantly different from a zero return. The Analysis of Variance provided in table 3.2a provides strong evidence ($p = 0.0016$) to reject the null hypothesis, H_{N4} , that there is no significant difference in the stock price reaction to an earnings warning of companies listed on different exchanges.

Table 3.2a : Post-event Analysis of Variance

Anova: Post Event Cumulative Abnormal Returns NYSE v NASDAQ

SUMMARY				
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
NASDAQ	150	7.2267263	0.0481782	0.3780516
NYSE	222	-30.23699	-0.136203	0.2501395

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	3.0432167	1	3.0432167	10.088566	0.0016172	3.8667167
Within Groups	111.61053	370	0.3016501			
Total	114.65375	371				

This result could be seen as indicating the NASDAQ is a more informationally efficient market than the NYSE, in that it immediately and fully incorporates new information into stock prices, while the NYSE incorporates news over an extended time period. Alternatively this result may be due to investors giving greater weighting to a company's growth prospects than current earnings when valuing NASDAQ listed stocks, meaning

that the overall response to an earnings warning is smaller and easier to incorporate into current prices than for the value stocks listed on the NYSE.

Conclusion:

- On average, stocks listed on the NYSE experience post-event drift following an earnings warning while NASDAQ listed stocks do not.

3.3 Effect of Market Capitalisation

In this section the effect of firm size, as measured by market capitalisation, on stock price behaviour surrounding an earnings warning is investigated. The sample population is split into two portfolios, those with market capitalisation of less than US\$625 million and those with market capitalisation of greater than US\$625 million. The figure of US\$625 million has no significance in itself other than to allow the sample population to be split into 2 numerically equal groups of 186. The null and alternate hypotheses tested are as follows:

Hypothesis H_{N5} : There is no significant difference in the stock price reaction to an earnings warning of companies of different size.

Hypothesis H_{A5} : The stock prices of companies of different size react differently to an earnings warning event.

The observed CAAR's of the two portfolios over the event period are displayed below in figure 3.3, and the key statistics in table 3.3.

Figure 3.3 : Cumulative Average Abnormal Returns for High and Low Capitalisation stocks.

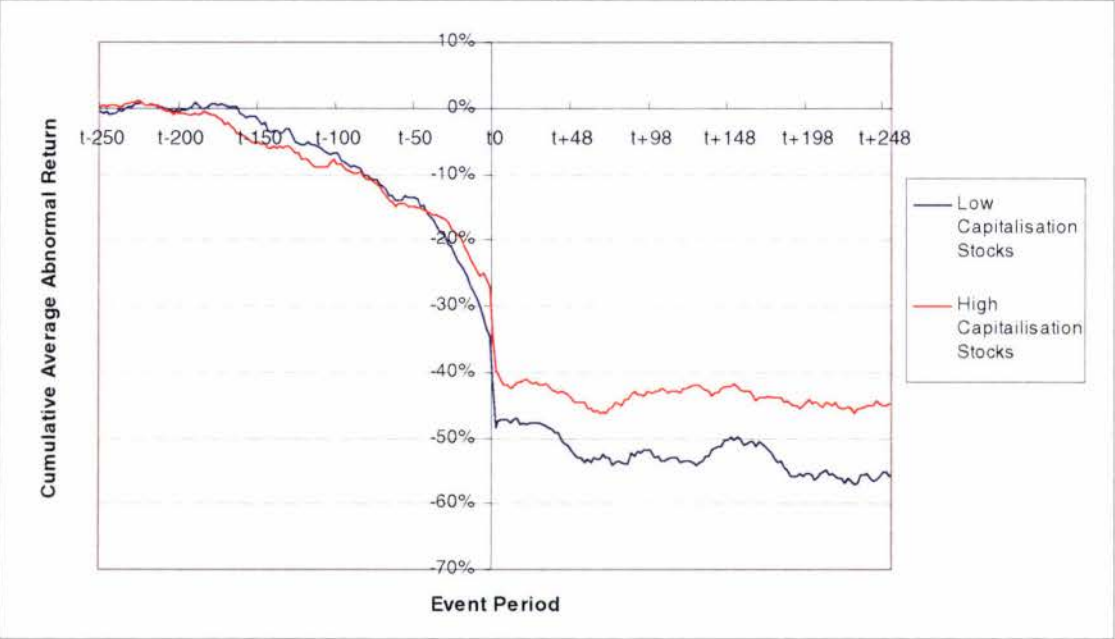


Table 3.3 : Cumulative Average Abnormal Returns for High and Low Capitalisation stocks.

Period	Low capitalisation stocks					High capitalisation stocks				
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-1	-34.6%	9.84***	186	36:150	>.0001	-27.9%	12.21***	186	33:153	>.0001
t 0 to t+1	-13.6%	13.29***	186	29:157	>.0001	-11.4%	13.66***	186	31:155	>.0001
t+2 to t+251	-7.0%	2.35*	186	75:111	>.0001	-5.4%	1.54	186	75:111	>.0001
Total	-55.1%					-44.8%				
***significant at 0.001 **significant at 0.01 *significant at 0.05										

While it can be seen from table 3.3 that the portfolio of low capitalisation stocks records consistently lower CAAR's across all three time periods examined than the portfolio of high capitalisation stocks, both sets of returns are fairly similar. For both portfolios the CAAR's observed are approximately: -30% in the pre-event period (significant at 0.001), -10% to -15% during the event window (also significant at 0.001), and -5% to -7% over

the post-event period. In the post-event period the *CAAR* of the portfolio of low capitalisation stocks is -7.0% and is significant at 0.05, while the *CAAR* of the high capitalisation group is lower at -5.4% and is not statistically significant. The Analysis of Variance displayed in table 3.3a shows there to be no evidence of any significant difference between the two data sets over this period.

Table 3.3a : Analysis of Variance High v Low Capitalisation stocks

Anova:

Post-event Cumulative Average Abnormal Returns
High v Low Capitalisation stocks

SUMMARY

Groups	Count	Sum	Average	Variance
Low Capitalisation	186	-10.05686	-0.054069	0.2744051
High capitalisation	186	-12.9534	-0.069642	0.345223

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.0225536	1	0.0225536	0.0727972	0.7874572	3.8667167
Within Groups	114.63119	370	0.309814			
Total	114.65375	371				

Analysis of the post-event *CAAR*'s to the two portfolios (figure 3.3a) indicates that the possible mean revision, or contrarian trends observed in section 3.1.3 appear to be present in the post-event *CAAR*'s of both the high and low capitalisation portfolios. For both the high and low capitalisation portfolios the majority of the post-event drift experienced over the 250-day post-event period occurs within the first three to four months following the end of the event window. The stock prices of both portfolios then appear to recover somewhat over the next four to five months before falling away again towards the end of the period. One small area of difference can be observed by focusing on the first 80 days

of the post-event period (approximately four months) which the period in which the majority of the post-event drift occurs.

Figure 3.3a: Cumulative Average Abnormal Returns for the period t+2 to t+251 – High v Low Capitalisation stocks

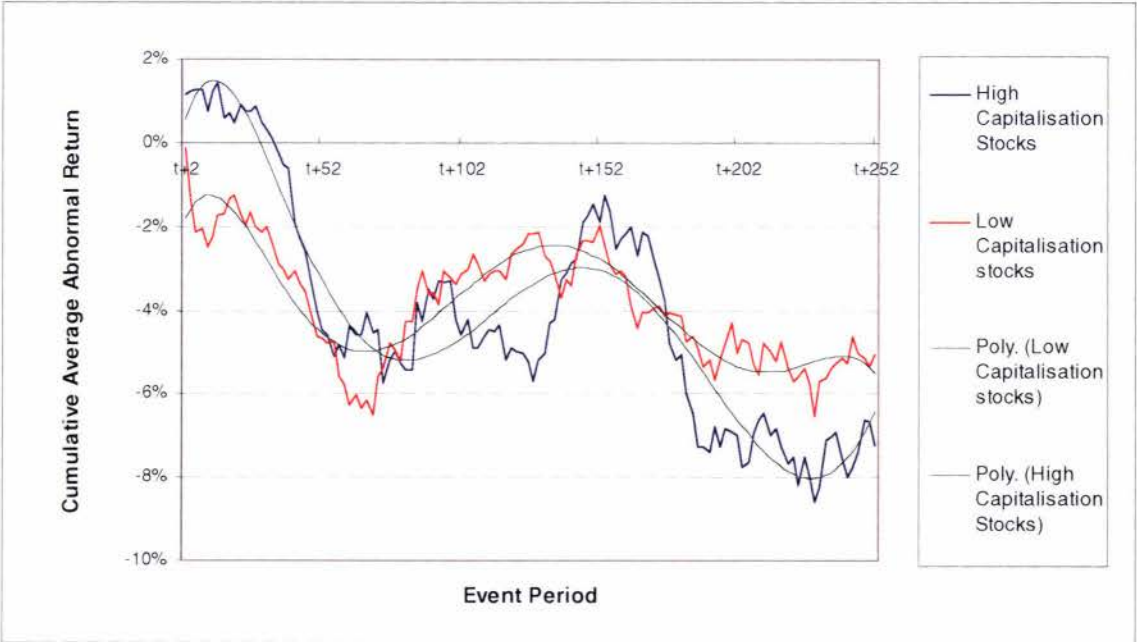
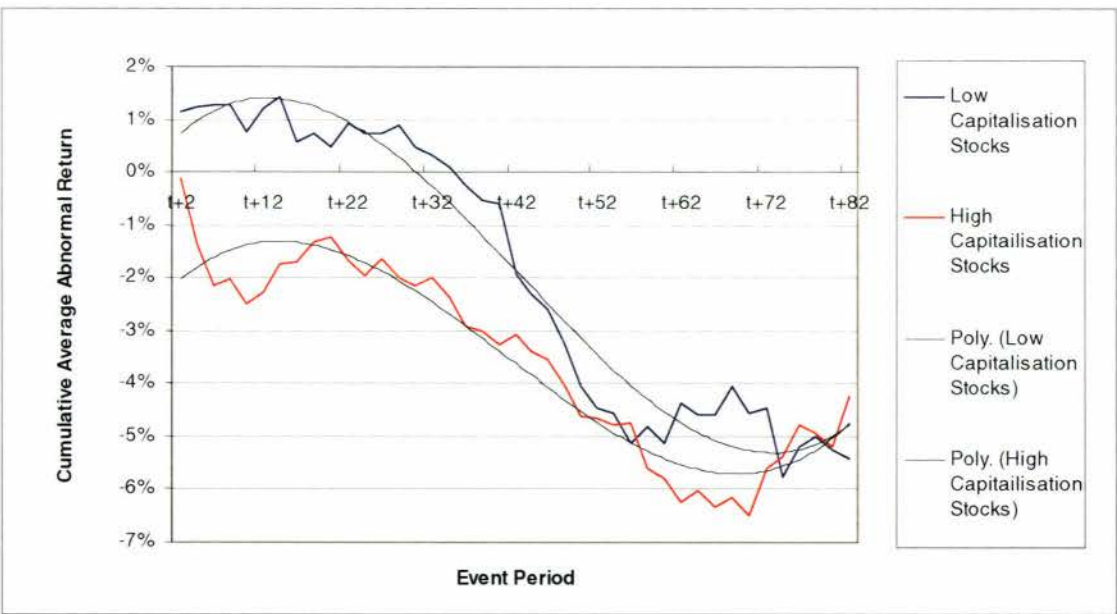


Figure 3.3b: Cumulative Average Abnormal Returns for the period t+2 to t+81 – High v Low Capitalisation stocks



In figure 3.3b it can be seen that low capitalisation stocks initially 'bounce back' from the price drop experienced during the event window and demonstrate a positive *CAAR* of up to 1.5% over the first two to three weeks of the post-event period. For the low capitalisation portfolio it appears to take approximately two months before the post-event drift observed eventually begins to set in. Conversely, the average stock price of the high capitalisation portfolio drops sharply in the days immediately following the end of the event window to record a *CAAR* of up to -2.5% over the first two weeks of the post-event period. Despite these differing beginnings to the post-event period the *CAAR*'s of both portfolios eventually drop to approximately -5% after three months before beginning to stabilise. While this result is interesting the difference between the *CAAR*'s of the two portfolios is not statistically significant. The principle result of this section is, therefore, that there is not sufficient evidence to be able to reject the null hypothesis H_{NS} , that there is no significant difference in the stock price reaction to an earnings warning of companies of different size.

Conclusion :

- There is no significant difference in the stock price reaction to an earnings warning of companies of different size.

3.4 The Price/Earnings Effect

Section 3.4 splits the sample population into two portfolios, the first comprised of stocks with a P/E ratio of 15.6 or less immediately prior to the warning event, and the second comprised of those stocks with a P/E ratio of greater than 15.6. The figure of 15.6 has no significance in itself other than to allow the sample population to be split into 2 numerically equal groups of 186. The purpose of this section is to examine the data for evidence of what Basu (1977) described as the 'P/E effect', that excess returns are positively related to the firms price/earnings ratio. In this instance the company's P/E ratio is used as a proxy for the markets estimation of its growth prospects. 'Growth' companies typically have a higher P/E ratio implying the valuation of their stock price relies heavily on the expectation of future dividend growth, as opposed to the present rate of dividends. Conversely the price of 'Value' stocks is more closely related to their current level of dividends. The rationale for employing the firm's P/E ratio as a conditioning variable is to see if the market interprets the information content of an earnings warning differently for stocks with differing expectations of future earnings growth. The null and alternate hypotheses tested are as follows:

Hypothesis H_{N6} : There is no significant difference in the stock price reaction to an earnings warning for companies with different P/E ratios.

Hypothesis H_{A6} : The stock prices of companies with different P/E ratios react differently to an earnings warning event.

The CAAR's of each of the P/E ratio based portfolios are displayed in figure 3.4 and the key statistics in table 3.4.

Figure 3.4 : Cumulative Average Abnormal Returns for High and Low P/E stocks.

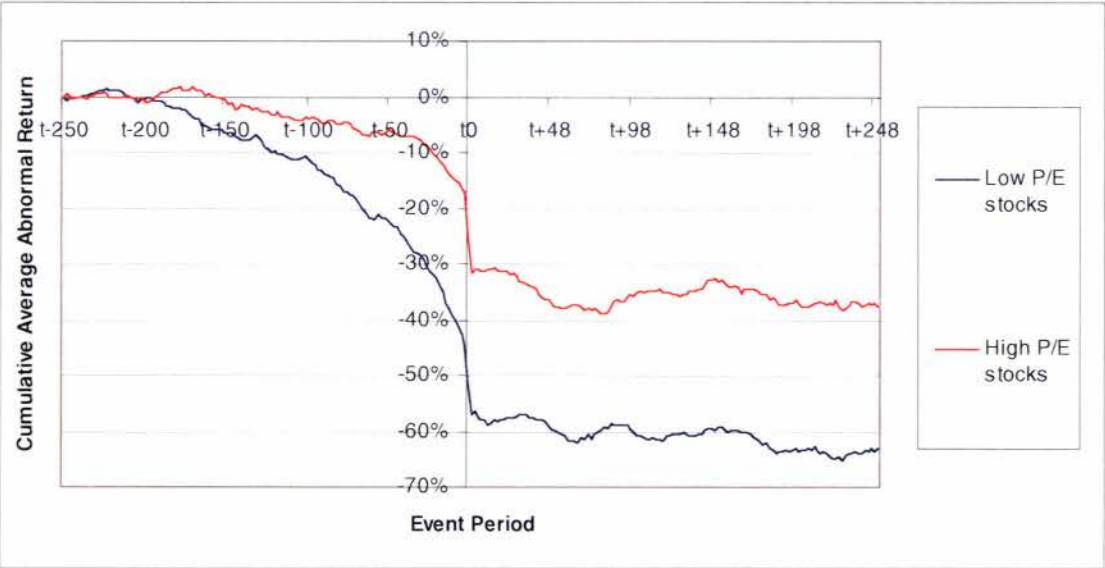


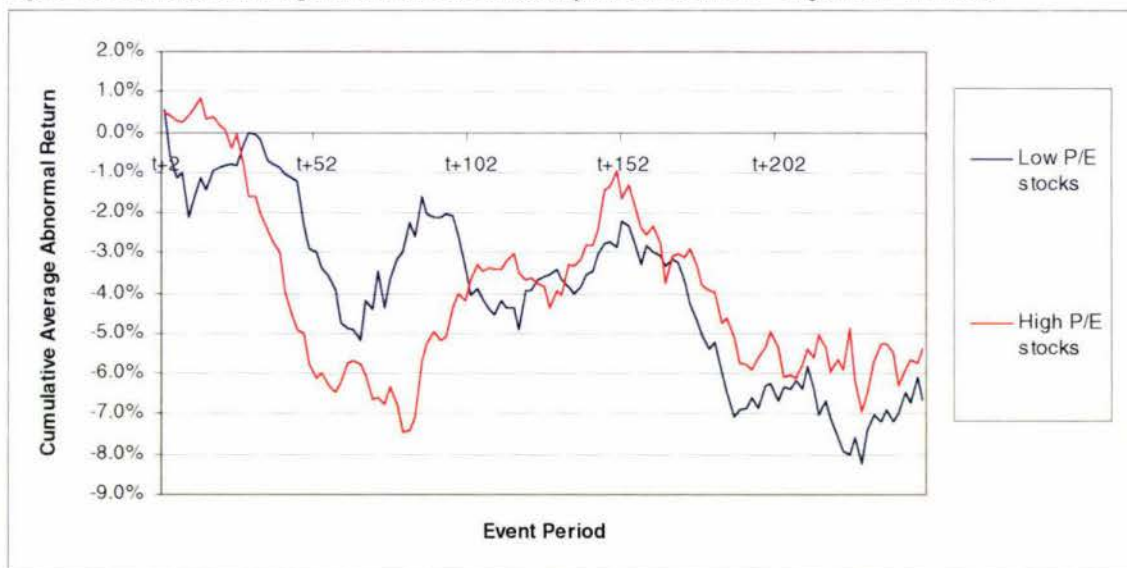
Table 3.4 : Cumulative Average Abnormal Returns for High and Low P/E stocks.

Period	Low P/E stocks					High P/E stocks				
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-1	-45.3%	16.21***	186	16:170	>.0001	-17.3%	5.11***	186	53:133	>.0001
t 0 to t+1	-11.6%	12.46***	186	27:159	>.0001	-13.4%	13.32***	186	24:162	>.0001
t+2 to t+251	-6.8%	1.67	186	78:108	>.0001	-5.6%	1.36	186	77:109	>.0001
Total	-63.7%					-36.2%				
***significant at 0.001 **significant at 0.01 *significant at 0.05										

Table 3.4 shows that the portfolio comprised of stocks with low P/E ratios immediately prior to the earnings warning announcement has a significantly lower CAAR across the pre-event period than the high P/E portfolio. This result is not surprising given that the firm's pre-event stock price is a factor in both the construction of the portfolios (P/E ratio) and the measurement of results (CAAR's). What is interesting in the stock price

behaviour of the two portfolios over the event window and post-event periods is not the difference in the portfolio *CAAR*'s but the similarities. Observed event window *CAAR*'s for the high and low P/E portfolios are -13.4% and -11.6% respectively (both significant at 0.001). In the post-event period both portfolios record *CAAR*'s of approximately -6% , though neither result is statistically significant. The similarity in the post-event stock price behaviour of the two portfolios becomes more evident when the *CAAR*'s are displayed from $t+2$ to $t+251$ (figure 3.4a). The two time series move together almost in tandem as they first drop, then recover and then drop again over the post-event period, again displaying evidence of the mean-reverting tendencies observed in the full sample.

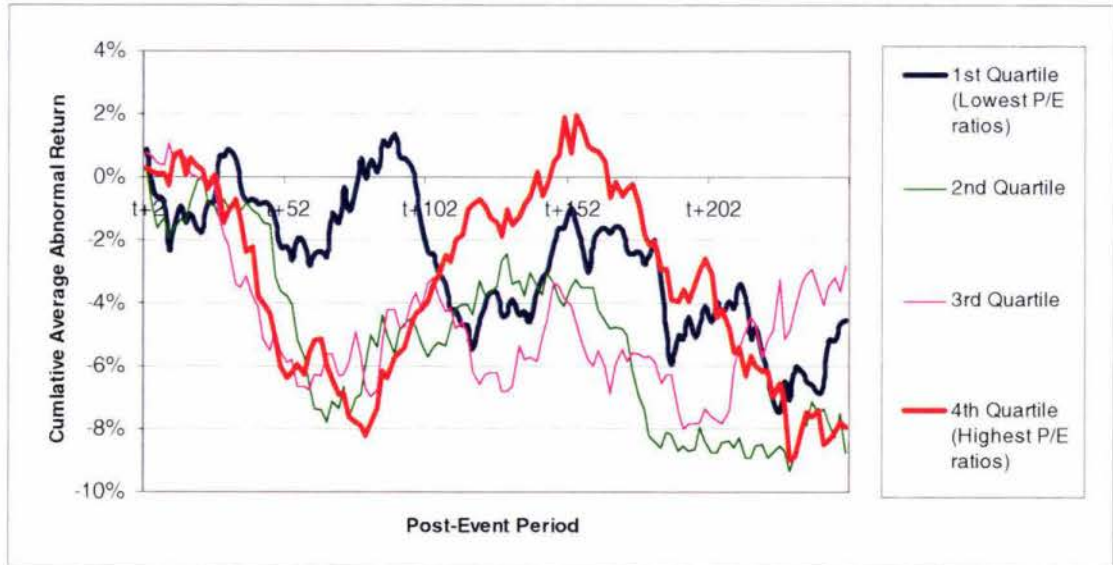
Figure 3.4a: Cumulative Average Abnormal Returns for the period $t+2$ to $t+251$ – High v Low P/E stocks



To further extend this analysis the two portfolios considered above are again split to construct four portfolios each representing one quartile of the sample ranked by P/E ratio, from the lowest P/E quartile with an average ratio of 8.75, through to the highest with an

average P/E ratio of 50.58. Figure 3.4b displays the post-event period *CAAR*'s for each portfolio.

Figure 3.4b: Cumulative Average Abnormal Returns for the period $t+2$ to $t+251$ – grouped by P/E ratio



There are two main trends to note from the analysis of the *CAAR* information displayed in figure 3.4b:

- (a) The relatively innocuous stock price behaviour of the lowest P/E quartile portfolio over the first four to five months of the post-event period. Approximately four months after an earnings warning has been announced these ‘value’ stocks have effectively tracked the market return ($CAAR = +0.5\%$), while the *CAAR*'s recorded by each of the other three higher P/E portfolios range from between -6% to -8% . However, the *CAAR* of the lowest P/E quartile does eventually decline and at the end of the post-event period all four portfolios display *CAAR*'s of between -3% to -9% .

- (b) The other striking feature of figure 3.4a is the highly volatile stock price behaviour of the highest P/E, or 'growth', portfolio. The *CAAR* of this portfolio of stocks declines sharply from the end of the event window to -8% after approximately four months, rebounds 10% to be at $+2\%$ seven to eight months following the warning event, and then again drops sharply to end the event period at approximately -8% .

While both of these observations provide grounds for speculation as to possible differences in behaviour of value versus growth stocks, analysis of variances which were carried out on both the two and four portfolio data sets did not find any evidence to reject the null hypothesis H_{N7} , that there is no significant difference in the stock price reaction to an earnings warning for companies with different P/E ratios.

Conclusion :

- There is no significant difference in the stock price reaction to an earnings warning for companies with different P/E ratios.

3.5 Market to Book ratio

Several groups of researchers, such as Lakonishok, Shleifer and Vishny (1994), and Rosenberg, Reid and Lanstein (1985) have found evidence to suggest those stocks with low (high) market to book ratios experience significantly higher (lower) rates of return than average. Section 3.5 examines the full sample of data for evidence of a similar relationship in the stock price behaviour of firms issuing earnings warnings. As with previous sections, the sample population is split into two portfolios. In section 3.5 the first portfolio of stocks is comprised of stocks with a market to book ratio of 1.865 or less immediately prior to the warning event, and the second portfolio is comprised of those stocks with a market to book ratio of greater than 1.865. The figure of 1.865 has no significance in itself other than to allow the sample population to be split into 2 numerically equal groups of 186. The null and alternate hypotheses tested are as follows:

Hypothesis H_{N7} : The stock prices of companies with different market to book ratios do not react differently to an earnings warning event.

Hypothesis H_{A7} : The stock prices of companies with different market to book ratios react differently to an earnings warning event.

The CAAR's of the two portfolios observed over the event period are displayed below in figure 3.5, and the key statistics in table 3.5. Table 3.5 shows that the portfolio comprised of stocks with low market to book ratios immediately prior to the earnings warning announcement have a significantly lower CAAR over the pre-event period than the high market to book portfolio. However, as with the pre-event result observed in section 3.4, it

should be remembered that the firms pre-event stock price is a factor in both the construction of the portfolios (market to book ratio) and the measurement of results (CAAR's) i.e. if a company's stock price had experienced a decline in the year prior to the warning announcement it would have a lower market to book ratio than if its stock price had risen (or experienced a smaller decline).

Figure 3.5 : Cumulative Average Abnormal Returns for High and Low Market to Book stocks.

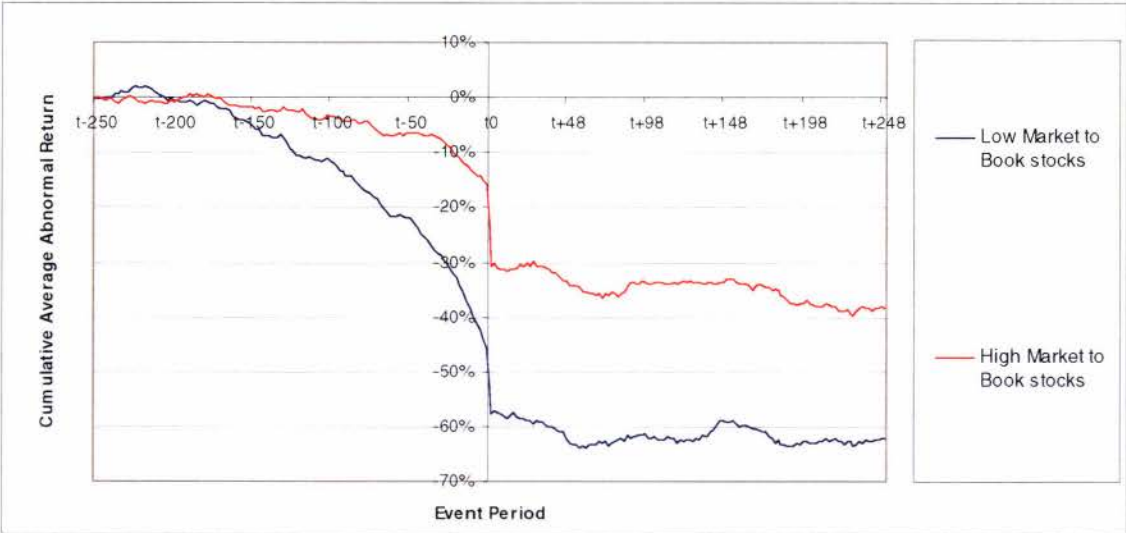


Table 3.5 : Cumulative Average Abnormal Returns for High and Low Market to Book stocks.

Period	High Market to Book stocks					Low Market to Book stocks				
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-1	-16.3%	5.22***	186	50:136	>.0001	-46.2%	15.43***	186	41:146	>.0001
t 0 to t+1	-13.8%	13.19***	186	26:160	>.0001	-11.2%	12.79***	186	25:161	>.0001
t+2 to t+251	-7.6%	1.95*	186	74:112	>.0001	-4.7%	1.11	186	81:105	>.0001
Total	-37.7%					-62.2%				
***significant at 0.001 **significant at 0.01 *significant at 0.05										

The event window and post-event stock price behaviour observed in the two portfolios is similar to that seen in sections 3.3 and 3.4. Both portfolios experience event window CAAR's of approximately -13% (significant at 0.001) and post-event CAAR's of -7.6%

and -4.7% for the low, and high, market to book portfolios respectively. The *t*-statistics of the two post-event *CAAR*'s indicate that the low market to book portfolio return is significantly different from zero (at 0.05) while the high market to book portfolio return is not. However, the results of an Analysis of Variance undertaken to compare the two sets of returns, displayed in table 3.5a, indicates that the difference observed is not of statistical significance ($p=0.618$).

Table 3.5a : Analysis of Variance High v Low Market to Book ratio stocks

Anova: Single Factor	Post-event Cumulative Average Abnormal Returns					
	High v Low market to book stocks					
SUMMARY						
Groups	Count	Sum	Average	Variance		
High market to book stocks	186	-14.18348	-0.076255	0.2819883		
Low market to book stocks	186	-8.826789	-0.047456	0.3373448		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.0771347	1	0.0771347	0.2490894	0.6180136	3.8667167
Within Groups	114.57661	370	0.3096665			
Total	114.65375	371				

This 'lack of difference' in post-event returns between the two portfolios can be more clearly seen in figure 3.5a (following page). The *CAAR*'s of the two portfolios can both be seen to steadily decline over the first three to four months of the post-event period to approximately -6%. Both portfolio *CAAR*'s then proceed to recover somewhat before falling away again over the final four to five months of the post-event period.

To further extend the analysis the two portfolios considered above are again split to construct four portfolios each representing one quartile of the sample ranked by market to book ratio, from the lowest market to book quartile with an average ratio of 0.91, through

to the highest with an average market to book ratio of 6.54. Figure 3.5b displays the observed post-event period CAAR's for each portfolio.

Figure 3.5a: Cumulative Average Abnormal Returns for the period t+2 to t+251 – High v Low P/E stocks

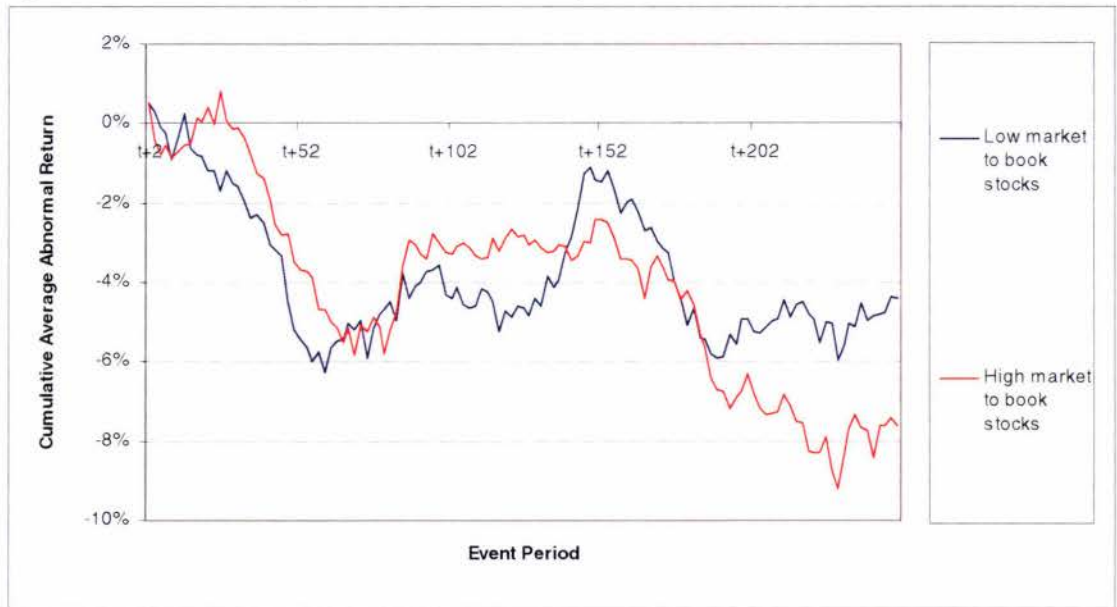
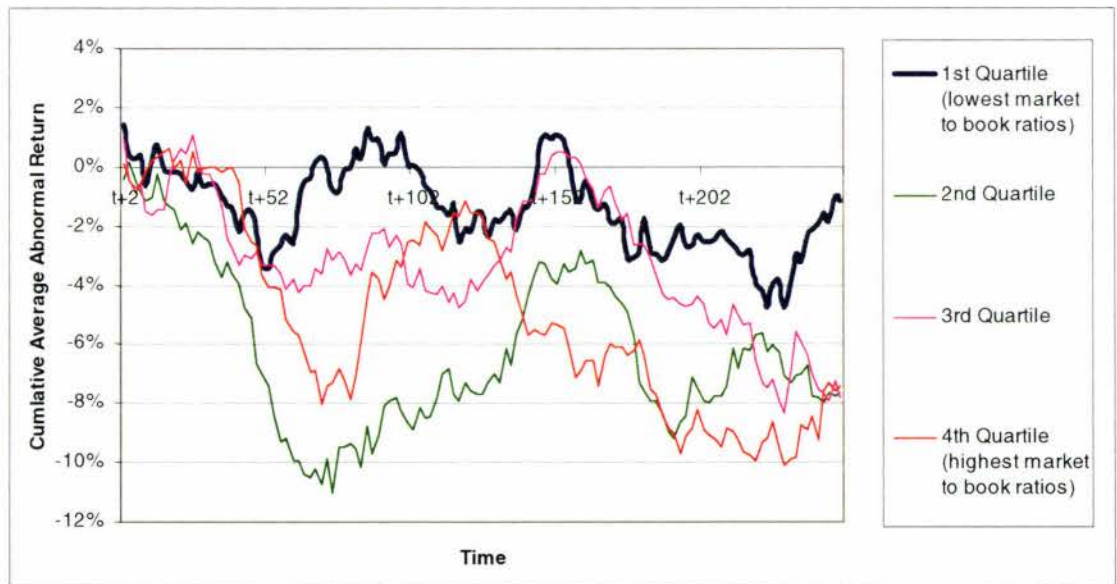


Figure 3.5b: Cumulative Average Abnormal Returns for the period t+2 to t+251 –grouped by market to book ratio



While it is interesting to note that the portfolio with the *lowest* average market to book ratio generally has the *highest CAAR* observed over the post-event period, the overall analysis of the quartile data displayed in figure 3.5b indicates no significant differences between the *CAAR*'s of the four portfolios. The above analysis provides no evidence to reject the null hypothesis H_{N7} , that the stock prices of companies with different market to book ratios do not react differently to an earnings warning event.

Conclusion :

- There is no significant difference in the stock price reaction to an earnings warning for companies with different market to book ratios.

3.6 Size of Earnings Warning

Section 3.6 considers whether the 'size' of an earnings warning has any significant impact on the stock price behaviour of the firm issuing the warning, subsequent to the earnings warning being issued. The size of the warning is measured using a variation of the Standard Unexpected Earnings ratio originally put forward by Foster (1977). A description of how the *SUEs* are calculated is given in section 2.3. However, to put in simple terms a *SUE* ratio of *one* indicates that a firm's earnings are likely to be *one* standard deviation lower than the market expectation, a *SUE* ratio of *two* indicates *two* standard deviations, i.e. the larger the *SUE*, the greater the negative size of the warning announcement. In this section the sample population is initially split into two groups, those with a *SUE* of 0.91 or less, and those with a *SUE* of greater than 0.91. The figure of 0.91 has no significance in itself other than to allow the sample population to be split into 2 numerically equal groups of 186. Two sets of hypotheses are tested, the first is that the stocks in the 'large warning' portfolio should experience a correspondingly larger price reaction over the event window than stocks experiencing 'small' warnings. Therefore, the first set of hypotheses tested is:

Hypothesis H_{N8} : The size of the earnings warning will have no effect on the *CAAR* observed during the event window.

Hypothesis H_{N8} : The size of the earnings warning will have an effect on the *CAAR* observed during the event window (firms with larger warnings will experience larger negative *CAAR*'s).

However, if the full impact of the earnings warning is immediately incorporated into stock prices, the size of the warning should have no impact on the post-event stock price behavior of the two portfolios. The hypotheses tested are therefore:

Hypothesis H_{N9} : The size of an earnings warning will have no effect on the *CAAR* observed over the post-event period.

Hypothesis H_{N9} : The size of an earnings warning will have an effect on the *CAAR* observed over the post-event period (i.e. there will be significant difference in the *CAAR*'s of the two portfolios).

The *CAAR*'s of each portfolio are displayed in figure 3.6, the key statistics in table 3.6.

Figure 3.6: Cumulative Average Abnormal Returns for the period t-250 to t+251 – Small v Large warning stocks

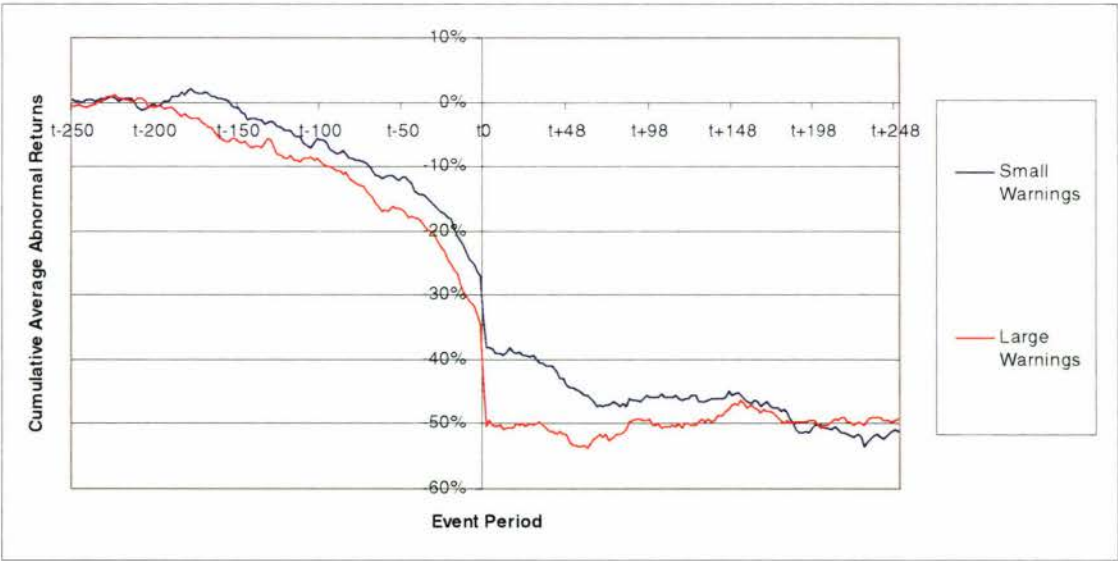


Table 3.6: Cumulative Average Abnormal Returns for the period t-250 to t+251 – Small v Large warning stocks

Period	Small warning stocks					Large warning stocks				
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-1	-28.0%	9.97***	186	39:147	>.0001	-34.5%	11.06***	186	30:156	>.0001
t-1 to t+1	-10.3%	12.14***	186	32:154	>.0001	-14.7%	16.27***	186	19:167	>.0001
t+2 to t+251	-13.2%	3.54***	186	70:116	0.0005	0.8%	0.82	186	85:101	0.1357
Total	-51.5%					-48.4%				

***significant at 0.001 **significant at 0.01 *significant at 0.05

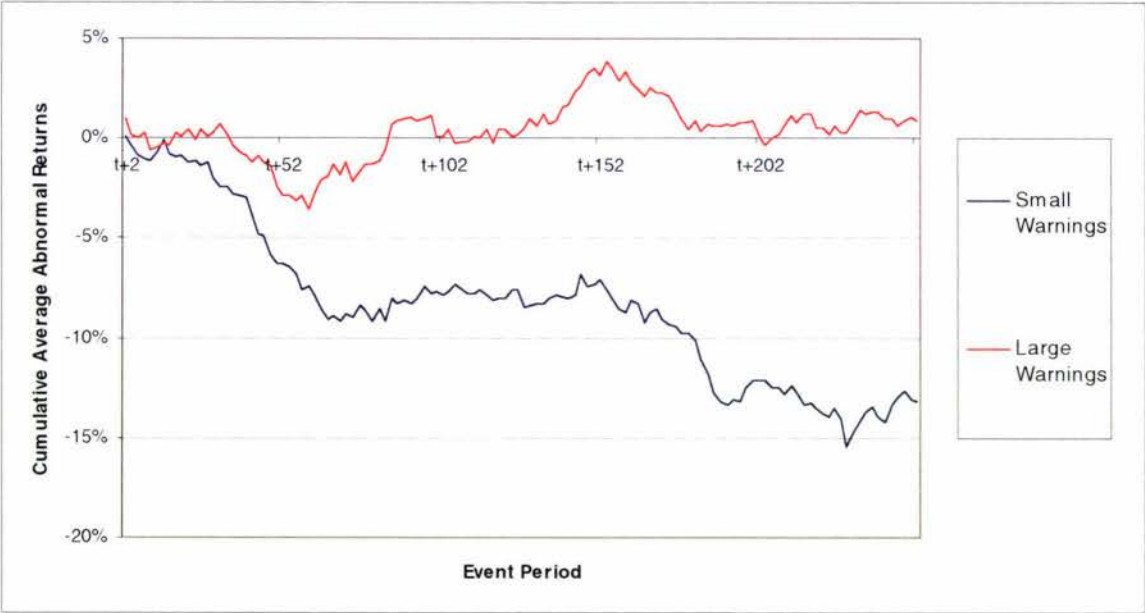
It can be seen from these results that both portfolios of stocks display similar behaviour in the pre-event period, each recording negative *CAAR*'s of approximately -30% (significant at 0.001). While the large warning portfolio does exhibit a larger negative *CAAR* than the small warning portfolio (-34.5% versus -28.0%), an analysis of variance conducted showed this difference not to be statistically significant ($p = 0.156$). However, from the time of the warning announcement onward there is evidence to suggest divergent behaviour between the two portfolios. Over the event window the portfolio of small warning stocks records a *CAAR* of -10.3% compared with a -14.7% for the portfolio of large warning stocks. An analysis of variance was performed on the two data sets for this period and is displayed below in table 3.6a.

Table 3.6a : Analysis of Variance Small v Large warning stocks – Event window

Anova:	Event Window Cumulative Average Abnormal Returns Small v Large warning stocks					
SUMMARY						
Groups	Count	Sum	Average	Variance		
Large Warning	186	-27.40432	-0.147335	0.0182049		
Small Warning	186	-19.078	-0.10257	0.0158403		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.1863648	1	0.1863648	10.948072	0.001029	3.8667167
Within Groups	6.298368	370	0.0170226			
Total	6.4847329	371				

The result of this analysis of variance provides sufficient evidence to be able to reject the null hypothesis H_{N8} , that the size of the earnings warning will have no effect on the *CAAR* observed over the event window, in favour of hypothesis H_{A8} , that the size of the earnings warning will have an effect on the *CAAR* observed over the event window (firms with larger warnings will experience larger negative *CAAR*'s). While this is an interesting result, possibly the most intriguing statistics displayed in table 3.6 relate to the stock price behaviour of the two portfolios after the event window has closed. The difference in the stock price behaviour of the two portfolios over the post-event period can be clearly seen in figure 3.6a.

Figure 3.6a : Cumulative Average Abnormal Returns for the period $t+2$ to $t+251$ – small v large warnings



In the post event period from $t+2$ to $t+251$ the stocks which have experienced large warnings, and the greatest relative price drops over the event window, appear to approximately track the markets. The *CAAR* of this portfolio rises by approximately

+0.8% over the post-event period, although there is no evidence to suggest that this figure is significantly different from zero. Conversely, the stocks that have experienced the smaller earnings warnings display constant negative post-event drift throughout this period, recording a *CAAR* of -13.2% which is statistically significant at 0.001. Although they begin the post-event period 11% apart, the *CAAR* of the small warnings portfolio drifts downward until it eventually finishes the period below that of the large warnings portfolio, both at approximately -50%. An Analysis of Variance was conducted on the post-event returns of the two portfolios. The results, which are displayed in table 3.6b, provide strong evidence ($p = 0.015$) to suggest that a significant difference exists in companies' post-event stock price reaction to an earnings warning, based on the size of the warnings announcement.

Table 3.6b : Analysis of Variance Small v Large warning stocks – Post-event

Anova: Post-event Cumulative Average Abnormal Returns Small v Large warning stocks						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Small Warning	186	-24.5392	-0.131931	0.307172		
Large Warning	186	1.5289333	0.0082201	0.3027037		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.8267406	1	1.8267406	5.9905341	0.0148469	3.8667167
Within Groups	112.82701	370	0.3049379			
Total	114.65375	371				

The results of this analysis of variance provide sufficient evidence to be able to reject the null hypothesis H_{N9} , that the size of the earnings warning will have no effect on the *CAAR* observed over the post-event period, in favour of hypothesis H_{A9} , that the size of

the earnings warning will have an effect on the *CAAR* observed over the post event period. In order to provide further evidence to support the possible existence of a ‘warning-size effect’, the two portfolios considered above are again split to construct four portfolios each representing one quartile of the sample ranked by warning, from smallest warning quartile with an average *SUE* of 0.25, through to the largest quartile with an *SUE* of 3.11. Figure 3.6b displays the *CAAR*’s for each portfolio over the event period with the key statistics being displayed in table 3.6c.

Figure 3.6b: Cumulative Average Abnormal Returns for the event period – grouped by warning size

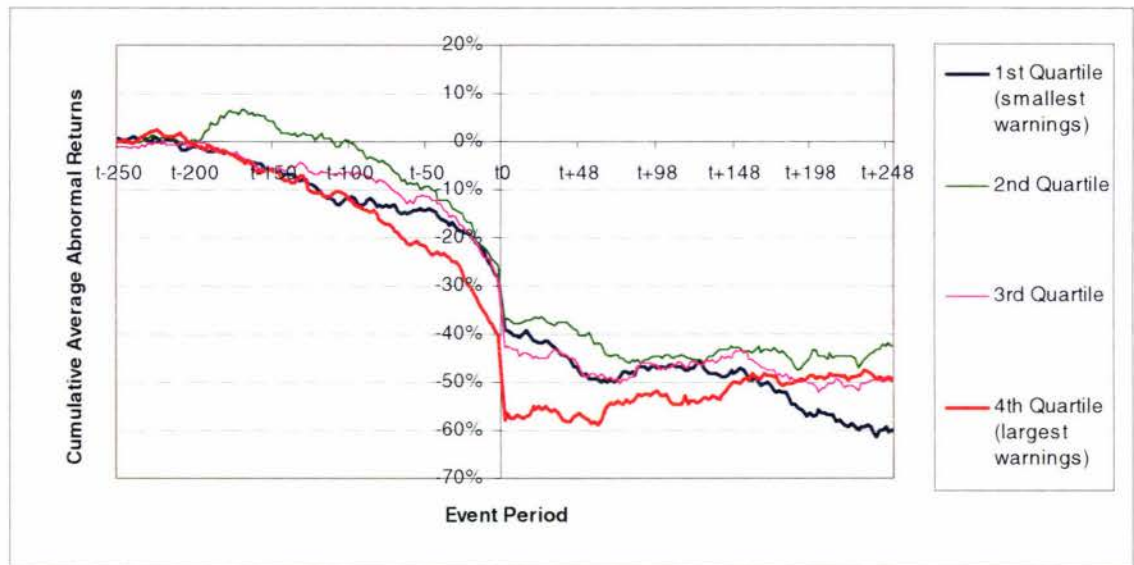


Table 3.6c: Cumulative Average Abnormal Returns for the event period – grouped by warning size

Quartile	Pre-event CAAR	Event window CAAR	Post-event period				
			CAAR	t-statistic	N	Pos:Neg	Prob
1st Quartile (Lowest SUE)	-29.9%	-10.2%	-21.3%	3.9243***	93	30:63	0.0004
2nd Quartile	-26.1%	-10.3%	-5.1%	1.0386	93	38:55	0.0483
3rd Quartile	-27.3%	-12.7%	-6.4%	1.3153	93	39:54	0.0731
4th Quartile (Highest SUE)	-39.0%	-16.8%	8.0%	1.0396	93	44:49	0.3393
***significant at 0.001			**significant at 0.01		*significant at 0.05		

There are three main trends to note from the analysis of the *CAAR* information displayed in figure 3.6b:

- (a) The first relates to the pre-event *CAAR*'s observed. The three lowest quartile portfolios (small to medium-sized warnings) all display pre-event *CAAR*'s of approximately -25% to -30% , while the highest quartile portfolio of stocks records a pre-event *CAAR* of -39% . Although this difference is not statistically significant it does provide support to the idea that the market to a certain extent anticipates the negative news content of the warning announcement i.e. companies experiencing the largest warnings exhibit the greatest degree of 'anticipation' in the lead up to the warning announcement.
- (b) The second trend to note is the decrease in event window *CAAR* which occurs with each quartile i.e. the greater the size of the earnings warning the greater the negative stock price reaction experienced over the event window.

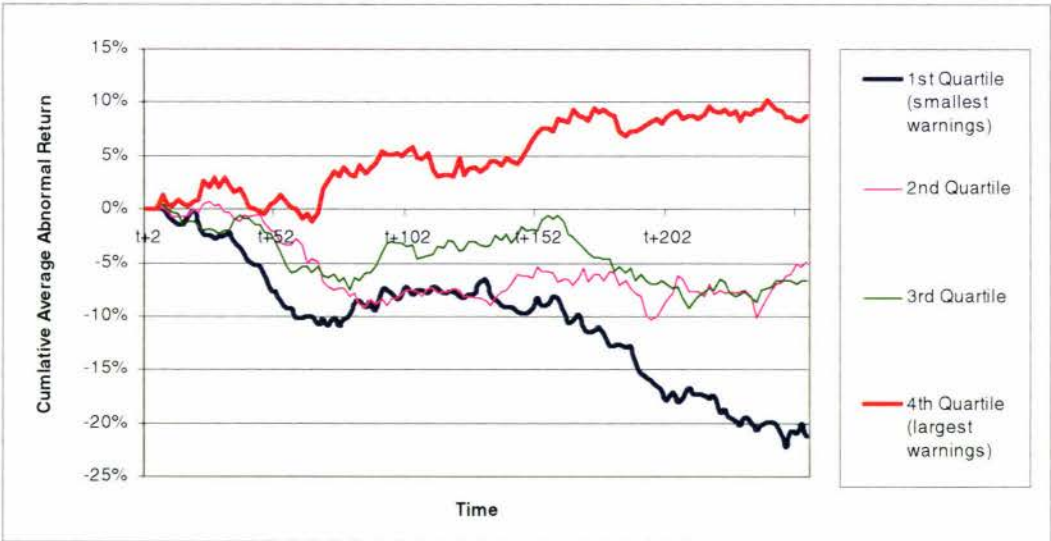
Table 3.6d : Analysis of Variance Small v Large warning stocks by Quartile (Event window)

Anova: Event Window Cumulative Average Abnormal Returns Small v Large warning stocks by Quartile						
SUMMARY						
Groups	Count	Sum	Average	Variance		
1st Quartile	93	-9.524828	-0.102418	0.0186791		
2nd Quartile	93	-9.55317	-0.102722	0.0131737		
3rd Quartile	93	-11.81374	-0.127029	0.011597		
4th Quartile	93	-15.59058	-0.167641	0.0241771		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.2630602	3	0.0876867	5.1865026	0.0016073	2.6291644
Within Groups	6.2216726	368	0.0169067			
Total	6.4847329	371				

The analysis of variance performed on this data, and displayed in table 3.6e, indicates this result to be statistically significant ($p = 0.0016$) and provides further evidence to support Hypothesis H_{A8} , that the size of the earnings warning will have an effect on the *CAAR* observed over the event window (firms with larger warnings will experience larger negative *CAAR*'s).

- (c) The third point to note from table 3.6d is the significant disparity of post-event *CAAR*'s across the four portfolios. The stark contrast in the post-event stock price behaviour of the largest and smallest warnings portfolio is most clearly evident in figure 3.6c.

Figure 3.6c: Cumulative Average Abnormal Returns for the event period – grouped by warning size



The second and third quartiles, representing ‘medium-sized’ warnings produce post-event *CAAR*'s approximately equal to the sample mean (-5.1% for the 2nd quartile and -6.4% for the 3rd quartile, versus a sample mean of -6.1%), however

the smallest warnings grouped together in the 1st quartile portfolio record a *CAAR* of -21.3% . This result represents post-event drift approximately three and a half times greater than the sample average and is significant at 0.001. Conversely the 4th quartile portfolio comprised of the 93 largest earnings warnings records a positive *CAAR* over the post-event period of $+8\%$. While the post-event *CAAR* of the largest warnings portfolio is not statistically different from zero the *CAAR* of the smallest warning portfolio is of statistical significance. This result is supported by the analysis of variance displayed in table 3.6e, which provides further strong evidence ($p = 0.0044$) to reject the null hypothesis H_{N9} , that the size of the earnings warning will have no effect on the *CAAR* observed over the post-event period.

Table 3.6e : Analysis of Variance Small v Large warning stocks by Quartile (Event window)

Anova: Post-event Cumulative Average Abnormal Returns Small v Large warning stocks by Quartile						
SUMMARY						
Groups	Count	Sum	Average	Variance		
1st Quartile	93	7.4401354	0.0800015	0.3531494		
2nd Quartile	93	-5.911202	-0.063561	0.2451312		
3rd Quartile	93	-4.747432	-0.051048	0.3155465		
4th Quartile	93	-19.79177	-0.212815	0.2889098		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	4.001957	3	1.3339857	4.4365005	0.0044415	2.6291644
Within Groups	110.65179	368	0.3006842			
Total	114.65375	371				

Overall the full period results from the four portfolios are somewhat counter-intuitive, with the portfolio of stocks issuing the *smallest* announcements recording a *CAAR* between 10% and 17% *lower* than each of the other three portfolios which issued *larger*

earnings warnings. However, the fact that this result does appear counter-intuitive does go some way to explaining the apparent underreaction of investors to negative news contained in small earnings warning announcements. The reason for this apparent contradiction may be that the *SUE* measure is not an accurate or appropriate proxy for the negative news content of an earnings warning announcement i.e. the 'size' of the negative news contained in an earnings warning may go beyond what can be seen from the surface, or can be simply measured by the short-term impact on accounting returns. Two scenarios demonstrate the possible 'hidden' news that may be contained in an earnings warning announcement:

Scenario A: A company may warn the market of a substantial drop in their expected next quarter earnings due to significant internal restructuring which has resulted in a series of large redundancy payments to senior management. While this decrease in quarterly earnings may result in a short-term stock price decline, the fact that the restructuring has taken place could be viewed as positive news for the companies long-term earnings prospects.

Scenario B: Conversely, a company may warn the market of a slight drop in expected next quarter earnings which results in little or no immediate stock price reaction. However a cynic could suggest that a company would not concern the market with the issuance of a particularly small earnings warning unless it had some additional motivation. Management may know more than is being disclosed or expect further negative news to follow. The initial small warning may be seen by management as being an opportunity to establish a dialogue with shareholders,

and the market in general, or as management trying to create an appearance of disclosure in order to protect themselves from the prospect of potential future shareholder litigation.

Scenario B above provides an example of how the market may to some extent trivialise the information content of a superficially small earnings warning announcement when it may in fact carry more negative news than is first apparent. In such a circumstance the depth of the warnings news content is only likely to be evident (and impact on stock prices) over time.

Conclusions:

- The size of the earnings warning will have an effect on the *CAAR* observed over the event window. Firms issuing larger (smaller) earnings warnings will experience larger (smaller) stock price declines over this period.
- The market underreacts to small earnings warnings. Companies issuing small earnings warnings are more likely to experience negative post-announcement drift.

3.7 Relationship between Pre-, and Post-Event Returns

Section 3.7 examines the sample data for evidence of any relationship that may exist between a company's pre-event stock price behaviour and its stock price behaviour subsequent to the issuance of an earnings warning announcement. To conduct this analysis the sample population is initially split into two portfolios: the first portfolio is comprised of those stocks recording a pre-event *CAAR* of -31.25% or lower, and the second portfolio is comprised of stocks recording a pre-event *CAAR* of -31.25% or higher i.e. between 0% and -31.25% or positive. As in the previous sections, the figure of -31.25% has no significance in itself other than to allow the sample population to be split into 2 numerically equal groups of 186. The null and alternate hypotheses tested are as follows:

Hypothesis H_{N10} : The pre-event return of a company issuing an earnings warnings will have no effect on the company's post-event return.

Hypothesis H_{A10} : The pre-event return of a company issuing an earnings warnings will effect on the company's post-event return.

The *CAAR*'s of the two portfolios are displayed in figure 3.7, with the key statistics displayed in table 3.7. Figure 3.7 clearly reflects the basis of the two portfolios construction. The stocks recording the highest pre-event *CAAR*'s outperform the market for approximately four months at the beginning of the event period (t_{-250} to t_{-170}), followed by a period of approximately seven months in which the portfolio effectively tracks the market return (t_{-171} to t_{-30}), before declining sharply over the final thirty days of

the pre-event period (t_{-29} to t_{-1}) to record a *CAAR* of 1.2% immediately prior to the event window. Conversely, the portfolio of stocks recording the lowest pre-event *CAAR* consistently underperforms the market throughout the pre-event period finishing with a *CAAR* of -63.7%.

Figure 3.7: Cumulative Average Abnormal Returns – Highest v Lowest pre-event *CAAR*'s

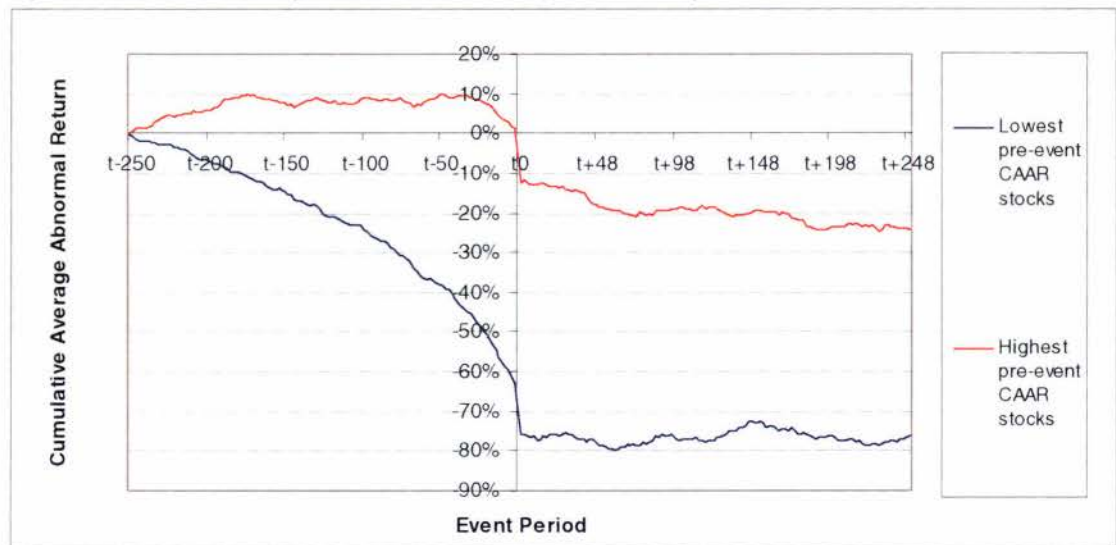


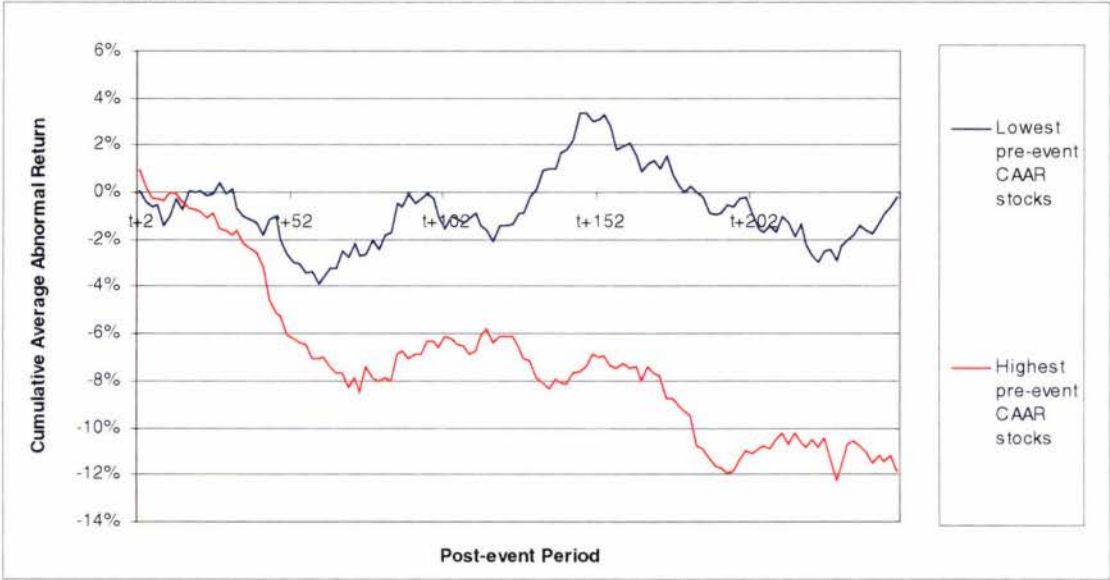
Table 3.7: Cumulative Average Abnormal Returns – Highest v Lowest pre-event *CAAR*'s

Period	Lowest Pre-event CAAR's					Highest Pre-event CAAR's				
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR	t-statistic	N	Pos:Neg	Prob
t-250 to t-1	-63.7%	35.14***	186	0:186	>.0001	1.2%	0.53	186	69:117	0.0003
t 0 to t+1	-12.1%	14.13***	186	26:160	>.0001	-12.9%	14.03***	186	25:161	>.0001
t+2 to t+251	-0.3%	0.09	186	88:98	0.2547	-12.0%	3.36***	186	67:119	0.0001
Total	-76.2%					-23.7%				
***significant at 0.001 **significant at 0.01 *significant at 0.05										

From table 3.7 it can be seen that the initial event window reaction to the earnings warnings is similar for both portfolios, with the lowest pre-event *CAAR* portfolio recording a *CAAR* of -12.1% and the highest pre-event *CAAR* portfolio recording a *CAAR* of -12.9%. However, the most significant results of this section relate to the

observed post-event returns. Over the post-event period the lowest pre-event *CAAR* portfolio records a *CAAR* of -0.3% . The standardised test statistic of 0.09 provides no evidence to suggest that this return is significantly different from zero. In strong contrast to this result the highest pre-event *CAAR* portfolio records a *CAAR* of -12% across the post-event period which is significant at 0.001.

Figure 3.7a : Cumulative Average Abnormal Returns for the period $t+2$ to $t+251$ – Lowest v Highest pre-event *CAAR* stocks.



The difference in post-event returns can be most clearly seen in figure 3.7a. Despite displaying some signs of post-event drift in the second and third months following the warning events, the portfolio of lowest pre-event *CAAR* stocks recovers to effectively track the market return over the period. Conversely, the portfolio comprised of the highest pre-event *CAAR* stocks displays very strong evidence of consistent post-event drift over the first three to four months of the post-event period, before stabilising somewhat and then falling away again toward the end of the post-event period. An analysis of variance was performed on the two sets of returns for the post-event period.

The results, which are displayed in table 3.7a, provide sufficient evidence ($p = 0.0425$) to reject the null hypothesis H_{N10} , that the pre-event return of a company issuing an earnings warnings will have no effect on the company's post-event return.

Table 3.7a : Analysis of Variance High v Low pre-event return stocks

Anova: Post-event Cumulative Average Abnormal Returns High v Low pre-event return stocks						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Low pre-event returns	186	-0.638807	-0.003434	0.3288073		
High pre-event returns	186	-22.37146	-0.120277	0.2840797		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.2696455	1	1.2696455	4.1431632	0.0425151	3.8667167
Within Groups	113.3841	370	0.3064435			
Total	114.65375	371				

As with previous sections, in order to extend the analysis the two portfolios considered above are again split to construct four portfolios each representing one quartile of the sample. The portfolios are ranked by pre-event return from the lowest pre-event return quartile, with an average *CAAR* over the pre-event period of -83.8%, through to the highest pre-event return quartile, with an average *CAAR* over the pre-event period of +19.4%. Figure 3.7b displays the *CAAR* of each portfolio over the full event period with the key statistics being displayed in table 3.7b.

Figure 3.7b : Cumulative Average Abnormal Returns for the event period – grouped by pre-event CAAR

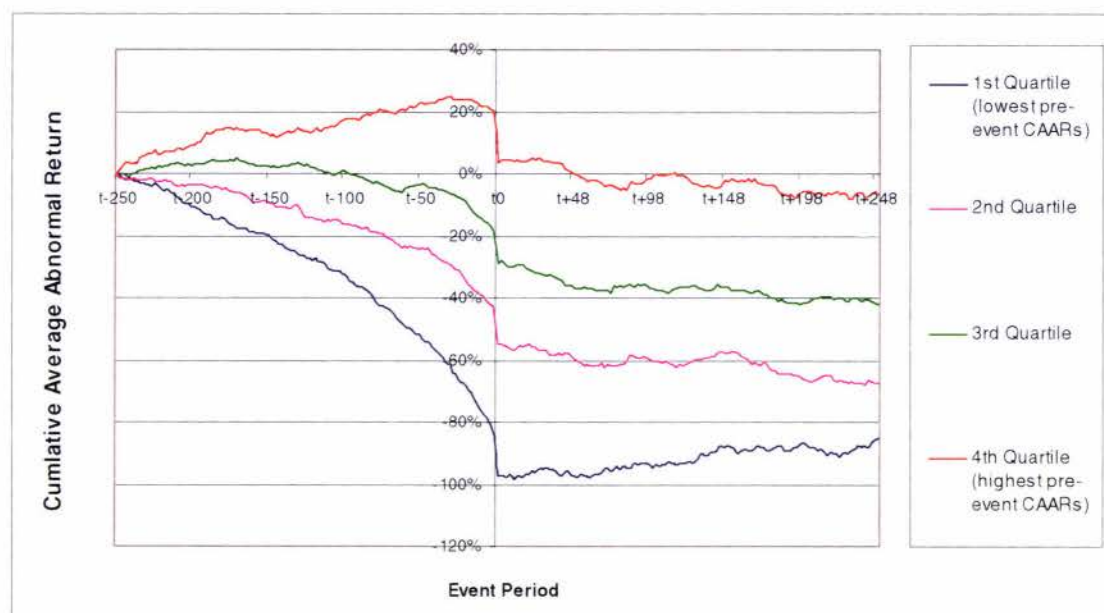


Table 3.7 b: Cumulative Average Abnormal Returns for the event period – grouped by pre-event CAAR

Quartile	Pre-event CAAR	Event window	Post-event period				
			CAAR	t-statistic	N	Pos:Neg	Prob
1st Quartile (Lowest Pre-event CAAR)	-83.8%	-13.2%	11.0%	1.71	93	53:40	0.9269
2nd Quartile	-43.6%	-11.0%	-11.8%	2.31*	93	35:58	0.0110
3rd Quartile	-21.1%	-9.9%	-13.2%	2.75**	93	25:68	>0.0001
4th Quartile (Highest Pre-event CAAR)	19.4%	-15.8%	-10.8%	1.75	93	51:42	0.2035
***significant at 0.001 **significant at 0.01 *significant at 0.05							

There are two main points to note from the analysis of the CAAR information displayed in table 3.7b:

- The first point to note is that the *largest negative* return over the event window was recorded by the portfolio that had experienced the *highest positive* returns over the pre-event period. This sharp decline in returns may indicate that the stocks comprising this portfolio were somewhat overvalued prior to the earnings

warning announcements being made. The analysis of variance displayed below in table 3.7c provides evidence to suggest that this difference in observed event window returns is of statistical significance ($p = 0.0116$).

Table 3.7c : Analysis of Variance High v Low pre-event return stocks – by Quartile (Event window)

Anova:		Event window Cumulative Average Abnormal Returns High v Low pre-event return stocks				
SUMMARY						
Groups	Count	Sum	Average	Variance		
1st Quartile	93	-12.30094	-0.132268	0.0223106		
2nd Quartile	93	-10.26781	-0.110407	0.0103712		
3rd Quartile	93	-9.194262	-0.098863	0.0173844		
4th Quartile	93	-14.71931	-0.158272	0.0183418		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.1912043	3	0.0637348	3.7267479	0.0115718	2.6291644
Within Groups	6.2935286	368	0.017102			
Total	6.4847329	371				

- (b) The second main point to note from the analysis of the stock price behaviour of the four portfolios is the *positive* post-event *CAAR* recorded by the portfolio with the *lowest* pre-event return. This portfolio, which is comprised of the 93 stocks exhibiting the lowest *CAARs* over the pre-event period, records a post-event *CAAR* of +11%. While this result cannot be said to be significantly different from zero it does provide a stark contrast to the post-event *CAARs* of the other three portfolios, which are all clustered around *CAARs* of -12%. The difference in the post-event *CAARs* of the four portfolios can be most clearly seen in figure 3.7c. The *CAAR* of the lowest pre-event return portfolio hovers around the market return for approximately the first three months of the post-event period before beginning a period of sustained positive abnormal returns. By contrast the *CAARs*

of the three other portfolios all display similar behaviour, dropping sharply over the first three to four months of the post-event period, then stabilising for a period of several months before falling away again toward the end of the post-event period.

Figure 3.7c : Cumulative Average Abnormal Returns for the post-event period –grouped by pre-event CAAR

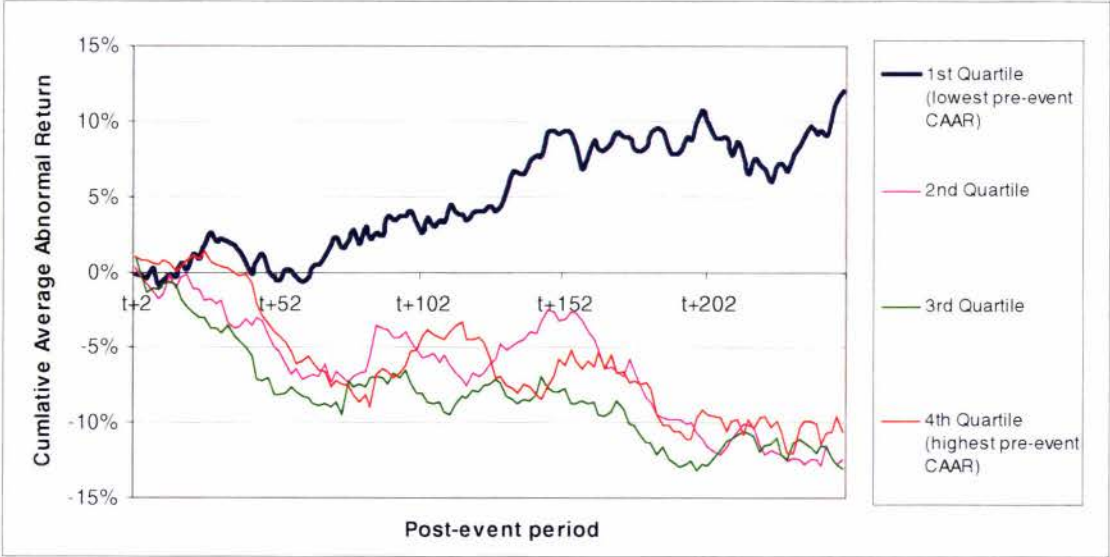


Table 3.7d : Analysis of Variance High v Low pre-event return stocks – by Quartile (Post-event)

Anova:		Post-event Cumulative Average Abnormal Returns				
		High v Low pre-event return stocks				
SUMMARY						
Groups	Count	Sum	Average	Variance		
1st Quartile	93	10.340126	0.1111841	0.3920923		
2nd Quartile	93	-10.97893	-0.118053	0.2425359		
3rd Quartile	93	-12.312	-0.132387	0.2161819		
4th Quartile	93	-10.05946	-0.108166	0.3547688		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3.7404855	3	1.2468285	4.1368623	0.0066588	2.6291644
Within Groups	110.91326	368	0.3013947			
Total	114.65375	371				

An analysis of variance was used to compare the observed post-event *CAARs* of the four portfolios. The results, which are displayed above in table 3.7d, provide further strong evidence ($p = 0.0067$) to reject the null hypothesis H_{N10} , that the pre-event return of a company issuing an earnings warnings will have no effect on the company's post-event return in favour of the alternate hypothesis H_{A11} , that the pre-event return of a company issuing an earnings warnings will effect on the company's post-event return. The results above provide some evidence to support the research of De Bondt and Thaler (1985) which identified long-run mean reversion in stock prices. De Bondt and Thaler showed that firms with prior extreme negative stock price performance seem to outperform those with prior extreme positive performance (after portfolios are formed based on past performance). The explanation for this anomaly was that the extreme negative (positive) stock price performance was the result of overreaction to a series of bad (good) earnings reports, and the subsequent stock price behaviour observed was a correction of that initial overreaction

Conclusion:

- The pre-event return of a company issuing an earnings warnings may effect the company's post-event return.

3.8 Conclusions

Section 3.8 provides a summary of the conclusions drawn from the analysis and results above and provides a discussion of these conclusions. 15 individual conclusions have been drawn from the analysis of results presented in part three, as follows:

1. There is very strong evidence to suggest that companies issuing earnings warnings have significantly underperformed the market in the year prior to the warning being announced.
2. The stock price underperformance relative to the market, which occurs over the pre-event period for companies issuing earnings warnings, begins approximately 175 business days from the warning announcement.
3. The size of the underperformance observed increases over the pre-event period and is concentrated in approximately the final 30 to 50 days prior to the warning announcement.
4. The market to some extent anticipates an earnings warning and incorporates this expectation into the stock prices of companies issuing earnings warnings prior to the warning announcement being made.
5. The market response to the negative news content in an earnings warning announcement is both immediate and significant.

6. There is strong evidence of negative post-event drift in the stock prices of NYSE listed companies issuing an earnings warning. The post-event drift may last for a period of up to one year following the warning being issued.
7. Stocks listed on the NYSE experience post-event drift following an earnings warning, NASDAQ listed stocks do not.
8. On average the stock prices of companies issuing an earnings warning perform in line with the market for the month following the warning being issued.
9. The majority of the post-event drift in the stock prices of companies issuing an earnings warning is concentrated in the 2nd and 3rd months following the warning being issued.
10. There is no significant difference in the stock price reaction to an earnings warning of companies of different size.
11. There is no significant difference in the stock price reaction to an earnings warning for companies with different P/E ratios.
12. There is no significant difference in the stock price reaction to an earnings warning for companies with different market to book ratios.
13. The size of an earnings warning will have an effect on the event window returns experienced by the company issuing an earnings warnings announcement. Firms

issuing larger (smaller) earnings warnings will experience larger (smaller) stock price declines over this period.

14. The market underreacts to small earnings warnings. Companies issuing small earnings warnings are more likely to experience negative post-announcement drift.
15. The pre-event return of a company issuing an earnings warnings may effect the company's post-event return. Firms experiencing extreme negative abnormal returns prior to an earnings warning may experience extreme positive abnormal returns subsequent to an earnings warning announcement being made.

The analysis and conclusions presented above provide a picture of the markets' response to earnings warnings. From this analysis it becomes clear that the stock prices of companies issuing earnings warnings have on average significantly underperformed the market for a period of approximately eight to nine months prior to the earnings warning announcement being made. The size and rate of this underperformance increases in the days and weeks leading up to warning announcement, indicating that the market to a certain degree anticipates the forthcoming negative earnings news and incorporates this expectation into stock price valuations. However, it would seem that the market does not *fully* anticipate the information content of the earnings warning as is witnessed by the significant negative stock price movements observed immediately following the issuance of an earnings warning announcement. There is obviously still new pricing information contained in an earnings warning announcement at the time of issuance. However it

would seem that the two markets examined, the NASDAQ and the NYSE, interpret this information in different ways. The evidence would suggest that the NASDAQ is informationally efficient in regard to earnings warning announcements, in that the stock prices of NASDAQ listed companies appear to 'fully' incorporate the new information contained in an earnings warning *at the time of announcement*. Conversely, investors in NYSE listed companies would appear to initially underestimate the negative news contained in an earnings warning, and only 'fully' incorporate this information into stock prices *over time*, resulting in the occurrence of significant post-event drift. This finding is consistent with Edwards' (1968) theory of *Conservatism*, which identifies as a common human trait that individuals are slow to change their beliefs in the face of new information. It would seem that the NYSE may possibly be deserving of its reputation of being the conservative elder statesmen of the American markets, with the NASDAQ its younger, more responsive, if not reactionary, apprentice. The correction of the initial underreaction to the earnings warnings observed in NYSE listed stocks does not begin until approximately one to two months subsequent to the earnings warning announcement being made. This is consistent with the theory of *Investor Overconfidence* put forward by Daniel et al. (1998) which implies that the full incorporation of negative news only occurs gradually as the investor realises that their initial private information or analysis was erroneous. There is also some evidence in the data of a tendency toward mean-reversion in the post-event stock prices of companies issuing earnings warnings. After the initial period of post-event drift the stock prices of the NYSE listed companies tend to recover for a period of several months before reverting back to negative drift with evidence that this post-event drift may persist for a period of up to one year after the

earnings warning announcement is made. However, contrary to the previous work of researchers such as Basu (1977) and Cook and Rozeff (1984), this study finds no evidence of post-event stock price returns being influenced by the firm specific factors of market capitalisation, P/E ratio, or market to book ratio. The occurrence, or non-occurrence, of post-event drift does appear to be influenced by the size of the earnings warning announcement. Companies issuing what appear to be the largest earnings warning announcements suffer the largest initial negative price response but are significantly less likely to exhibit the post-event drift experienced by companies issuing what on the surface appear to be smaller warnings. In this regard investors would seem to be more likely to underestimate the negative news contained in relatively small earnings warning announcements, while the negative news in the larger announcements may be more obvious. This result highlights the need for investors to consider the context an earnings warning is issued in, and the need to try and 'read between the lines' of the information provided by management in an earnings warning announcement. The value of the information contained in an earnings warning announcement may in this sense extend beyond what is easily decipherable from initial observation. It would seem that the market is not perfect when it comes to interpreting new information. There is evidence of underreaction to new information and some evidence to provide support to the 'overreaction hypothesis'. This can be seen in the positive post-event market adjusted returns observed in stocks that experience the greatest negative pre-event performance. The positive returns can be interpreted as indicating that the extreme negative pre-event returns experienced by some stocks were the result of investors pre-warning overreaction to negative news available in the market, or as over-anticipating the negative news to be

contained in the forthcoming earnings warning announcement. While this finding does indicate that investors may in some circumstances overreact to negative news, this behaviour is more likely to be seen in the stock prices of NASDAQ listed companies, and does not detract from the principle finding of this study, that investors in NYSE listed stocks generally underreact to the information content in earnings warnings announcements.

Appendix 1. The Negative P/E Portfolio

As noted in Section 2.2, 13 warnings were inadvertently omitted from the sample due to negative P/E information being unavailable through the data collection method originally employed. Data from the event period for each of these 13 warning events has subsequently been collected and the behaviour of this ‘negative P/E portfolio’ is examined below. The CAAR of the portfolio over the event period is displayed in figure A.1, with the key statistics displayed in table A.1.

Figure A.1: Cumulative Average Abnormal Returns Negative P/E Portfolio v Full Sample

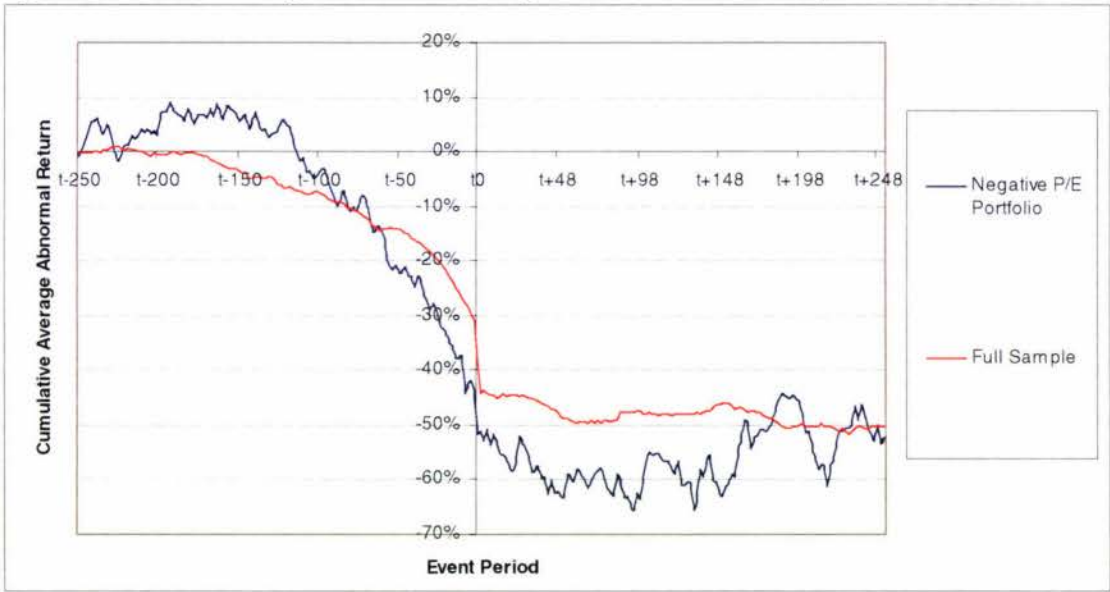


Table A.1: Cumulative Average Abnormal Returns Negative P/E Portfolio v Full Sample

Period	Negative P/E Portfolio					Full Sample
	CAAR	t-statistic	N	Pos:Neg	Prob	CAAR
t-250 to t-1	-47.8%	2.96**	13	2:11	0.0112	-31.7%
t 0 to t+1	-3.4%	1.12	13	4:9	0.264	-13.4%
t+2 to t+251	-1.1%	0.04	13	6:7	0.5	-6.1%
Total	-52.3%					-51.2%
***significant at 0.001 **significant at 0.01 *significant at 0.05						

Analysis of the data above provides three main areas of interest:

- (a) The pre-event *CAAR* of the negative P/E portfolio is considerably lower than the *CAAR* of the full sample for this period (-47.8% versus -31.7%). The timing of this negative return is also interesting. For the first 6 months of the pre-event period the negative P/E portfolio actually displays a positive *CAAR* of $+4.6\%$. However the returns for the portfolio fall off dramatically over the second half of the pre-event period displaying a negative *CAAR* of over -50% for the period $t-125$ to $t-1$. This sharp drop in the prices of the stocks comprising the portfolio is presumably in response to the negative earnings figures being announced by each firm over this period.
- (b) The second point to note from the returns of the negative P/E portfolio is the relatively small price response to the warning announcements over the event window. The portfolio exhibits a negative *CAAR* of -3.4% over this period compared to the -13.4% for the full sample of 372 stocks. This relatively small reaction probably reflects the sharp drop in the portfolios stock prices over the previous 6 months. It would seem the market has more fully anticipated the forthcoming negative news for this group of stocks, and given their relatively poor recent earnings history are not as 'surprised' by the earnings warning announcement as for other stocks.
- (c) The third interesting feature of the stock price behaviour of the negative P/E portfolio is its post-event return. The portfolio records a negative *CAAR* over the post-event period of just -1.1% , considerably lower than the -6.1% recorded by

the full sample of 372 stocks. This post-event return, however, is comprised of two distinct phases. Over the first 95 days of the post-event period the negative P/E portfolio demonstrates a negative *CAAR* of -14.4%. The observed portfolio return then begins to rally, recording a positive *CAAR* of +21.4% over the next 95 days, before tapering off somewhat to finish the period t_{+96} to t_{+252} with a *CAAR* of +13.3%.

Figure A.2 : Polynomial equations for Negative P/E Portfolio versus Full Sample

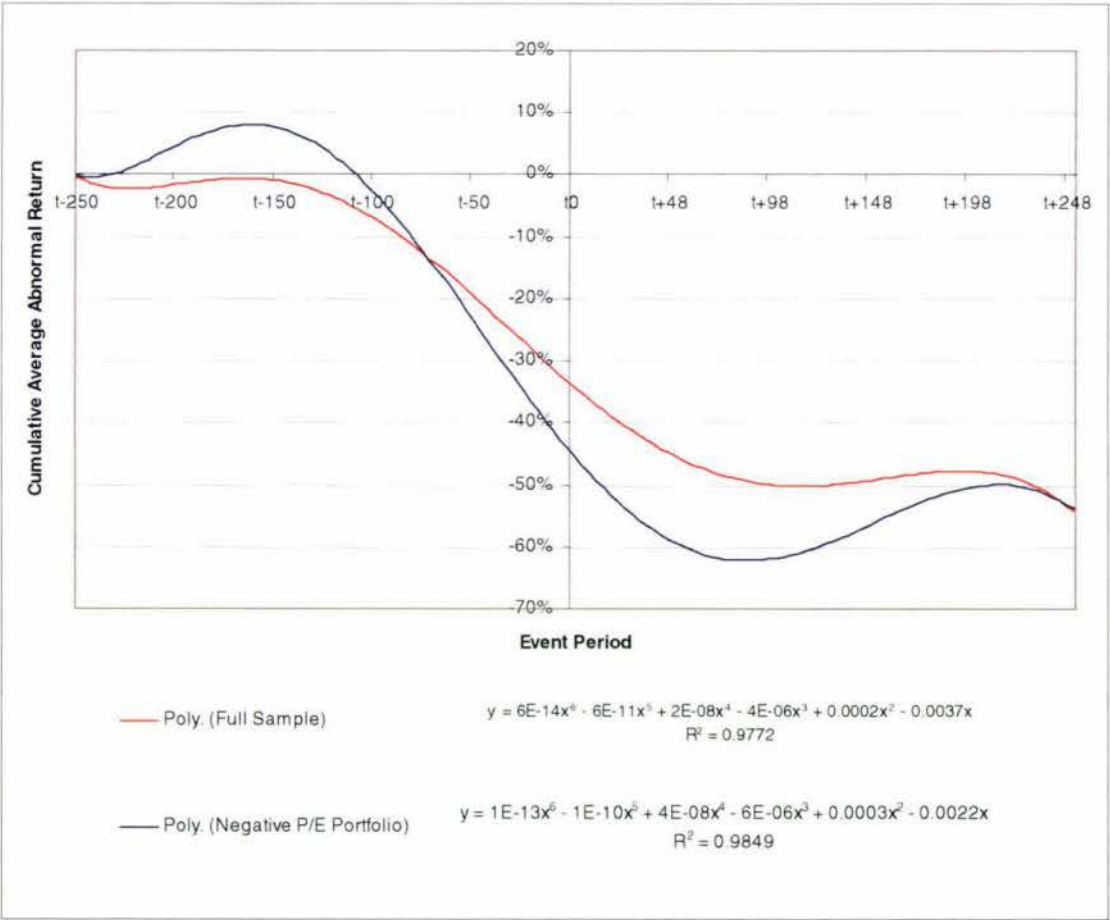


Figure A.2 displays the 6th order polynomial regression curves of the negative news portfolio and the full sample of 372 stocks. While the two curves are very similar, the

curve for the negative P/E portfolio does appear to be a somewhat more 'compressed' form of the equation, highlighting the steep stock price decline experienced by the stocks comprising the portfolio over the pre-event and early post-event periods. Figure A.2 also serves to highlight the strong stock price recovery made by the negative P/E portfolio over the later half of the post-event period. Although the sample is small ($n=13$) this result does provide some support to the '*Overreaction Hypothesis*', with the negative CAAR of approximately -65% witnessed in the negative P/E portfolio over the period t_{-125} to t_{+95} being seen as the initial overreaction to the series of negative earnings figures being produced by the firms in the portfolio, and the positive $15 - 20\%$ rebound experienced from t_{+96} onward being the correction of that initial overreaction. It would be interesting to further extend the monitoring of the post-event return for the negative P/E portfolio to see if the positive abnormal returns persist past t_{+252} .

Conclusion:

- The sample size of the negative P/E portfolio ($n=13$) is too small to draw any significant conclusions.

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