



# **The occurrence of insider trading in target shares of JSE listed companies prior to takeover announcements.**

**A research project submitted**

by

**Francois van der Plas**

Student number: 264 5136

E-mail: [francois.vanderplas@rmb.co.za](mailto:francois.vanderplas@rmb.co.za)

Mobile: 082 963 1581

A research project submitted to the Gordon Institute of Business  
Science, University of Pretoria, in partial fulfilment of the requirements  
for the degree

of

**MASTER OF BUSINESS ADMINISTRATION**

**14 November 2007**



## **Abstract**

Research into whether insider trading exists in the shares traded on the Johannesburg Stock Exchange (“JSE”). The purpose of the research is to examine the share price in target companies and to determine whether or not it increases significantly during the days immediately preceding a takeover, delisting or share buy-back announcement.

Out of a total of 5,039 merger and acquisition transactions, during the six- year period from 2000 to 2005, only 30 transactions met the criteria of information availability and non-occurrence of confounding events. The Average Cumulative Abnormal Returns (CAAR) of target companies during a 21-day event window period were examined. The examination of the CAAR was based on the historical bootstrapping technique and the CAAR was plotted on the frequency distribution to test for significance.

The CAAR of the sample tested to be statistically significant in the days prior to the first public announcement. Evidence of a share price build-up in the days prior to the first public announcement was found. Controlling for confounding events, this price build-up could be indicative of insider trading.

This research study seems to be the first study focused on insider trading and pre-announcement price run-ups on the Johannesburg Stock Exchange.

---



## **Declaration**

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University.

Francois van der Plas

November 2007



## **Acknowledgements**

I would like to thank my supervisor, Professor Mike Ward, for his guidance, time spent, insight and interest in my research report. It has been a pleasure and an honour to work alongside such a knowledgeable individual.

I also thank Chris Muller and Mike Ward for making their event study model available, which was crucial to successfully complete this research report.

The staff of Rand Merchant Bank's information centre were of great help in obtaining the literature on which this research report is based and also accessing the various databases that were needed.

I would also like to thank the team of Ernest & Young Corporate Finance for making their electronic mergers and acquisitions database available. Without the database this research report would have been difficult to complete.

Lastly, I thank my partner, Leonora, who has provided tremendous support and encouragement during the entire MBA programme. Without her love, support, sacrifice and understanding this MBA programme would have been much harder.



## Contents

Abstract.....	i
Declaration.....	ii
Acknowledgements.....	iii
Contents.....	iv
1. Introduction to the research problem .....	1
2. Literature Review .....	5
2.1 What is insider trading? .....	5
2.2 Regulation of insider trading in South Africa .....	6
2.3 The impact of insider trading on share price .....	8
2.4 Informed trading and the derivative markets .....	10
2.5 Measuring abnormal share price returns.....	12
2.6 Pre-acquisition impact on the target company's share price.....	17
3. Research hypothesis.....	19
4. Research methodology .....	22
4.1 Unit of analysis.....	22
4.2 Population of relevance .....	22
4.3 Sampling method and size .....	25
4.4 Data collection process.....	26
4.5 Data analysis approach .....	28
4.5.1 Event study and control portfolios.....	29
4.6 Data integrity .....	38
4.7 Research limitations.....	38
5. Results and discussion .....	40
5.1 Description of sample .....	40

---



---

5.2 Results and discussion .....	42
5.3 Summarised conclusion of results .....	50
6. Conclusion .....	52
References.....	56
Appendix 1: Details of sample selection .....	62
Appendix 2: Details of AAR and CAAR for 30 companies in the sample .....	64
Appendix 3: Details of frequency distribution .....	65
Appendix 4: Cumulative Frequency Distribution at $t_1$ .....	66
Appendix 5: Quantile-Quantile Plot .....	66
Appendix 6: Scatter Plot of Frequency distribution sample.....	67
Appendix 7: CD containing database.....	67



## 1. Introduction to the research problem

In our current economic environment, corporate takeovers, de-listings and share buy-backs of companies regularly provide a catalyst for insider trading. The magnitude of the share price run-ups, in many cases, points to possible leaks or tips by insiders connected with the transaction.

In the United States insider trading attracts substantial interest from the media, governing bodies and researchers. Data compiled by Bloomberg shows that options trading jumped an average 221% in the three days before the announcements of the seventeen largest US takeovers of the past year, compared with the average for the previous fifty days. (Business Day, Tuesday May 8, 2007)

The Business Day article furthermore highlights the fact that the number of people involved in leverage buyout (LBO's) deals raised the challenge for preventing leaks. Deals are so big that funds often team up and each hires its own law firms and investment banks. Linda Thomsen, enforcement chief at the Securities and Exchange Commission (SEC) in the USA, also says that they are seeing deliberate, calculated misconduct by people who otherwise make a substantial livelihood from the very markets they are abusing. (Business Day, Tuesday May 8, 2007)

---



“Insider trading has always been the stuff of controversy and scandal, making headlines and destroying reputations. It is at the very root of discrimination, as it gives a small, usually already relatively privileged minority, an unfair advantage over the broad majority who do not enjoy the same equality of information or opportunity.” (JSE, 2006, p. 4)

The use of privileged information for the purposes of gain (or to avoid a loss) at the expense of others is morally and legally reprehensible. The eradication of this practice is essential to the efficient working and reputation of any market, and the society in which it operates. This is nowhere more critical than in South Africa, which is striving to remove the historical, social and economic inequities that created such huge divides between the “haves” and the “have-nots”. It is also a non-negotiable requirement for all markets to remove any suspicion of impropriety in order to attract and retain investment flows. (JSE, 2006, p. 4)

One consistent finding of the literature is that insiders earn significant excess returns. About half of the cumulative excess returns accrue, however, in the twelve to twenty days preceding the first public announcement. Keown and Pinkerton (1981) conclude that, on average, 40% to 50% of the price gain experienced by a target firm’s stock occurs before the actual takeover announcement. Keown and Pinkerton (1981) furthermore state that leakage of insider information is a pervasive problem occurring at a significant level in the days prior to the first public announcement of a proposed merger.

---





International researchers consistently find the occurrence of a stock price run-up in the target company before the announcement of takeovers (for example Meulbroek (1992)).

A study by Jayaraman, Frye and Sabherwal (2001) notes that there is a significant increase in trading activity in options of target companies prior to the takeover announcement. This increased trading also suggests that there is a significant level of informed trading in the options market prior to announcement of a corporate event.

The aim of this research is to determine whether insider trading occurs in the shares of target companies listed on the Johannesburg Securities Exchange (“the JSE”) prior to the first public takeover announcement. The study will investigate whether takeover announcements concluded in the period 2000 to 2005 are preceded by abnormal increases in the share price and share volume of stock traded in the securities of the target company.

Share price run-up will be used to provide a detailed analysis of trading activity in a target company preceding the first public announcement date of a potential takeover. This analysis will provide an indication that abnormal and potential insider trading occurs before the first announcement of a potential takeover.

This research can be distinguished from other studies in that it focuses on the JSE. Various international studies around insider trading have been conducted, but no published study in a South African context could be located. Bhana

---



(2005) mentions that the role insider trading plays in the pre-announcement excess returns earned by management buyout deals is a fruitful area of research.

This research report is set out as follows: Chapter 2 describes the relevant theory base by way of a literature review; Chapter 3 sets out the research hypotheses; Chapter 4 explains the research methodology that was applied; Chapter 5 presents the results of research undertaken and the discussion of the results and Chapter 7 presents the conclusion.



## 2. Literature Review

### 2.1 What is insider trading?

“Inside information” is defined in Section 1 of the Insider Trading Act (1998) as specific or precise information, which has not been made public and which:

- is obtained or learned as an insider; and
- if it were made public, would be likely to have a material effect on the price or value of any security listed on a regulated market.

The Act does not define what constitutes specific or precise information and the courts will determine this on a case-by-case basis. What may constitute specific or precise information in one situation may possibly not do so in another, depending on the surrounding circumstances.

One can appreciate that the degree of precision in the information will affect the extent of the investment decisions taken by an insider. A comment such as “we are having a really good year” may be considered to lack sufficient precision to fall within the Act, but, if attached to another yardstick such as market expectations, or measured against the prior year, may well fall within the Act.

An “insider” is defined in Section 1 of the Insider Trading Act (1998) as an individual, who has inside information

(a) through

---



- 
- being a director, employee or shareholder or an issuer of securities or financial instruments to which the inside information relates; or
  - having access to such information by virtue of his or her employment, office or profession; or

(b) where such individual knows that the direct or indirect source of the information was a person contemplated in paragraph (a).

## 2.2 Regulation of insider trading in South Africa

The Insider Trading Act, 135 of 1998 came into operation on 17 January 1999. This Act replaced previous legislation regarding insider trading, which was embodied in The Companies Act, 1973. The previous legislation contained criminal sanction and had not resulted in a single case coming to court despite the fact that the South African markets had a reputation for the prevalence of insider trading. (FSB, 2004)

The Insider Trading Act, 135 of 1998, makes it easier to impose criminal sanctions and the Financial Services Board (“FSB”), in addition, can take civil action against offenders. The Insider Trading Act (1998) empowers the FSB to issue civil summons against alleged offenders for up to three times the profit gained, or the losses avoided, as a result of unlawful insider trading. It also makes provision for a claims officer who will be responsible for the distribution of the proceeds of successful legal action against offenders. Prejudiced

---



---

investors will therefore in future be able to recoup some of their losses. It also has the added advantage that a case against an offender need only be proved on a balance of probabilities, and not reasonable doubt.

In accordance with the Insider Trading Act (1998) the maximum penalties for insider trading comprise a R2 million fine, ten years imprisonment, or both. Persons with insider information who encourage or discourage others to trade will also run the risk of being convicted of an offence.

The Insider Trading Act (1998) has more effective investigative powers than previous legislation, such as:

- any person can be summoned and interrogated by officers of the FSB;
- the FSB will be able to obtain warrants to search premises; open containers and seize documents if necessary; and
- the FSB can apply to court for the attachment of assets or evidence to prevent their concealment, removal or destruction.

One of the changes to the regulation of insider trading that will make the Insider Trading Act (1998) effective concerns the fact insider trading has not only come to be seen as a criminal offence, but a civil offence as well. In civil proceedings, the standard of proof is not as high as with criminal proceedings, and this has opened a new door for the authorities. Previously insider trading was hard to prove beyond reasonable doubt and thus, an insider trading conviction was therefore never won in South Africa under the old law.

---



## 2.3 The impact of insider trading on share price

Several previous research papers have investigated the pre-bid run-up in share price and trading volumes of target companies. All the studies are conclusive that the share price and volumes traded in target companies increase significantly during the weeks immediately preceding the takeover bids.

However the reasons for this pre-bid run-up are mixed. Research by Mandelker (1974), Halpern (1976) and Keown and Pinkerton (1981) produce evidence of significant positive movements in target firm stock prices prior to a public announcement. Both Mandelker (1974) and Halpern (1976) used monthly data in their research and found a prevalence of positive price movements of 58% beginning one month prior to the takeover announcement and increasing to 62% in the month of the announcement. Keown and Pinkerton (1981) refined these empirical findings with daily data and found that statistically significant positive abnormal returns begin 12 days before a takeover announcement. Similarly, Gupta and Misra (1988) presented evidence that target stock prices tend to follow an upward trend starting 12 to 20 days before an actual takeover announcement is made public. They suggested this is evidence of significant amounts of trading based on insider information in the pre-announcement period.

Whilst a large number of commentators in the field of insider trading claim to explain the price run-up of targets prior to public announcements to insider

---



trading, as described above, some researchers argue that other legitimate factors affect market activity. Jarrell and Poulsen (1989) suggested that, contrary to the insider trading theory, the same pre-bid price run-ups are consistent with capital markets anticipating the acquisition of a target firm. Controlling for media speculation about the potential takeover of the target before a formal takeover announcement, Jarrell and Poulsen (1989) found that pre-bid price run-ups are significantly higher in media-speculated bids than in non-speculated bids. The researchers concluded that these price run-ups are consistent with a legitimate market for information in the form of capital market anticipation of an acquisition rather than insider trading. "Our results indicate that the presence of rumours in the news media concerning an impending bid is the strongest variable in explaining unanticipated premiums and pre-bid run-up for tender targets" (Jarrell and Poulsen, 1989, p.244)

Linking findings by Jensen and Ruback (1983), whereby they found that over 85% of the total premium can be explained by public information, to the findings of Jarrell and Poulsen (1989), one can imply that significant pre-bid market activity is consistent with little or no illegal insider trading. They also indicate that aggregate run-up statistics must be used cautiously as a measure for illegal insider activity.

Meulbroek (1992) examined the stock price effects of informed trading by making use of a sample that consisted of illegal insider trading detected and prosecuted by the Securities and Exchange Commission (SEC). In this

---



---

research, Meulbroek (1992) concluded that insiders incorporate a large fraction of their information into share prices before information is made public. She reported that 44% of the pre-announcement price run-up occurs on days on which insiders are trading. Interestingly, Meulbroek's (1992) findings are in contrast to Jarrell and Poulsen's (1989) findings that media speculation is the major contributor to pre-bid price run-up. "Moreover, the run-up that occurs on insider trading days is greater than the run-up that occurs either on days with public news announcements or on days without news announcements or insider trading" (Meulbroek, 1992, p.1663).

Combined, these studies seem to suggest that the pre-bid run-ups in stock price and volume are driven by both types of informed trading, insiders and informed speculators anticipating an acquisition.

#### 2.4 Informed trading and the derivative markets

Various international research studies concluded that insiders are active in the option market for target companies prior to the first announcement date.

Chakravartay, Gulen and Mayhew (2004) have stated that investors who have access to private information can choose to trade in the stock market or in the options market. Given the high leverage achievable with options and the built-in downside protection, one might think the options market would be an ideal platform for informed trading. Similarly, Cox and Rubinstein (1985) argue that

---



the cost of trading in options is often lower than the cost of making a series of trades to replicate the payoffs such options offer.

Through investigating trading activities in options of target companies listed on the Chicago Board of Options Exchange (CBOE) during the period 1986 to 1996, Jayaraman, Frye and Sabherwal (2001) found that there was a significant increase in the trading activity of call and put options for companies involved in a takeover prior to the rumour of an acquisition or merger. The result is consistent with both the volume of option contracts traded and open interest.

Consistent with Jayaraman *et al* (2001), evidence presented by Arnold, Erwin, Nail and Nixon (2005) indicates the existence of a substitution effect that favours the purchase of option contracts over the underlying securities preceding tender offer announcements.

Analysing the nonparametric binomial test statistic, Arnold *et al.* (2005) revealed that significantly more than 50% of the targets with traded options experienced aggregate call option volume in excess of their median control period level beginning on day  $t_{-6}$  and extended through the announcement day. These results are similar to those of Levy and Yoder (1993) who found that the implied standard deviations of options contracts increased significantly three days prior to takeover announcements



---

Options and warrants on single shares are not highly traded in South Africa, mainly due to the limited availability of listed options and warrants.

## 2.5 Measuring abnormal share price returns

The hypothesis of the strong form of market efficiency assumes that the share market reacts quickly to incorporate new information into prices. The market's reaction to new information about a corporate action (i.e. de-listing, merger or acquisition) is measured by way of excess or abnormal returns. In studying the impact of new information (largely insider information) on the share price of target companies prior to the public announcement date for this research report, event study methodology was used.

Event studies are based on the work done by Fama, Fisher, Jensen and Roll (1969). They first identified unusual share price returns, which they named "residuals". These "residuals" represent the share price performance after subtracting the expected return. Some commentators still refer to the unusual share price returns as "residuals" while the majority of new researchers prefer to use the terms "excess returns" or "abnormal returns". These "abnormal returns" are analysed to determine whether there is a statistically significant difference between actual share price returns of target companies and their expected returns over the event window period.

Research by McWilliams and Siegel (1997) using the event study framework, found that this framework provides a true measure of the financial impact of an

---



---

event only if a set of assumptions regarding the empirical experiment is valid.

The critical assumptions are:

- Market efficiency – share prices incorporate all available information;
- Unanticipated events – the market only becomes aware of the event upon the announcement; and
- Confounding effects – no other major event occurs during the event window period.

It is critical that the research adheres to the abovementioned assumptions and this will be discussed in more detail in Chapter 4.

Roll (1978) has warned that estimates of abnormal performance may be sensitive to the benchmark used, which may result in different research results from different researchers. A South African event study done by Mushidzi and Ward (2004) states that there are a number of approaches or methods to estimate a firm's expected return, the most popular of which are based on:

- Mean Adjusted Model – a firm is expected to generate the same returns as those averaged during the estimation period;
- Market Model – calculations of a firm's expected return incorporate the risk of the firm with respect to the market;
- Market Adjusted Model – a firm is expected to generate the same returns as the rest of the market during the event window; and
- Control Portfolio Model – a firm is grouped with a portfolio of firms which are the same depending on the criteria used for the grouping. The



expected return of the company will be the same as the observed return of the control portfolio during the event window.

All these models use the concept of residual analysis, pioneered by Fama *et al.* (1969).

After a concise literature review on the different benchmark models, Smit (2005) came to the conclusion that the most appropriate model is the Control Portfolio Model. Following, is a short summary of the weaknesses of the other models:

- Market Model – it is not market  $\beta$ s only that sufficiently describe the cross-section of expected returns, but other factors also do (i.e. company's market capitalisation; leverage; book-to-market equity ratio and earnings/price ratios).
- Mean Adjusted Model – share prices do not always reflect a linear trend, especially in the case of less liquid shares, and past performance is not always a good predictor of expected future returns.

Smit (2005) states that, when using the Control Portfolio Model, the control portfolios can be constructed on a number of different bases, such as the acquiring company's industry; companies of similar size; companies with similar  $\beta$ s; companies with similar earnings-to-price ratios; or companies with a similar book-to-market equity ratio.



A study by Wernerfelt and Montgomery (1988) found evidence that the Control Portfolio Model is more appropriate than the Mean Adjusted Model, the Market Model and the Market Adjusted Model. The authors found that industry effects were the major determinants of firm performance, firm effects played a small role and market share played hardly any role.

In a later study, Fama and French (1996), stated that many of the anomalies of share price returns described above (for example book-to-market equity ratio, size, etc.) that are not explained by the capital asset pricing model, are related. Accordingly, they say that the expected return in excess of the risk-free rate can be explained by way of the following three-factor model:

$$E(R_i) - R_f = b_1[E(R_m) - R_f] + s_1E(\text{SMB}) + h_1E(\text{HML}) + \varepsilon_{it}, \quad (\text{Formula 1})$$

where:

- $E(R_i)$  = the expected return of security  $i$ ;
- $R_f$  = the risk-free rate;
- $b_1, s_1$  and  $h_1$  = slopes in a time-series regression, or more specifically:
  - $b_1$  = the market  $\beta$ ;
  - $s_1$  = the coefficient of tilt or factor sensitivity towards small companies' shares and away from big companies' shares;



---

$h_1$	=	the coefficient of tilt or factor sensitivity towards high book-to-market equity ratio companies' shares (also referred to as "value" companies) and away from low book-to-market equity ratio companies' shares (also referred to as "growth" or "glamour" companies);
$E(R_m)$	=	the expected return on the broad market portfolio;
$E(\text{SMB})$	=	the difference between the expected return on a portfolio of small companies' shares and the expected return on a portfolio of large companies' shares (SMB - small minus big);
$E(\text{HML})$	=	the difference between the expected return on a portfolio of high book-to-market equity ratio companies' shares and the expected return on a portfolio of low book-to-market equity ratio companies' shares (HML – high minus low); and
$\epsilon_{it}$	=	the error term.

Fama and French (1996) found that their three-factor model is superior to the capital asset pricing model, which fails to explain the difference in returns as a

---



---

result of other variables such as book-to-market equity ratio, company size, etc. (i.e.  $\beta$  does not sufficiently explain expected returns). However, they admitted that the three-factor model is merely a model and could not be expected to fully explain the expected returns of all securities or portfolios.

## 2.6 Pre-acquisition impact on the target company's share price

The vast majority of studies into corporate acquisitions indicate that target company shareholders earn significantly abnormal positive returns around the announcement period.

Asquith and Kim (1982) studied conglomerate mergers and found that only the target company shareholders gain from mergers. The acquiring firms' shareholders' and bondholders' gains were shown to be insignificant. Jensen and Ruback's (1983) findings, which complement Asquith and Kim's (1982) findings, indicated that corporate takeovers generate positive gains whereby the target firm's shareholders benefit and the bidding firm's shareholders do not lose.

Research by Dodd and Ruback (1977) indicated that for the twelve-month period prior to the tender offer, shareholders of bidding firms earned significant positive abnormal returns. This changed, whether the bid was successful or not. In the month of the offer only successful bidders earned significant abnormal returns, while shareholders of target firms earned large positive abnormal returns irrespective of whether the tender offer was successful or not.

---



Affleck-Graves, Flack and Jacobson (1988) conducted a study whereby they looked at the effect of a merger announcement on the share price of the acquired and acquiring companies. This study was based in South Africa and found that the shareholders of the acquired companies earned significant positive abnormal returns, while there was no immediate evidence of abnormal returns to shareholders of acquiring companies.

A later study by Jensen (1988) confirmed that takeovers benefit shareholders of target companies. It was found that premiums in hostile takeovers historically exceeded 30 percent on average and in recent times have averaged circa 50 percent.

From the findings discussed above, it is clear that inside information prior to a public announcement regarding a merger or acquisition can be very lucrative. It is concluded from prior research, that the target company's shareholders will usually be offered a premium to what their shares are trading at the time of the announcement. An insider could therefore acquire shares in the target company from the acquirer at a price below the offer price and make a handsome profit in the process. Derivative instruments can also be used to gain leverage to enhance profits and minimise downside.





### 3. Research hypothesis

The purpose of this research was to examine the share price in target companies and to determine whether or not it increases significantly during the days immediately preceding a takeover, de-listing or share buy-back announcement. Any increase in share price prior to the first public announcement of a takeover, merger, de-listing or share buy-back is indicative of insider trading, as discussed in Chapter 2.

The research focussed on share price only and excluded volume traded and trading in derivatives. Exclusion of derivatives was due to the fact that most of the options traded in South Africa are traded over-the-counter (OTC) which makes access to the information extremely difficult, bordering on the impossible, while single stock futures and warrants are also excluded, due to the difficulty in accessing information. Volume traded was excluded and could be used as a focus point in future research.

#### *Hypothesis 1:*

The null hypothesis states that the shares of target companies earn no significant Average Cumulative Abnormal Returns (CAAR) prior to the first public announcement date. The alternative hypothesis states that the shares of target companies do earn significant Average Cumulative Abnormal Returns (CAAR) prior to the first public announcement date.

---



$$H_0: \text{CAAR} = 0$$

$$H_A: \text{CAAR} > 0$$

The term Average Cumulative Abnormal Return (CAAR) referred to in the hypothesis is the cumulative average abnormal return observed across the portfolio of 30 shares as described in Chapter 4. This is to say that the difference between expected and actual share price returns is accumulated for the 21 days preceding the event date for each of the companies and then averaged. Thus, the test statistic used in testing the stated hypothesis, can be presented as:

$$\text{CAAR}_{K,L} = \frac{1}{n} \sum_{t=K} \text{CAR}_{i,K,L} \quad (\text{Formula 6})$$

where:

$\text{CAAR}_{K,L}$  = the average cumulative abnormal return for all securities in the sample for the period from  $t = K$  to  $t = L$ ; and

$\text{CAR}_{i,K,L}$  = the cumulative abnormal return for each security  $i$  in the sample of a total of  $n$  securities for the period from  $t = K$  to  $t = L$

---



The hypothesis was tested by means of estimating the probability distribution of the test statistic (CAAR) under the null hypothesis, by using a historical bootstrapping technique.



## 4. Research methodology

### 4.1 Unit of analysis

The unit of analysis was a single target company involved in a takeover bid, de-listing or share buy-back scheme during the six-year period 2000 to 2005. Furthermore, the premium paid for the target company's shares was required to be in excess of 15%.

### 4.2 Population of relevance

The methodology for determining the population of relevance that was used is similar to that used by Smit (2005). The population of relevance consisted of all the targets of a takeover bid, de-listing or share buy-back during the six-year period 2000 to 2005. The study focussed on premiums paid for target company shares in excess of 15%. A premium in excess of 15% was decided on, because the insider can benefit significantly in a short period of time by trading on such inside information. If the premium paid for the target company's shares is too small, the risk in trading on inside information is considered too big, compared to the reward.

---



---

The population of relevance was extracted from the database of mergers and acquisitions compiled by Ernst & Young for their annual review of mergers and acquisitions in South Africa. In order to be included in the population of relevance, selected companies had to adhere to all of the following criteria:

- The description of the transaction had to be either a share buy-back, conditional offer for shares, unconditional offer for shares, section 311 scheme of arrangement, acquisition of related business, offer to minorities, merger of related business, buyout of minorities, group reconstruction or hostile takeover;
- The reason for the inclusion of an “offer to minorities” is that an insider could acquire these shares at a discount on the premium offered to the minorities and sell them at the higher price to the acquirer.
- The target company had to be listed on the JSE at the time of the offer;
- The premium paid for the target company’s shares had to be in excess of 15% of the pre-target price as per the Ernest & Young database;
- Confounding events should not have occurred in the event window period of 21 days prior to the first public announcement; (confounding events for this study comprised all information that could have a material effect on the share price of the target company; i.e. release of financial statements, trading statements, first cautionary announcement within the event window, additional cautionary announcement providing information that could affect the share price materially or any other information that could affect the share price materially. If the first



cautionary announcement and public announcement occurred on the same day, it was not seen as a confounding event and was included in the population of relevance);

- Daily share prices of the target companies had to be available for the entire event window as well as a period of six years before the event window;
- Target companies' PE and book-to-market ratios had to be available.

The Ernest & Young database does not contain information on the market capitalisation of the target company, whether any confounding events occurred within the event window, PE multiples or price-to-book values.

A number of steps had to be followed to determine which target companies met the aforementioned criteria. They involved the following:

- Extracting all transactions from the Ernest & Young database that met the description: share buy-back, conditional offer for shares, unconditional offer for shares, Section 311 scheme of arrangement, acquisition of related business, offer to minorities, merger of related business, buyout of minorities, group reconstruction or hostile takeover;
  - Eliminating all target companies that were not listed on the JSE at the time of the first public announcement;
  - Excluding target companies with an offer premium of less than 16% of the previous day's closing price;
-



- Reviewing the McGregor's BFANet Word database (a database that contains all JSE-listed companies' SENS announcements; circulars; annual reports and news reports) for each target company in the preceding step, to ascertain whether any confounding events, as discussed in previous paragraph, occurred within the event window period. All target companies that had experienced confounding events within the event window period were eliminated from the population of relevance, because of the potential impact that such confounding events may have had on the share price of the target company;
- Eliminating target companies from the population of relevance for which the P/E and book-to-market ratios were unavailable. These ratios were first acquired from the BFANet database, and, if not available from BFANet, they were acquired from Bloomberg;
- Eliminating target companies for which the market capitalisation was unavailable. The market capitalisation was calculated at close of day prior to the public announcement, by multiplying the outstanding ordinary shares (extracted from the last audited financial results prior to the announcement day) with the closing share price (day prior to first public announcement). The share price and outstanding ordinary shares were sourced from the BFANet database, Bloomberg was consulted where information could not be extracted.

#### 4.3 Sampling method and size

---



The population of relevance was extracted from the Ernest & Young Mergers and Acquisitions database. Out of a total of 5,039 merger and acquisition transactions, during the six-year period from 2000 to 2005, only 30 transactions met the criteria as described in paragraph 4.2 above. The 30 companies constituted the final sample in this study. The sample was selected judgementally and not randomly, therefore it is important to note that it places some limitation on the statistical inferences made. Random sampling is a prerequisite of the Central Limit Theorem. This limitation was only noted and not imposed on the methodology, subsequent to certain other international and local studies.

Meulbroek's (1992) prerequisite was that the target firm had to be listed on the New York Stock Exchange or on the American Stock Exchange from January 1985 to December 1986 and that the daily share returns were available. Bhana (2004) imposed a number of selection criteria such as only voluntary spin-offs included, spin-off excluded if either the parent or the subsidiary was a financial institution, only spin-offs between 1988 and 1999 included, as well as some other criteria.

Each of the 30 transactions in this judgemental sample was studied instead of treating the 30 transactions as a population of relevance.

#### 4.4 Data collection process

---





---

Firstly, the target companies were selected from the population of relevance as per the Ernest & Young database, using the criteria as discussed in Paragraph 4.2. The next step was to extract the daily share price performance for the target companies. Daily share prices for the selections were extracted from the BFANet database, using McGregor's RAID Station data extraction program.

The P/E multiples and price-to-book ratios were obtained from the BFANet database in the same manner as the daily share prices and volume traded. The outstanding ordinary shares, for the purpose of calculating the market capitalisation, were also obtained from the BFANet database. Where the required information was not available from the McGregor BFANet database, it was sourced from Bloomberg.

The confounding events were obtained by studying the Security Exchange News Service (SENS) announcements and other news reports. The SENS announcements and news reports were obtained from the BFANet word database. Confounding events for the purpose of this study comprised all events or information publicly available, which could materially affect the value of a share or company and which could influence investor behaviour. An event was classified as a confounding event if it comprised:

- Financial statements – audited and un-audited which were released within the event window period prior to the announcement date;
- Trading statements which were released within the event window period prior to the announcement date;



- 
- Updates to previous released (outside the event window) un-audited financial statements that could have a material effect on the share price of the company;
  - The first cautionary announcement when within the event window period of 21 days prior to first public announcement;
  - A further cautionary announcement within event window period of 21 days prior to the first public announcement if it could have a material effect on the share price of the target company (i.e. the acquirer offered a premium of 40% to the shareholders of the target for their shares – this could increase speculation and drive share price up);
  - Other events or information released in the event window period prior to the first public announcement that could potentially affect the share price of the target company (i.e. electricity failures expected at most of the ferrochrome furnaces would have a negative effect).

Share prices and price-to-book values from 1988 onwards, of all JSE-listed companies were acquired from the BFA McGregor database. This was used for the construction of the control portfolios.

#### 4.5 Data analysis approach

Most international studies that researched the probability of insider trading made use of the event study methodology to test for abnormal performance.

This is in line with the studies by Meulbroek (1992) and Givoly and Palmon (1985).

The event of interest for the purpose of this study is the target offer made by the acquirer. The event date is regarded as the day on which the first public announcement of the takeover, de-listing or share buy-back is made. This was denoted as “ $t_0$ ”. The impact on the price of the target company’s shares was measured daily over a period of 23 trading days, starting from a fixed event day,  $t_0$ , and working backwards for 21 days from  $t_0$  to  $t_{-21}$  and forward for 1 day to  $t_{+1}$ .

The announcement date for this study was the first announcement of a definite takeover, de-listing or share buy-back scheme on SENS. It is a JSE requirement that all company announcements are first released on SENS and only then published in the press. The only instance when a press announcement can occur before the SENS announcement is when the press announcement is made after close of trade and the SENS announcement is made before trade resumes the following day.

#### 4.5.1 Event study and control portfolios

The calculation of the expected return was the first step in analysing the data. The Control Portfolio Model was used to determine the expected returns for the reasons as set out in Paragraph 2.5. In constructing the control portfolios the methodology of Mordent and Muller (2003) was used.

---



---

The methodology used by Mordent and Muller (2003) for constructing the control portfolios is based on earlier work by Fama and French (1996). This is discussed in more detail in Paragraph 2.5. The Control Portfolio Model incorporates the price-to-book value ratio and the company size, but Mordent and Muller went further and stated that the “resources effect” is similar to the book-to-market and size effect. “It’s impact is similar to that of size and value: it provides a better explanation for the cross-section of returns over and above that afforded by traditional asset-pricing models” (Mordant and Muller, 2003, p. 21).

The “resources effect” is based on the work of Gilbertson and Goldberg (1981) and Van Rensburg (2001). These researchers found that the JSE is different from other stock markets in that a large portion of the shares on the bourse are strongly influenced by commodity prices and that for mining companies, predominantly gold mines, make up a sizeable proportion of its market capitalisation. They further argued that the performance of the mining shares was dominated by the gold price, which had little impact on the other segment of the market, the industrial sector. According to Gilbertson and Goldberg (1981), any asset-pricing model used to calculate returns on the JSE would be enhanced by taking account of this dual nature.

Mordant and Muller (2003) classified all JSE-listed companies into one of eight control portfolios based on the resources effect, price-to-book value ratio and the company size. This research study differs from that of Mordant and Muller

---



(2003) as the JSE-listed companies are classified into twelve control portfolios compared to their eight control portfolios. The companies were classified into small, medium and large capitalisation companies instead of only small and large capitalisation companies as per Mordant and Muller (2003). The control portfolios are set out in Table 4.1:

**Table 4.1: Control Portfolios**

<b>Control Portfolio</b>	<b>Resources or non-resources co.</b>	<b>Value or growth co.</b>	<b>Large medium small size</b>
SGN	Non-resources	Growth	Small
SGR	Resources	Growth	Small
SVN	Non-resources	Value	Small
SVR	Resources	Value	Small
MGN	Non-resources	Growth	Medium
MGR	Resources	Growth	Medium
MVN	Non-resources	Value	Medium
MVR	Resources	Value	Medium
LGN	Non-resources	Growth	Large
LGR	Resources	Growth	Large
LVN	Non-resources	Value	Large
LVR	Resources	Value	Large

The classification of the above-mentioned effects was determined as follows:



- A company's size was measured by its market capitalisation. All the companies were ranked in descending order of market capitalisation and the 40 shares with the largest market capitalisation constituted the large capitalisation portfolio. This replicated the JSE's ALSI40 Index. Shares, with a market capitalisation that fell in the category 41<sup>st</sup> to 100<sup>th</sup> constituting the medium capitalisation portfolio. The remaining shares comprised the small capitalisation portfolio (Mordant and Muller, 2003);
- A company was classified as a growth or a value investment by using price-to-book value ratios of all companies listed on the JSE. The price-to-book value ratios were calculated from the McGregor BFANet database and ranked, after which the median price-to-book value ratio was determined. All companies with price-to-book ratios above the median were classified as growth investments and the remainder as value investments (Mordant and Muller, 2003);
- The broad JSE sector groupings were used as criteria to decide whether stock represented a resource share or not. All mining and non-mining resources shares were classified as resources while the rest of the market was classified as non-resource (Mordant and Muller, 2003).

Each share listed on the JSE was placed in one of these twelve control portfolios depending on its characteristics. The control portfolios were rebalanced every quarter to ensure that changes in share characteristics (price-to-book ratios, market capitalisations, new listings and de-listings) were closely tracked over time. De-listed shares were included up to the date of termination

---



of listing, after which the share price returns of the de-listed companies were treated as missing data items until the end of the quarter. The de-listed shares were excluded from the following quarter's rebalancing of control portfolios. Similarly, the share price returns of newly listed shares were treated as missing data items; the newly listed shares were included in the next quarter when the control portfolios were rebalanced. Weekly equal-weighted indices were constructed for each of the twelve portfolios from the returns of all the stocks in that particular group. The weekly share price return for each share within each portfolio was calculated in terms of Formula 2. (Mordant and Muller, 2003).

$$R_{it} = \log [P_{it}/P_{it-1}] \quad (\text{Formula 2})$$

where:

$R_{it}$  = the share price return for security  $i$  for day  $t$ ; and

$P_{it}$  = the share price of security  $i$  at the end of day  $t$ .

Mimicking Mordant and Muller (2003), beta coefficients were calculated for each share in the sample by regressing the share's daily log-function share price return over a 36-month period (756 trading days at an average of 21 trading days per month) preceding the takeover announcement date against the daily returns of each of the twelve control portfolios for the same period. The result was a regression formula (Formula 3) for each selection. An alpha coefficient for each share was also obtained from the regression equation.



As stated in Mordant and Muller (2003), “the Control Portfolio model measures the expected return of share<sub>*i*</sub> in period<sub>*t*</sub> as the sum of the sensitivity of share<sub>*i*</sub> to the returns eight factor-mimicking portfolios and a calculated alpha estimate in period<sub>*t*</sub>.” This is summarised in Formula 3 for a twelve factor portfolio.

$$E(R_{it}) = \alpha_{i,t} + \beta_{i,1}SGN_t + \beta_{i,2}SGR_t + \beta_{i,3}SVN_t + \beta_{i,4}SVR_t \\ + \beta_{i,5}MGN_t + \beta_{i,6}MGR_t + \beta_{i,7}MVN_t + \beta_{i,8}MVR_t + \beta_{i,9}LGN_t + \beta_{i,10}LGR_t + \\ \beta_{i,11}LVN_t + \beta_{i,12}LVR_t + \varepsilon_{it}$$

(Formula 3)

where:

$E(R_{it})$  = the expected return on security<sub>*i*</sub> on day<sub>*t*</sub>;

$\alpha_{i,t}$  = the alpha intercept term of security<sub>*i*</sub> on day<sub>*t*</sub>;

$\beta_{i,1} \dots \beta_{i,8}$  = the beta coefficients on each control portfolio return;

$\varepsilon_{it}$  = the error term;

$SGN_t \dots SGR_t$  = the log-function share price returns on each of the twelve control portfolios set out in Table 4.1 on day *t*, calculated in terms of Formula 2.





---

After calculating the alpha and beta coefficients for each selection, the expected return for each selection, for each day in the event window, was calculated. This was done by inserting the average return for each of the twelve control portfolios for that particular day as the relevant variable of the matching control portfolio's beta coefficients in the regression equation (Formula 3).

After the expected return for share<sub>*i*</sub> in period<sub>*t*</sub> was calculated, the abnormal return for each selection, for each day in the event window period, was calculated. The abnormal return is simply the actual return of share<sub>*i*</sub> in the same period less the calculated expected return.

$$AR_{it} = R_{it} - E(R_{it}) \quad \text{(Formula 4)}$$

where:

$AR_{it}$  = the abnormal return of stock<sub>*i*</sub> in period<sub>*t*</sub>,

$E(R_{it})$  = the expected share price return of stock<sub>*i*</sub> in period<sub>*t*</sub> determined in terms of Formula 3;

$R_{it}$  = actual return of stock<sub>*i*</sub> in period<sub>*t*</sub>

The actual return on stock<sub>*i*</sub> in period<sub>*t*</sub> is calculated as:

$$R_{it} = (P_t - P_{t-1})/P_{t-1}$$

where:

---

---

$P_t$  = the price of stock<sub>*i*</sub> in period<sub>*t*</sub>

$P_t - P_{t-1}$  = the price of stock<sub>*i*</sub> at the beginning of period<sub>*t*</sub>

Performance over an extended period was calculated by summing the Abnormal Returns (ARs), calculated in terms of Formula 4, to obtain the Cumulative Abnormal Return (CAR) for each selection, for each event window period. Moradant and Muller (2003) used a weighted average abnormal return for each event day, while Smit (2005) did not apply a weighting. Smit's (2005) methodology was followed for the purposes of this research. The following formula was used to calculate the CAR:

$$CAR_{i,K,L} = \frac{1}{30} \sum_{t=K} AR_{it} \quad (\text{Formula 5})$$

where:

$CAR_{i,K,L}$  = the cumulative abnormal return for security<sub>*i*</sub> for the period from  $t = K$  to  $t = L$ ; and

$AR_{it}$  = the abnormal return for security *i* for day *t*, as calculated in Formula 4.

Smit (2005) went further and calculated the average cumulative abnormal return (CAAR) for each selection for the event window period. This methodology was followed in this study and, after all the Cumulative Abnormal Returns (CARs) for each selection for the 23-day window [-21; +1] had been calculated, the

---



---

average cumulative abnormal return (CAAR) was calculated as the simple average CAR of the selection in the sample for the event window period, as set out in Formula 6:

$$CAAR_{K,L} = \frac{1}{n} \sum_{t=K} CAR_{i,K,L} \quad (\text{Formula 6})$$

where:

$CAAR_{K,L}$  = the average cumulative abnormal return for all securities in the sample for the period from  $t = K$  to  $t = L$ ; and

$CAR_{i,K,L}$  = the cumulative abnormal return for each security  $i$  in the sample of a total of  $n$  securities for the period from  $t = K$  to  $t = L$ , as calculated in Formula 5.

After the CAAR for the 21-day event window period (21-day period immediately prior to the announcement) was calculated, the historical bootstrapping technique was applied to determine the frequency distribution. The significance of the CAAR at  $t_1$  will be tested using the frequency distribution. First, random CAARs had to be calculated. This was done by randomly selecting an event date for each company in the sample and applying the methodology as discussed in Chapter 4. This process was repeated 1,000 times. The CAAR for each iteration at  $t_1$  was divided into bins and plotted as a histogram. This

---

histogram is the graphical representation of the frequency distribution of the random CAARs of 1,000 iterations at one day prior to the public announcement.

#### 4.6 Data integrity

During the construction of the control portfolios and the sample selection process, various data integrity problems arose:

- Companies with missing data were excluded from the control portfolios and sample;
- Companies with less than six years of data before the event date were excluded as six year's worth of share price data was needed to calculate the frequency distribution;
- Companies with event dates that differed from the Ernest & Young database and SENS announcements were excluded from the sample;
- Shares with a return in excess of +40% (or -40%) were excluded for the purposes of calculating the frequency distribution; (it was assumed that these were data errors of some sort and these were excluded for that specific observation only.

#### 4.7 Research limitations

The research that was performed had certain limitations and these were the following:

---



- Additional potential factors influencing pre-announcement run-ups, i.e. news speculation (other than that reflected in the BFANet database) within the event window period were not isolated and excluded. Certain confounding events that have not been identified could have influenced the share price performance. Jarrell and Poulsen (1989) presented evidence in support of the anticipation hypothesis;
- The first cautionary announcement could trigger speculation, which could result in much of the impact of the offer being factored into the target companies share price at the time of the cautionary announcement or even preceding such cautionary announcement;
- The research investigated the occurrence of insider trading during the six-year period from 2000 to 2005, therefore is not representative of all takeovers, de-listings or share buybacks during all time periods. This was mainly due to fact that the Ernst & Young mergers and acquisitions database changed in 1999 and acquisitions prior to 1999 consequently could not be accessed for purposes of this study (in line with Smit's (2005) study);
- This study did not investigate insider trading in derivatives;
- This study did not look at volumes traded and trading volumes could also be indicative of insider trading;
- The study considered a relatively small sample;
- The sample was a judgemental sample; this placed some limitation on the statistical inferences that are made.



## 5. Results and discussion

### 5.1 Description of sample

The sample consisted of all mergers and acquisitions as per the Ernest and Young database, drawn from a total of 5,039 transactions during the six-year period from 2000 to 2005. All the companies that made up the sample had to adhere to the particular criteria described in Paragraph 4.2, above. These criteria can be largely classified into three categories, namely (1) availability of information; (2) non-occurrence of confounding events within the 21 days preceding the first public announcement of the takeover and (3) data integrity issues. Only 30 companies met these criteria. Each of the 30 companies in this judgemental sample was analysed separately instead of treating the 30 selections as a population of relevance and selecting a random sample from such a small population of relevance. Appendix 1 provides a detailed representation of each selection. A summary of the sample is presented in Table 5.1.

.



**Table 5.1: Summary of the mergers and acquisitions between 2000 and 2005 that met the selection criteria**

<b>Population size</b>	5,039
<b>Sample size</b>	30
<b>Frequency of year of occurrence</b>	30
2000	5
2001	4
2002	5
2003	6
2004	3
2005	7
<b>JSE Sub-sectors</b>	30
Beverages	1
Building, Construction and Engineering	2
Chemicals, Oils and Plastics	1
Clothing and Textiles	1
Electronic and Electrical Equipment	2
Food Producers and Processors	2
General Retailers	4
Household Goods and Textiles	3
Investment Companies	1
Leisure and Hotels	2
Life Assurance	2
Mining Finance	1
Platinum	1
Real Estate and Property	2
Retail	1
Short-term Insurance	1
Specialty and Other Finance	1
Support Services	2
<b>Premium paid for acquired shares</b>	30
16% to 25%	10
26% to 50%	8
51% to 75%	3
76% to 100%	4
> 100%	5
Maximum premium	218%
Minimum premium	16%
Mean	41%



## 5.2 Results and discussion

This section provides a representation of the results with a discussion thereof.

**Table 5.2: Abnormal Return Realisations of the 30-company sample**

Announcement Date	Company	t-1	t0	t+1
10/08/2005	Aflife	-6%	-9%	-9%
12/02/2003	Amaps	20%	16%	14%
24/08/2000	Bolwear	-2%	-5%	13%
04/12/2000	Cemenco	69%	84%	85%
29/08/2002	Chester	-16%	-18%	-16%
17/08/2001	Clyde	34%	49%	50%
19/07/2002	Daewoo	14%	13%	15%
05/03/2004	Digicore	-17%	-5%	-8%
04/01/2005	Excell	1%	11%	19%
31/10/2001	Aflife	16%	88%	87%
21/08/2003	Freddev	3%	39%	37%
11/01/2000	Gardian	12%	17%	17%
25/10/2000	Glohold	9%	91%	94%
17/12/2002	Goldreef	26%	30%	33%
09/11/2004	Grintek	13%	16%	37%
14/11/2002	Homechoice	64%	62%	63%
15/02/2005	Inmins	-22%	-22%	-24%
12/07/2004	Ist	-7%	-6%	-2%
16/09/2005	Messina	-4%	-3%	-26%
22/01/2003	Nandos	-1%	7%	6%
10/01/2003	Ninian	-6%	-7%	-6%
23/10/2003	Pepkor	-1%	13%	12%
17/10/2003	RIsprops	41%	80%	81%
11/07/2005	Sanlam	6%	6%	6%
06/10/2000	Seaharv	-4%	-4%	-4%
31/01/2001	Strand	6%	28%	30%
14/07/2005	Tigbrands	-1%	3%	2%
03/05/2005	Trnpaco	-6%	-6%	-6%
19/10/2001	Wescap	-4%	45%	45%
24/07/2002	Yabeng	3%	3%	-9%
Average Daily Return		2%	12%	1%
CAAR		8.09%	20.55%	21.15%

Table 5.2 represents the cumulative abnormal returns for each company as at (t<sub>-1</sub>), (t<sub>0</sub>) and (t<sub>+1</sub>). Table 5.2 also depicts the average daily return of the sample of 30 companies for the day prior to announcement (t<sub>-1</sub>), the announcement day



( $t_0$ ) and one day after the announcement ( $t_{+1}$ ). It also depicts the CAAR for ( $t_{-1}$ ), ( $t_0$ ) and ( $t_{+1}$ ).

**Figure 5.1: Time evolution of CAAR**

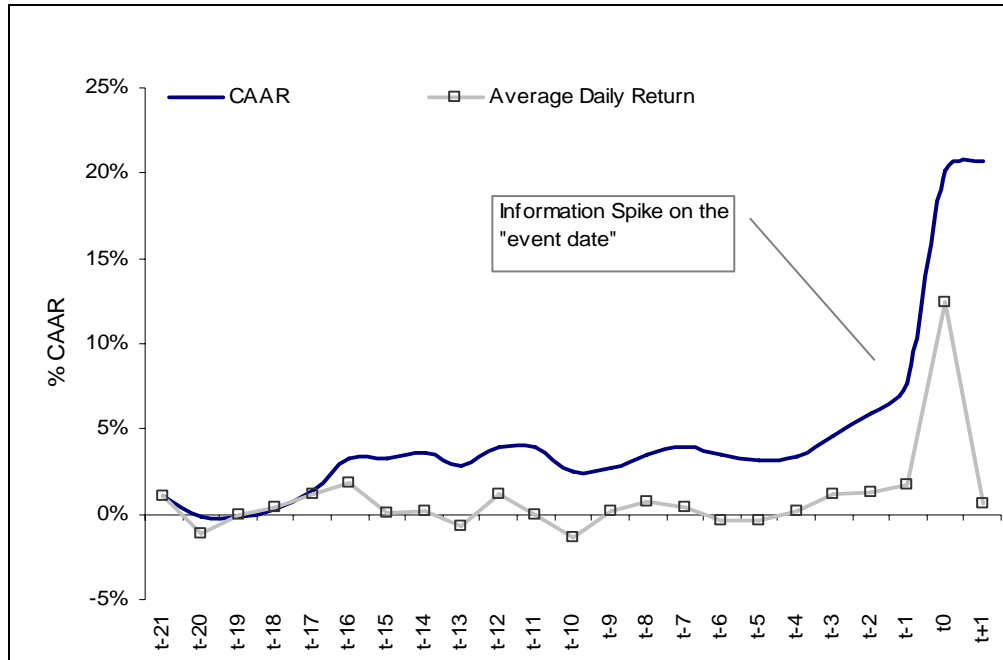


Figure 5.1 depicts the CAARs calculated for the sample of 30 companies that adhered to the criteria discussed in Paragraph 4.2. The CAARs are shown for each day of the 23-day event window period  $[-21,+1]$  commencing on the twenty-first day before the first announcement date and ending on the first day after the announcement date. The graph also illustrates the average daily returns for the same event window period.

The CAAR curve seems relative flat for the period  $t_{-21}$  to  $t_{-18}$ , with a CAAR for this 4-day period of only 0.48%. There seems to be some information leakage in



the market during the period  $t_{-17}$  to  $t_{-16}$ . This is reflected in the upward slope which equates to a 3% increase, or price build-up, in the CAAR for this period. Furthermore, there seems to be some volatility in the market between the days,  $t_{-15}$  and  $t_{-4}$ . This could be the result of random speculation and anticipation concerning whether the deal might materialise or not. This study is most interested in the upward slope for the 4-day period from  $t_{-4}$  to  $t_{-1}$ . During this 4-day period the CAAR increased from 3.74% to 8.09%. This seems to suggest a gradual pricing-in of sensitive information by the market. On  $t_{-1}$  the CAAR is 8.09%, which means that 8% of the total CAAR is accumulated in the 21 days prior to the announcement. This price build-up could be the result of random noise, leakage of sensitive information or sampling error. As expected, the CAAR spikes at  $t_0$  and a CAAR of 20% is realised. This is explained by the fact that all the information has now become public knowledge and the bulk of the price adjustment is done once information is available. The slope between period  $t_0$  and  $t_{+1}$  is flat and this is indicative of the majority of the information having been priced-in on the announcement date.

**Table 5.3: Summary Statistics of Sample Data at  $t_{-1}$**

Average	Standard Deviation	Skewness	Kurtosis	1 <sup>st</sup> Quartile	3 <sup>rd</sup> Quartile	Minimum	Maximum
0.35%	3.54%	-0.23	3.61	-1.63%	2.67%	-12.04%	11.43%

Table 5.3 presents a summary of the statistics that were calculated from the output of the frequency distribution at  $t_{-1}$ . Values are bounded in the range (-12%, 11.43%); the first and third quartiles realised respectively at 1.63% and



2.67%. It is interesting to note the negative skewness; measured at -0.23, this seems to accord with what can be observed from the Q-Q Plot line depicted in Appendix 4. The distribution moreover shows leptokurtic behaviour. This is evident in the kurtosis calculated at 3.61 compared to the Normal distribution's kurtosis of 3. The skewness can also be observed in the frequency distribution, figure 5.3. The skewness is expected as a bootstrapping technique using real data, and no assumptions around a Normal distribution's t- and z-tests were used. Appendices 5 and 6 also provide additional information regarding the skewness and distribution of the frequency distribution.

**Figure 5.2: CAAR Average Estimate of frequency distributions**

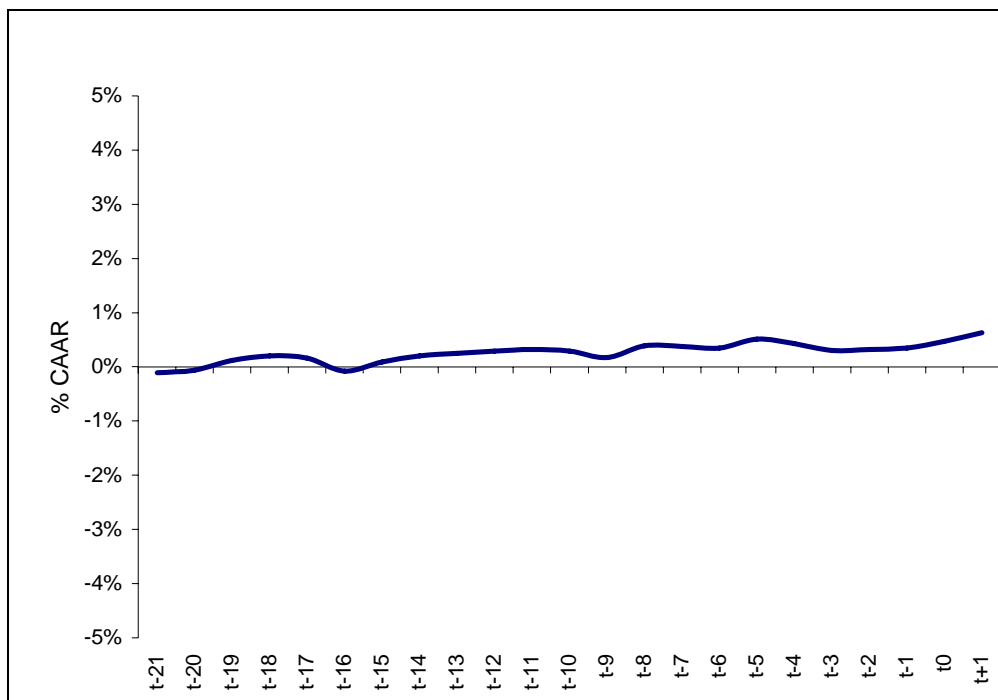


Figure 5.2 depicts the CAAR for each event day as calculated in the bootstrap technique. These CAARs were calculated using 1,000 randomly chosen event

dates for each company in the sample and therefore it would be expected that all the CAAR's are centered on zero.

On the contrary, it seems that the market moved slightly upwards (around 0.75%), over the event window period. This equates to an annual return of around 9%. The All Share Index (ALSI) has had an average annual return of around 14% for the past 75 years. This upward movement could therefore be the result of market movements, as explained in the ALSI's average return. The reason for the difference between the ALSI annual return and the annual return witnessed could be that the frequency distribution's sample was randomly chosen, not equal-weighted and not a representation of the ALSI.

Figure 5.3: Frequency Distribution of sample data at  $t_1$

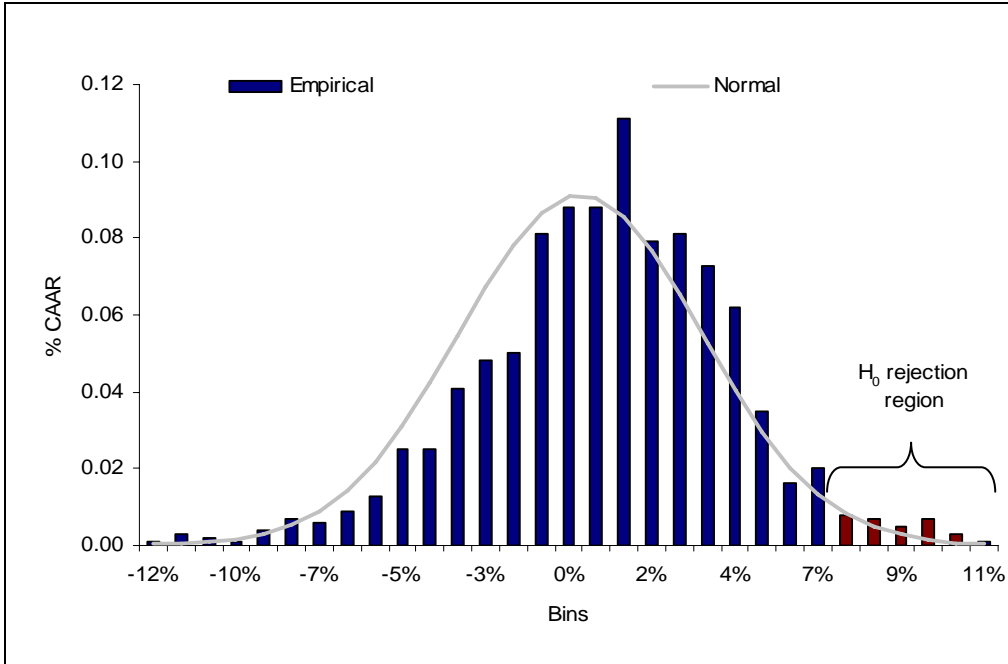


Figure 5.3 illustrates the frequency distribution of the sample data at event day  $t_1$ . This distribution was calculated by using the historical bootstrapping technique. The CAARs for each selection were grouped into bins and plotted as a histogram. It is observed in figure 5.3 that the frequency distribution is a somewhat skewed to the right. This graphical representation confirms the findings presented in table 5.3.

The next step was to determine the significance of the 8.09% CAAR realised in the event period  $[-21,-1]$ . This was determined by adding all the randomly chosen data points to the north of 8.09% in figure 5.3 and expressing this as a percentage over the total number of 1,000 randomly chosen data points. There are a total of 23 data points to the right of the 8.09% CAAR which equates to 2.3%. This means the 8.09% CAAR falls within the 95% confidence bound and applying a significance level of 5% the  $H_A$  can not be rejected. Thus, the alternative hypotheses which states that the shares of target companies do earn significant Average Cumulative Abnormal Returns (CAAR) prior to the first public announcement date can not be rejected.

$$H_0: \text{CAAR} = 0$$

$$H_A: \text{CAAR} > 0$$

Thus, the probability if the 8.09% CAAR that is observed being due to chance is 2.3%. Alternatively, there is 97.7% certainty that the 8.09% CAAR is not due to chance but to meaningful events.

---

Figure 5.4: CAAR Confidence Bounds

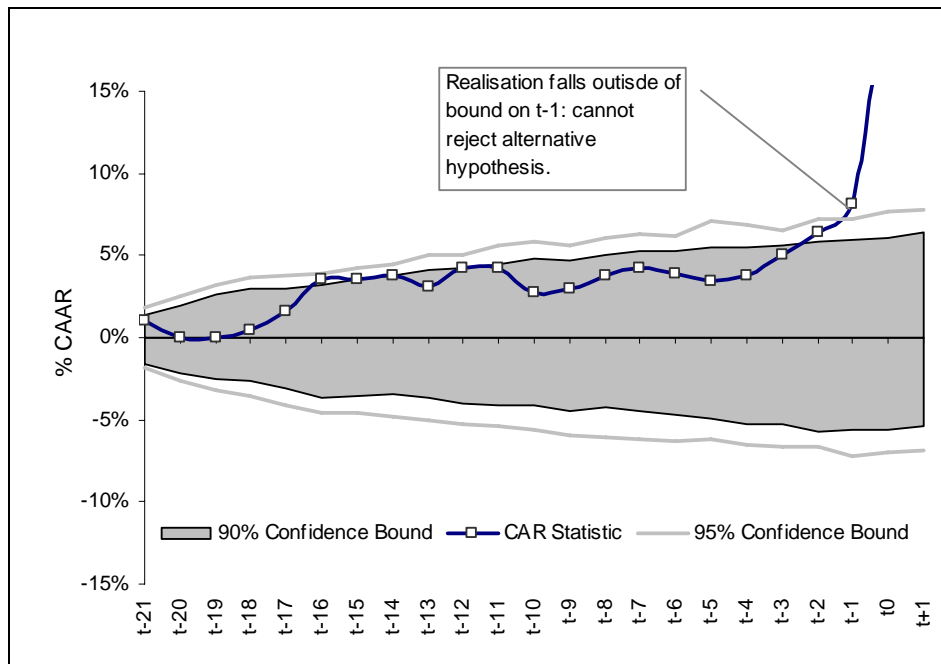


Figure 5.4 illustrates the 90% and 95% confidence bounds for the test statistic (CAAR) of the 30-company sample, for the event window period  $[-21, +1]$ . The confidence bounds comprise a representation of each event day's frequency distribution while the CAAR statistic is the CAAR for the 23-day event window period. The CAAR of 8.09% at  $t_{-1}$  is outside the 95% confidence bound and confirms the finding in the previous paragraph that the  $H_A$  can not be rejected for the CAAR of 8.09%.

The results of this study are in line with international studies as discussed in the literature review, except for the size of the accrued premium. Gupta and Misra (1998) have stated that half of the cumulative excess returns accrue in the 12 to 20 days preceding an announcement. Similarly, a study by Keown and



Pinkerton (1981) found that 42% of the share price accrues in the days before the announcement. The size of the premium could potentially be smaller than the premium build up in international studies, due to the size of the deals studied in this research.

The semi-strong form efficient market hypothesis states that all public information is reflected in the market price of a security so that only those possessing inside information can outperform the market (Keown and Pinkerton, 1981). It seems from figure 5.1 that certain insiders are trading on inside information which results in an 8% share price build-up in the days prior to the announcement. Furthermore, the market does appear to adjust immediately to the first public announcement of a corporate action. This can be observed in the flatness of the CAAR curve between  $t_0$  and  $t_{+1}$ .

This finding is confirmed by a study conducted on merger announcements and insider trading by Keown and Pinkerton (1981). These researchers found that half of the market reaction occurred in the days before the first public announcement, and most of the remaining reaction occurred on the announcement date, with an additional smaller reaction contributing to the build-up the following day.



### 5.3 Summarised conclusion of results

Table 5.4 compares the findings of this study regarding insider trading in target companies with those of the most prominent international studies. South African studies are not represented, because none could be found.

**Table 5.4: Findings of comparable studies and this report**

Authors	Sample size	Period	Event window (up to announcement date)	Abnormal return
Keown & Pinkerton (1981)	194	1975 – 1978	61 days	40% - 50%
Gupta & Misra (1988)	87	1986 - 1987	30 days	50%
Jarrel & Paulson (1989)	172	1981 - 1985	21 days	40%
This study	30	2000 - 2005	22 days	8%

All of the international studies based on American bourses realised an abnormal return of between 40% and 50% in the pre-announcement period compared to an 8% CAAR in this study. Potential reasons for the difference between the findings of international studies and the findings of this study could be that American insiders are less cautious with regard to trading on inside information; inside information is disseminated more easily in the American market; or American investors could be more opportunistic and acting on insider information could be seen as less of a crime in America than in South Africa.

The overall conclusion from this research report into insider trading in the shares of target companies is that such trading does occur, especially in the





days immediately before a public announcement. This finding is consistent with most international studies, except for the reported CAAR value being much higher in the international studies. The findings of this research report differ from those of Jarrel and Paulsen (1989) in that these researchers claimed that price build up is due to normal market anticipation and not to insider trading



## 6. Conclusion

This study presents data on share prices for target companies in 30 successful takeover, de-listing or share buy-back transactions on the JSE between 2000 and 2005.

The most substantial contribution of this study is that it seems to be the only South African study that investigates the occurrence of insider trading in the days preceding the announcement of a corporate action to date. The topic was widely researched and no other study could be traced. The only other study focusing on insider trading was a study by Mordant and Muller (2003) that investigated the profitability of directors' share dealings on the JSE.

Another unique aspect of the study is the use of the historic bootstrapping technique to make statistical inference.

The research report found that the market reaction to intended corporate actions, as discussed in the study, starts prior to the first public announcement of the intended action. The 30 targets of successful bids show significant share price run-ups in the event window period prior to the announcement. Averaged over the sample, about 8% of the eventual offer premium was anticipated in the form of pre-bid run-up.

There is strong statistical evidence to suggest the incorporation of price information in the period leading up to the first public announcement, evidenced

---



in a price build-up in the lead period. On controlling for confounding events within the event window period, the price build-up was suggestive or indicative of insider trading.

The research also found that more than half (4.5% of the 8.09% CAAR) of the share price run-up were in the 5 days prior to the first announcement.

The findings in the report also confirm, what appears to be common knowledge, that impending corporate actions are poorly-kept secrets and that trading on this non-public information is widespread. Potential sources for the information leakage could be that various investment banks, law firms and other advisory companies all work on the same deals simultaneously. Keeping this information confidential proves to be extremely difficult, especially on large deals.

The Chinese Walls implemented by some of these institutions seem to be too low. In order to combat the leakage of confidential and price-sensitive information, institutions need to develop, implement and enforce reasonable policies and procedures to safeguard such sensitive information and to ensure that improper trading does not occur.

Potential measures to address this include the containment of insider information; a moratorium on trading in the company's shares by employees and advisors and trading surveillance. In the United States, the government has

---



implemented laws, like the Sarbanes Oxley Act, which aims to improve the Chinese Wall concept by formalising and preventing conflict.

Some companies in South Africa, especially the larger institutions, seem to have implemented and to be enforcing some of the procedures mentioned in the previous paragraph. Furthermore, the JSE and Financial Services Board (FSB) also monitor trading and trading behaviour prior to the conclusion of large deals. However, with all these procedures and monitoring in place insider trading still occurs.

Insider trading is pervasive and illegal, but still continues to happen as suggested by this research study. Reasons for this could include the quick and relatively “risk-free” return that can be made as well as the perception that it is not frowned upon to purchase/sell shares if you hold inside information. In addition, it is hard to measure and prove insider trading. The first ever conviction for insider trading on the JSE only happened in 2007; and this after a lengthy court case. The Insider Trading Act (1998), as discussed in the literature review, and the first successful conviction could act as deterrents to future insider trading.

The results also support the semi-strong form efficient market hypothesis. This support is reflected in the market’s reaction to the new public information whereby all the information is priced-in the day after the announcement.

---



Insider trading on the JSE is a field that deserves extensive further research. It is recommended that future research be conducted over a longer period to cover more than one business cycle, as the occurrence of de-listings, consolidations, mergers and acquisitions are cyclical.

This study only focused on the share price build-up in the days prior to the event. Further studies could investigate trading volume on the days preceding an announcement.

Another interesting aspect to consider is insider trading in derivatives. Derivatives provide gearing and, where an insider has certainty of a deal materialising, he/she can earn significant profits with relatively low risk by making use of this gearing effect. Options can be utilised for its gearing potential as well as limiting the potential downside of investments. In the event of the deal not materialising, the only loss will be the premium paid. This makes options a popular instrument for the execution of insider trades.

Another study could investigate the price run-up before the first cautionary announcement.

It is very difficult to control for all confounding events within the event window period. For the purposes of this study, all the sources within means were used to determine and exclude confounding events. It has been noted that other information, anticipation and speculation could have an influence on the results.

---



## References

Affleck-Graves, J.F., Flack, T.P. and Jacobson, A.J. (1988) The effect of merger announcements on the share prices of the acquired and acquiring companies. *South African Journal of Business Management*, 19(14), 147-154.

Arnold, T., Gayle, E., Lance, N., and Nixon, T. (2005) Do option markets substitute for stock markets? Evidence from trading on anticipated tender offer announcements. DRAFT

Asquith, P. and Kim, E.H. (1992) The post-merger performance of acquiring firms: A re-examination of an anomaly. *The Journal of Finance*, XLVII(4), 1605-1621.

Bhana, N. (2005) The share price reaction to management buyout announcements of companies listed on the JSE Securities Exchange. *Investment Analysts Journal*, 62, 19–30.

Chakravarty, S., Gulen, H. and Mayhew, S. (2004) Informed Trading in stock and options markets. *The Journal of Finance*, LIX(3), 1235–1257.

Cornell, B. and Sirri, E.R. (1992) The reaction of investors and stock prices to insider trading. *The Journal of finance*, XLVII(3), 1031–1059.

---



Cox, J. and Rubinstein, M. (1985) *Options Markets*. Englewood Cliffs, NJ: Prentice-Hall

Dodd, P. and Ruback, R. (1977) Tender offers and stockholder return. *Journal of Financial Economics*, 5, 351-372.

Fama, E.F., Fisher, L., Jensen, M.C. and Rall, R. (1969) The adjustment of stock prices to new information. *International Economic Review*, 10(1), 1-21.

Fama, E.F. and French, K.R. (1996) Multifactor explanations of asset pricing anomalies. *The Journal of Finance*, 51(1), 55–84.

Fama, E.F. and French, K.R. (1992) The cross-section of expected stock returns. *The Journal of Finance*, 47(2), 427–465.

Financial Services Board (FSB) (2004) *The impact of South Africa's insider trading regime*. Johannesburg: FSB. Summary at <ftp://ftp.fsb.co.za/public/insider/activities.pdf> (accessed 15 June 2007).

Gao, Y. and Oler, D. (2004) Trading in target stocks before takeover announcements. *Western Finance Association annual meeting, October 2004, Vancouver Canada*. Vancouver: Western Finance Association: 1–47. Summary at



---

[http://www.indiana.edu/~aisdept/people/files/Oler/takeover%20Oct%2026\\_04\\_withident.pdf](http://www.indiana.edu/~aisdept/people/files/Oler/takeover%20Oct%2026_04_withident.pdf) (accessed 3 July 2007).

Gilbertson, B. and Goldberg, M. (1981) The market model and the Johannesburg Stock Exchange. *Investment Analysts Journal*, 17, 40–42.

Givoly, D. and Palmon, D. (1985) Insider trading and the exploitation of inside information: Some empirical evidence. *Journal of Business*, 58(1), 69- 87.

Gupta, A. and Misra, L. (1988) Illegal insider trading: Is it rampant before corporate takeover? *The Financial Review*, 23(4), 453–464.

Halpern, J.P. (1976) Empirical estimates of the amount and distribution of gains to companies in mergers. *The Journal of Business*, 46, 554–575.

*Insider Trading Act (1998)*, s.1

Jarrell, G.A. and Poulsen, A.B. (1989) Stock trading before the announcement of tender offers: Insider trading or market anticipation? *Journal of Law, Economics, & Organisation*, 5(2), 225–248.

Jayaraman, J., Frye, M.B. and Sabherwal, S. (2001) Informed trading around merger announcements: An empirical test using transaction volume and open interest in options market. *The Financial Review*, 37, 45-74.

---





Jensen, M.C. and Ruback, R.S. (1983) The market for corporate control.

*Journal of Financial Economics*, 11, 5–50.

Jensen, M.C. (1988) Takeovers: Their Causes and Consequences. *Journal of Economic Perspectives*, 2(1), 21–48.

Johannesburg Stock Exchange (Pty) Ltd (2006) *Insider trading and other market abuses*. Summary at

[http://www.jse.co.za/docs/insider/insider\\_trading.pdf](http://www.jse.co.za/docs/insider/insider_trading.pdf) (accessed 25 May 2007).

Keown, A.J. and Pinkerton, J.M. (1981) Merger Announcements and insider trading activity: An empirical investigation. *The Journal of Finance*, 36(4), 855–869.

Laffont, J. and Maskin, E.S. (1990) The efficient market hypothesis and insider trading on the stock market. *Journal of political Economy*, 98(1), 70–93.

Levy, H. and Yoder, J.A. (1993) The behaviour of option implied standard deviations around merger and acquisitions announcements. *Financial Review*, 28, 261–272.

Lin, J. and Howe, J.S. (1990) Insider trading in the OTC market. *The Journal of finance*, XLV(4), 1273–1284.

---



Mandelker, G. (1974) Risk and Return: The case of merging firms. *Journal of Financial Economics*, 1, 303–35.

McWilliams, A. and Siegel, D. (1997) Event studies in managerial research: Theoretical and empirical issues. *Academy of Management Journal*, 40(3), 626–657.

Meulbroek, L.K. (1992) An empirical analysis of illegal insider trading. *The Journal of finance*, XLVII(5), 1661–1699.

Mordant, N. and Muller, C. (2003) Profitability of director's share dealings on the JSE. *Investment Analysts Journal*, 57, 17–32.

Mushidzhi, T.B. and Ward, M. (2004) Abnormal returns for cash vs. share funded acquisitions. *Investment Analysts Journal*, 60, 17–31.

Roll, R. (1978) Ambiguity when performance is measured by the security market line. *The Journal of Finance*, 33(4), 1051-1069.

Sheer, D. (2007) US buyout bonanza sets off alarm over insider trading. *Business Day*, 28 May, p.16

Smit, C.J.B. (2005) *The impact of large acquisitions on the share price and operating financial performance of acquiring companies listed on the JSE*. MBA Thesis, Gordon Institute of Business Science.

---



Van Rensburg, P. (2001) A decomposition of style-based risk on the JSE.

*Investment Analysts Journal*, 54, 45-60.

Wernerfelt, B. and Montgomery, C.A. (1988) Tobin's q and the importance of focus in firm performance. *The American Economic Review*, 78(1), 246-250.



Appendix 1: Details of sample selection

Acquirer	Target	Resource/Non Resource	Announcement Date	Effective Date	Target Offer Price	Target Pre JSE	% premium
Sanlam Ltd	African Life Assurance Company Ltd	Non-Resource	10/08/2005	12/12/2005	2250	1911	18%
Salton Hong Kong Ltd	Amalgamated Appliances	Non-Resource	12/02/2003	02/05/2003	125	106	18%
Cargo Carriers Holdings (Pty) Ltd	Bolton Footwear Ltd	Non-Resource	24/08/2000	01/12/2000	230	100	130%
Skansa Cementation International Holdings Ltd	Cementation Co Afr Ltd	Non-Resource	04/12/2000	09/02/2001	250	112	123%
Chester Investment Hldgs	Chester Investment Hldgs	Non-Resource	29/08/2002	08/11/2002	85	70	21%
The Gordon Wilson Family Trust	Clyde Industrial Corp	Non-Resource	17/08/2001	17/08/2001	75	61	23%
Daewoo Electronics Sa Ltd	Daewoo Electronics Sa Ltd	Non-Resource	19/07/2002	11/11/2002	2	1	100%
Digicore Holdings Ltd	Digicore Holdings Ltd	Non-Resource	05/03/2004	05/03/2004	60	49	22%
Excellerate Holdings Ltd	Excellerate Holdings Ltd	Non-Resource	04/01/2005	31/12/2004	70	60	17%
Fortune Beverages Ltd	Fortune Beverages Ltd	Non-Resource	31/10/2001	31/10/2001	350	110	218%
Randgold & Exploration Company Ltd	Free State Development And Investment Corporation Ltd	Resource	21/08/2003	24/11/2003	368	250	47%
Saab	Grintek Ltd	Non-Resource	09/11/2004	09/11/2004	190	124	53%
Gold Reef Casino Resorts	Gold Reef Casino Resorts	Non-Resource	17/12/2002	31/01/2003	300	240	25%
The Jankelowitz Consortium	Glohold Ltd	Non-Resource	25/10/2000	15/12/2000	10	5	100%
Santam Ltd	Guardian National Ins Co	Non-Resource	11/01/2000	30/12/1999	1307	660	98%



Acquirer	Target	Resource/No n Resource	Announce ment Date	Effective Date	Target Offer Price	Target Pre JSE	% premium
Garfam Nominees (Pty) Ltd	Homechoice Holdings Ltd	Non-Resource	14/11/2002	14/11/2002	18	14	29%
Winhold Ltd	Inmins Ltd	Non-Resource	15/02/2005	23/05/2005	409	259	58%
Manupont 198 (Pty) Ltd	Ist Group Ltd	Non-Resource	12/07/2004	18/10/2004	200	157	27%
Lonmin Plc	Messina Ltd	Resource	16/09/2005	06/02/2006	4500	1795	151%
Brozent Holdings (Pty) Ltd	Nando's Group Holdings Ltd	Non-Resource	22/01/2003	14/04/2003	70	52	35%
Ninian & Lester Holdings Ltd	Ninian & Lester Holdings Ltd	Non-Resource	10/01/2003	14/02/2003	850	701	21%
Castellina Investments (Pty) Ltd	Pepkor Ltd	Non-Resource	23/10/2003	30/01/2004	1200	664	81%
JCI Ltd	Rand Leases Properties Ltd	Non-Resource	17/10/2003	16/02/2004	112	46	143%
Sanlam Ltd	Sanlam Ltd	Non-Resource	11/07/2005	24/10/2005	1367	1174	16%
Tiger Brands Ltd Ord	Sea Harvest Corp Ltd	Non-Resource	06/10/2000	01/12/2000	725	610	19%
Consortium	Strand Group Hldgs Ltd	Non-Resource	31/01/2001	06/04/2001	85	60	42%
Tiger Brands Black Managers Trust	Tiger Brands Ltd	Non-Resource	14/07/2005	17/10/2005	11200	8010	40%
Transpaco Ltd	Transpaco Ltd	Non-Resource	03/05/2005	17/06/2005	630	460	37%
Catalyst Holdings (Pty) Ltd	Western Cape Property Co	Non-Resource	19/10/2001	14/12/2001	90	57	58%
Consortium	Yabeng Inv Hldg Company	Non-Resource	24/07/2002	04/10/2002	30	21	43%

## Appendix 2: Details of AAR and CAAR for 30 companies in the sample

Company	t-21	t-20	t-19	t-18	t-17	t-16	t-15	t-14	t-13	t-12	t-11	t-10	t-9	t-8	t-7	t-6	t-5	t-4	t-3	t-2	t-1	t0	t+1
Aflife	-1.23%	-1.26%	-1.18%	-2.75%	-0.32%	0.00%	2.50%	-0.08%	0.28%	-0.32%	0.38%	0.25%	-1.79%	0.40%	-0.98%	-0.50%	0.69%	-0.83%	0.72%	-0.57%	0.12%	-2.80%	-0.10%
Amaps	-1.45%	1.73%	-0.35%	3.12%	8.60%	3.15%	-1.66%	-7.04%	-8.22%	1.84%	1.01%	3.40%	0.83%	-0.11%	0.48%	-2.61%	2.05%	5.10%	6.57%	-3.00%	6.17%	-3.20%	-2.74%
Bolwear	5.61%	0.18%	-0.13%	-0.05%	0.46%	-0.21%	3.51%	-0.18%	-0.40%	-1.26%	-0.05%	1.21%	-0.72%	1.10%	-0.28%	0.86%	-0.13%	-1.45%	-9.85%	0.89%	-0.75%	-3.40%	17.91%
Cemenco	-0.07%	3.87%	2.64%	-1.05%	1.05%	-0.37%	0.51%	0.71%	1.17%	24.14%	0.00%	0.37%	0.07%	1.97%	6.81%	1.34%	1.27%	0.08%	3.03%	0.55%	21.30%	14.71%	0.63%
Chester	-0.46%	0.35%	-1.94%	-5.29%	1.87%	-0.31%	1.98%	-0.46%	1.28%	0.26%	-1.68%	0.67%	1.85%	0.05%	-0.01%	-1.18%	-5.36%	-0.01%	-4.63%	0.50%	-3.06%	-1.95%	1.08%
Clyde	-3.57%	4.24%	5.60%	4.87%	1.28%	1.80%	4.08%	-1.22%	1.31%	-6.05%	-5.91%	-0.24%	8.07%	4.05%	6.57%	1.31%	2.64%	-0.56%	-0.93%	3.99%	2.56%	15.07%	0.74%
Daewoo	-1.06%	-1.69%	1.07%	-0.98%	2.05%	43.29%	-43.88%	2.75%	-0.77%	0.62%	1.01%	0.81%	-1.74%	1.31%	1.93%	2.44%	1.90%	-2.95%	3.20%	3.63%	1.00%	-0.68%	1.93%
Digicore	-0.43%	-0.48%	-5.31%	5.67%	-6.13%	-0.04%	6.31%	-7.52%	0.09%	4.49%	-4.68%	2.21%	-2.67%	-2.47%	-6.24%	3.87%	0.41%	-2.29%	-2.08%	0.31%	0.25%	11.59%	-2.60%
Excell	1.12%	0.04%	-1.97%	-7.38%	6.39%	1.71%	1.34%	-0.80%	0.04%	-14.26%	-0.28%	0.30%	-0.12%	1.17%	3.11%	0.04%	2.27%	-2.32%	14.46%	0.54%	-4.16%	10.22%	7.81%
Aflife	0.18%	-0.22%	0.91%	3.72%	0.04%	6.37%	-0.63%	-0.22%	0.02%	1.35%	-0.03%	0.98%	0.00%	0.26%	0.25%	0.59%	1.36%	0.76%	0.19%	-0.29%	0.87%	71.17%	-0.29%
Freddev	0.71%	-7.18%	-1.73%	2.23%	3.06%	-9.66%	-2.37%	0.19%	0.31%	-0.53%	8.17%	-0.41%	-1.98%	6.24%	-0.21%	-0.66%	-4.48%	9.33%	-0.28%	-1.21%	3.00%	36.18%	-1.42%
Gardian	-2.05%	2.14%	0.26%	-0.05%	0.68%	-0.30%	-0.47%	3.26%	2.05%	1.71%	-1.71%	-0.05%	-0.38%	2.60%	-0.05%	-0.05%	-2.31%	0.42%	1.78%	2.45%	0.86%	4.69%	0.06%
Glohold	29.79%	-26.60%	1.02%	0.99%	3.89%	5.57%	15.17%	1.64%	3.27%	16.78%	1.54%	-44.69%	2.23%	5.28%	1.97%	-21.98%	3.65%	4.45%	1.55%	1.60%	2.32%	81.38%	3.37%
Goldreef	3.09%	0.03%	0.22%	0.90%	7.65%	0.24%	-4.17%	4.68%	0.62%	1.10%	1.18%	-5.79%	6.30%	3.12%	1.56%	-1.53%	-1.07%	2.78%	1.91%	2.40%	0.85%	3.90%	3.15%
Grintek	-0.02%	-0.78%	1.63%	2.93%	-1.64%	1.91%	0.07%	1.12%	0.46%	-0.68%	2.75%	-1.17%	0.19%	-2.29%	-1.68%	0.74%	0.43%	1.28%	-2.04%	5.76%	4.49%	2.33%	20.91%
Homechoic	0.34%	-3.05%	0.15%	0.69%	4.45%	7.94%	3.36%	0.78%	-1.79%	5.74%	-15.32%	17.76%	2.27%	3.83%	0.79%	4.93%	2.28%	-4.14%	-4.80%	20.84%	16.80%	-1.82%	0.84%
Inmins	-1.05%	-6.58%	-3.18%	-4.85%	1.64%	-0.15%	-0.45%	-0.90%	-3.61%	-0.63%	0.45%	0.87%	0.17%	-0.41%	5.57%	-0.69%	-0.58%	-3.06%	-0.43%	-1.30%	-2.56%	-0.58%	-2.15%
Ist	3.00%	1.70%	-0.02%	-0.32%	-2.47%	-0.42%	-5.76%	1.19%	-0.03%	-2.17%	0.07%	-0.31%	-1.24%	0.87%	0.74%	-0.09%	-2.44%	0.67%	-2.30%	3.39%	-0.89%	0.80%	4.22%
Messina	-1.63%	0.83%	-0.54%	-0.73%	-0.59%	-0.73%	0.88%	1.67%	0.21%	1.12%	0.22%	0.62%	-2.60%	-2.75%	-0.13%	-0.94%	-0.45%	0.65%	2.01%	-0.74%	-0.32%	0.82%	-22.76%
Nandos	-0.72%	-0.34%	-0.34%	-0.68%	7.71%	-0.22%	-0.34%	-3.94%	-1.11%	-1.02%	3.09%	-7.54%	0.12%	1.74%	-4.05%	5.77%	-0.95%	1.47%	-0.96%	-0.20%	1.25%	8.48%	-1.58%
Ninian	-0.39%	-1.11%	-0.53%	4.19%	-0.05%	2.26%	-2.17%	-0.70%	-1.21%	-0.53%	-0.53%	-0.03%	0.61%	-3.36%	-0.53%	-0.53%	0.88%	-0.34%	-0.42%	-1.21%	-0.57%	-0.35%	1.04%
Pepkor	-0.24%	-3.69%	-0.40%	1.65%	2.45%	2.69%	3.51%	-0.13%	-0.26%	-0.22%	1.76%	2.51%	-0.10%	-1.43%	-1.58%	-1.39%	-2.63%	-0.04%	0.96%	-2.46%	-1.79%	13.62%	-0.33%
Risprops	-0.25%	-0.06%	1.51%	1.14%	0.80%	0.70%	3.97%	1.42%	1.11%	1.20%	0.23%	-11.71%	3.21%	1.15%	0.45%	-0.28%	-1.38%	0.58%	28.55%	0.07%	8.79%	38.94%	0.57%
Sanlam	-0.27%	1.92%	2.76%	-0.45%	0.34%	-0.41%	0.56%	0.62%	-0.31%	1.78%	0.84%	0.15%	-0.02%	0.37%	0.50%	1.71%	-2.37%	0.33%	-0.46%	-1.20%	-0.17%	-0.40%	0.21%
Seaharv	-0.57%	0.82%	-0.01%	0.00%	-0.85%	-0.27%	-0.18%	0.04%	0.36%	-0.15%	-0.06%	-0.13%	-0.35%	-0.70%	-0.43%	-0.46%	-0.76%	-0.31%	0.13%	-0.17%	0.08%	-0.26%	-0.13%
Strand	0.26%	1.03%	-0.88%	0.47%	-10.11%	-0.37%	15.30%	7.09%	-3.01%	-5.41%	0.15%	1.07%	-6.68%	2.88%	-1.33%	-0.24%	4.41%	-1.62%	3.30%	-0.24%	0.23%	22.12%	1.19%
Tigbrands	-0.21%	-0.11%	0.05%	-0.73%	1.64%	-0.09%	-0.68%	-0.52%	0.50%	2.99%	1.61%	-1.49%	-1.18%	-0.82%	-0.19%	-0.43%	0.92%	-0.88%	-0.19%	-0.27%	-0.92%	3.60%	-0.48%
Trnpaco	1.14%	-1.00%	7.07%	-0.79%	0.13%	-3.05%	-1.48%	1.61%	-5.51%	1.93%	1.28%	-0.37%	-0.53%	-0.97%	-0.35%	-1.85%	-0.21%	-0.77%	-3.50%	1.51%	-0.77%	0.94%	-0.50%
Wescap	4.88%	1.25%	0.40%	-2.64%	0.66%	-1.23%	-0.70%	1.79%	-2.13%	0.75%	-0.01%	-2.53%	0.38%	1.85%	0.23%	0.66%	-9.28%	0.33%	0.80%	-0.06%	0.61%	49.45%	-0.62%
Yabeng	-1.81%	0.45%	-5.13%	9.81%	0.64%	-1.45%	0.94%	0.46%	-6.76%	1.12%	0.99%	0.28%	0.82%	0.62%	1.12%	-0.12%	-3.17%	1.37%	1.07%	5.90%	-3.66%	-0.88%	-11.94%
<b>AAR</b>	<b>1.09%</b>	<b>-1.12%</b>	<b>0.05%</b>	<b>0.46%</b>	<b>1.18%</b>	<b>1.94%</b>	<b>-0.03%</b>	<b>0.24%</b>	<b>-0.73%</b>	<b>1.19%</b>	<b>-0.06%</b>	<b>-1.44%</b>	<b>0.27%</b>	<b>0.76%</b>	<b>0.47%</b>	<b>-0.38%</b>	<b>-0.41%</b>	<b>0.27%</b>	<b>1.25%</b>	<b>1.38%</b>	<b>1.73%</b>	<b>12.46%</b>	<b>0.60%</b>
<b>CAAR</b>	<b>1.09%</b>	<b>-0.03%</b>	<b>0.02%</b>	<b>0.48%</b>	<b>1.66%</b>	<b>3.60%</b>	<b>3.57%</b>	<b>3.81%</b>	<b>3.08%</b>	<b>4.27%</b>	<b>4.20%</b>	<b>2.76%</b>	<b>3.03%</b>	<b>3.79%</b>	<b>4.26%</b>	<b>3.88%</b>	<b>3.47%</b>	<b>3.74%</b>	<b>4.98%</b>	<b>6.36%</b>	<b>8.09%</b>	<b>20.55%</b>	<b>21.15%</b>

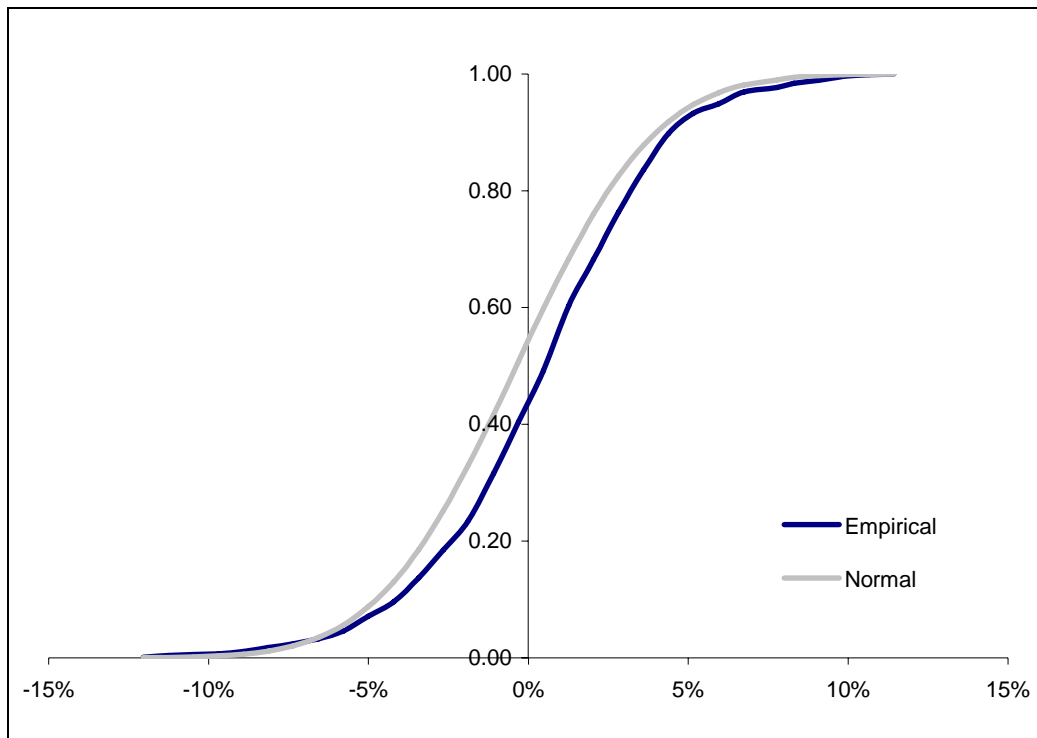


Appendix 3: Details of frequency distribution at  $t_1$

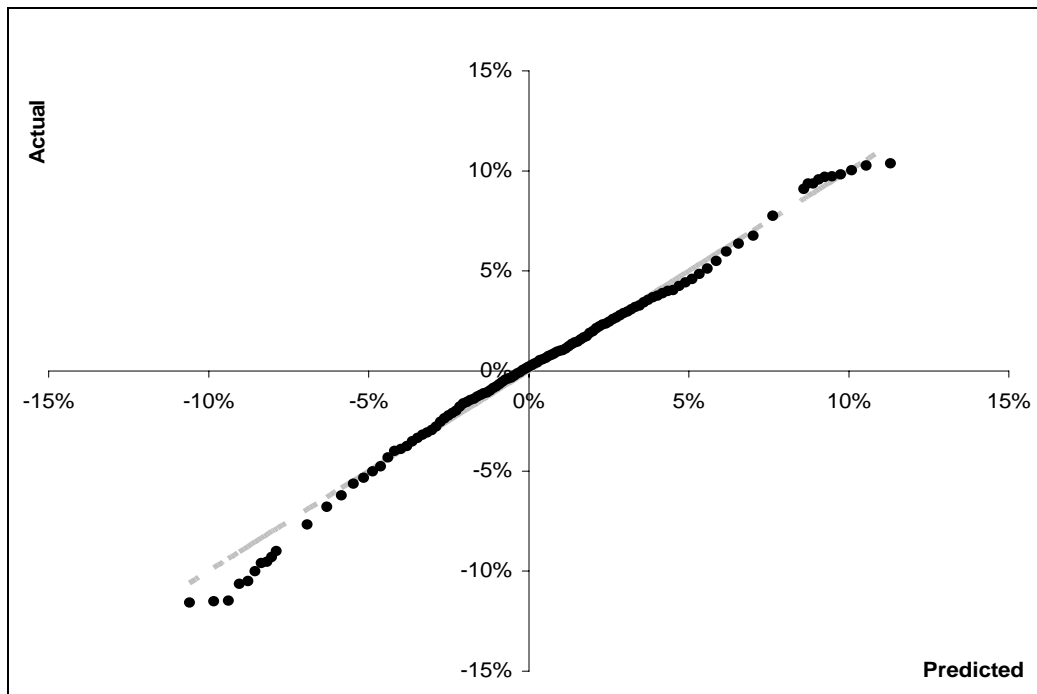
Bin	Cumulative Obs.	Obs. Per Bin	Frequency	Cum. Freq.
-0.1204	1	1	0.0010	0.0010
-0.1125	4	3	0.0030	0.0040
-0.1047	6	2	0.0020	0.0060
-0.0969	7	1	0.0010	0.0070
-0.0891	11	4	0.0040	0.0110
-0.0813	18	7	0.0070	0.0180
-0.0734	24	6	0.0060	0.0240
-0.0656	33	9	0.0090	0.0330
-0.0578	46	13	0.0130	0.0460
-0.0500	71	25	0.0250	0.0710
-0.0422	96	25	0.0250	0.0960
-0.0343	137	41	0.0410	0.1370
-0.0265	185	48	0.0480	0.1850
-0.0187	235	50	0.0500	0.2350
-0.0109	316	81	0.0810	0.3160
-0.0031	404	88	0.0880	0.4040
0.0048	492	88	0.0880	0.4920
0.0126	603	111	0.1110	0.6030
0.0204	682	79	0.0790	0.6820
0.0282	763	81	0.0810	0.7630
0.0361	836	73	0.0730	0.8360
0.0439	898	62	0.0620	0.8980
0.0517	933	35	0.0350	0.9330
0.0595	949	16	0.0160	0.9490
0.0673	969	20	0.0200	0.9690
0.0809	977	8	0.0080	0.9770
0.0887	984	7	0.0070	0.9840
0.0965	989	5	0.0050	0.9890
0.1044	996	7	0.0070	0.9960
0.1122	999	3	0.0030	0.9990
0.1200	1000	1	0.0010	1.0000
Number of datapoints to the right of 8.09% (CAAR)				23
Total number of datapoints in bins				1000
% of datapoints to the right of 8.09% (CAAR)				2.3%



Appendix 4: Cumulative Frequency Distribution at  $t_1$



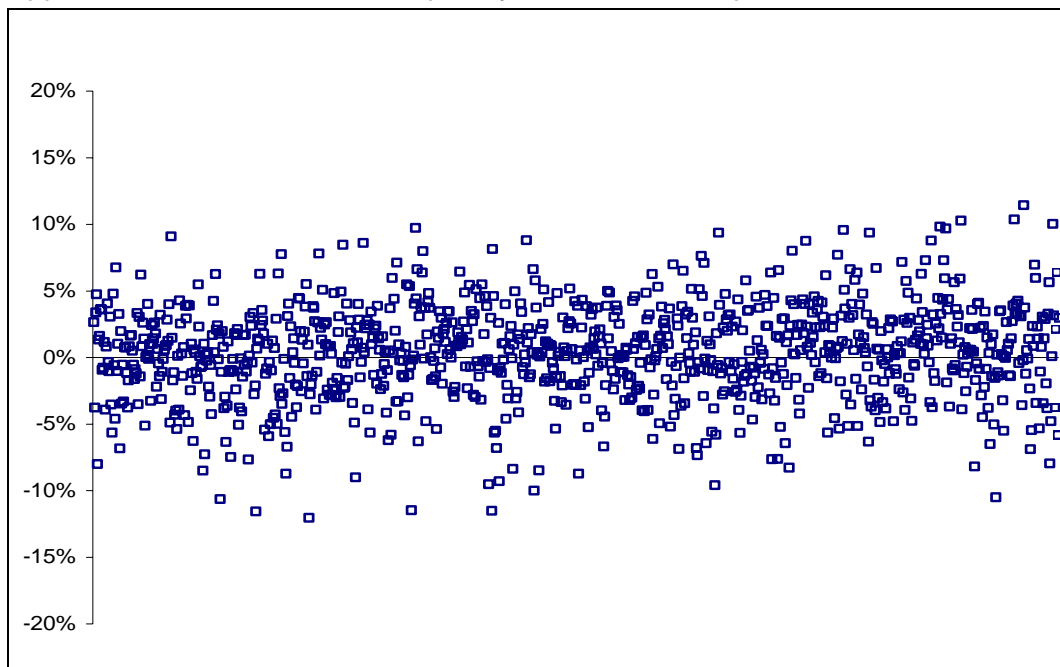
Appendix 5: Quantile-Quantile Plot at  $t_1$







Appendix 6: Scatter Plot of Frequency distribution sample



Appendix 7: CD containing database