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THE EFFICIENCY OF THE JOHANNESBURG STOCK EXCHANGE WITH RESPECT TO TAKEOVER INFORMATION

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A dissertation submitted to the faculty of Commerce,
University of the Witwatersrand, Johannesburg
in partial fulfilment of the requirements
for the Degree of Master of Commerce.

JOHANNESBURG
1986

ABSTRACT

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Takeovers are an important economic activity appearing to affect both the current profitability and the growth prospects of the firms involved. The market's perception of these synergies seems to be reflected in the share prices of both the acquired and acquiror companies. This dissertation examines the impact of takeovers on share prices on The Johannesburg Stock Exchange (JSE), within the context of the efficient market hypothesis, during the period 1 January 1979 to 30 June 1984, and attempts to identify the number of months before the closing date of the offer that the market begins to anticipate the takeover. It is a study of an efficient market in the semi-strong form.

The methodology used to identify the period when the market begins to anticipate the takeover, was to measure the residuals between the actual share prices and the expected share prices had there been no takeover, adjusted for movements in the market index, around the closing date to register for the takeover offer. Significant departures from the normal residuals were attributed to the takeover news. The market model, which has been tested in South Africa and other countries for this type of study and for other tests of the semi-strong form of the efficient market hypothesis, was used to estimate expected share prices.

The dissertation also presents a theoretical discussion of the efficient market hypothesis in its three different forms and reviews the empirical research conducted on this theory, both in relation to takeovers and other subjects, in South Africa, the United Kingdom and the United States of America.

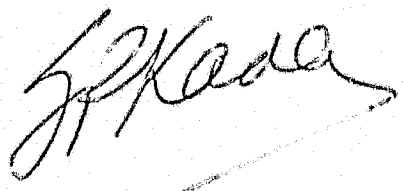
As regards the period when the market begins to anticipate the takeover it was found that, on average, the market began to anticipate the takeover seven months before the closing date of the takeover offer for both acquired and acquiror companies. Whilst the JSE appears efficient in the timing of the takeover adjustment for both acquired and acquiror companies it appears that it may be inefficient in the assimilation of the accuracy of the takeover news as far as acquiror companies are concerned. It was also found that a larger proportion of companies taken over had negative residuals before the takeover was discounted, and that a large proportion of acquiror companies reported negative residuals after the discounting of the takeover by the market.

DECLARATION

I, Suresh Parbhoo Kana, do hereby declare that this dissertation entitled "The efficiency of The Johannesburg Stock Exchange with respect to takeover information" is my own unaided work save to the extent indicated in the acknowledgement and references.

I further declare that this dissertation or any part of it has not been submitted in the past or is to be submitted for a degree in any other university.

The information used in this dissertation has not been obtained by me while being employed by, or working under, the aegis of any person or organisation other than the University of the Witwatersrand.



SURESH PARBHOO KANA

DEDICATION

To Kalpana, Harshalkumar and the rest of my family.

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to all those kind people who assisted me in compiling this research dissertation. In particular I would like to thank:-

Mr David Solomon for his guidance, encouragement and assistance in supervising this study.

Doctor Sidney High and Professor Michael Pratt for advice in certain areas.

Miss Shirley Harrison for typing this dissertation.

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CHAPTER 1

INTRODUCTION

CHAPTER 1 - INTRODUCTION

1.1 Research justification

Takeover, mergers and acquisitions have played an important role in the growth of firms in South Africa. Some companies particularly the mining houses, financial institutions and financial holding companies appear to have specifically adopted a growth by acquisition strategy and if past trends continue then most investors and management will at some time be involved in such activity. To fully appreciate the potential of such activity it is useful for investors and management to know the impact of takeovers on the share price of both the acquired and acquiror companies and the period when the market begins to anticipate the takeover.

Whilst the research conducted by MacGregor (36) is the most authoritative in South Africa on the subject of takeovers and mergers, it does not study the impact of the takeover announcement on the share price of the acquired and acquiror companies. This study has been undertaken to remedy the lack of research into this particular area.

1.2 Objectives of the study

The specific objectives of this study are:-

(a) To approximate the number of months prior to the closing date of the takeover offer that the market begins to anticipate the takeover.

(b) To provide investors and management with information relating to the impact of takeovers on the share returns of the acquired and acquiror company.

In this chapter the definitions accorded to the terms 'takeover', 'merger' and 'acquisition' as used within the context of this dissertation are discussed. In addition, reasons why takeovers occur and some conflicting views in this regard are discussed.

As the pricing of shares on the stock exchange has to be efficient to measure the impact of a takeover, a discussion of efficient markets and its implications on share pricing is contained in Chapters 2 and 3.

1.3 Definitions

The terms 'merger', 'acquisition' and 'takeovers' are often used synonymously and interchangeably in financial literature. It is necessary to analyse the use of the terms and to establish its meanings within the context of this dissertation.

Section 314 of the Companies Act, 1973 defines a 'takeover scheme' and a 'takeover offer' as follows:-

> 'Takeover scheme' means a scheme involving the making of an offer by the offeror for acquiring shares of the offeree company which together with any shares of that company already held by the offeror at the time of the making of the offer, will have the effect of:-
>
> (a) vesting the control of the offeree company directly or indirectly in the offeror; or
>
> (b) the offeror acquiring all the shares or all the shares of a particular class of the offeree company,
>
> but does not include any offer made in the course of or in connection with any individual negotiation with any shareholder for the acquisition of any such shares,

'Takeover offer' means an offer for the acquisition of shares under a takeover scheme.

This definition is all-encompassing in the sense that it includes, amongst others, the situations of:-

(a) A listed company obtaining control of an unlisted company;

(b) A listed company obtaining control of another listed company;

(c) An unlisted company obtaining control of another unlisted company; or

(d) Two companies coming together with effective control by the shareholders of each company vested through a third company which owns the shares in the two companies.

Therefore this definition does not distinguish between listed and unlisted companies. This distinction is very important in this study as market information is available only for listed companies.

The following definitions are allocated to the terms takeover, acquisition and merger in this dissertation. The terminology is used solely for the purposes of this dissertation and has no legal significance:-

(a) The term 'takeover' is used where one listed company acquires more than 50% of the equity of another listed company and both companies continue to be listed on the stock exchange for at least twelve months after the takeover date;

(b) The term 'acquisition' is used when:-

(i) one listed company acquires the entire equity of another listed company and either the former or the latter becomes unlisted within twelve months of the acquisition; or

(ii) a listed company acquires an unlisted company.

(c) The term 'merger' is used to define a situation where two or more companies, listed or unlisted, are coming together with effective control by the shareholders of each company vested through a third company, which may or may not be listed and which owns the shares in the individual companies.

This dissertation deals only with takeovers as market information is available for both the acquired and acquiror companies.

Acquisitions are not covered because share prices and returns are not readily available for unlisted companies. Hence it is not possible to measure the expected returns on a share within the framework of the market model.

Mergers are also excluded from the study on grounds that:-

(a) The company owning the shares in the other companies has changed its nature and therefore its historical performance cannot be used to predict its future performance; or

(b) One of the companies involved in the merger may be unlisted or newly formed in which case market information on the shares may not be available.

1.4 Why takeovers occur

Some of the reasons forwarded in finance literature (5)(34) for the occurence of takeovers are the desire by management to:-

(a) Increase shareholder wealth;
(b) Increase assets;
(c) Increase sales;
(d) Create employment;
(e) Tap synergies between compatible companies;
(f) Acquire management talent;
(g) Achieve economies of scale;
(h) Improve cash flow;
(i) Reduce overall risk by diversification.

Whilst these may be reasons for which management may have conducted takeovers in the past, these reasons are sure to prevail in the future.

An interesting controversy as to why takeovers occur, lies in the objectives of management and the objectives of the shareholders.

The neoclassical theory of the firm postulates that a company exists to maximise the wealth of its shareholders. This theory is valid so long as both ownership and management of the company is provided by the sa.. person i.e. the entrepreneur.

The growth of the scale of business and the evolution of the company as the dominant operation of trading has brought into question the validity of the neoclassical theory of the firm. The requirements of large companies with respect to capital outlay, risk reduction and entrepreneurial skills has separated the ownership and management

function into two distinct groups. The capital outlay is provided by the shareholders and debt holders while the management function is provided by professional managers. Shareholders appoint directors who appoint managers. Directors are supposed to represent the interests of shareholders and to determine the broad policies that managers are to execute. This involves the delegation of related decision making to the managers and whilst the decisions made by managers are reviewed by the directors periodically they cannot be supervised in detail. This leaves the destiny of the company to top management, who may not be shareholders, and as long as directors have confidence in top management they will ratify their decisions. The shareholders will in turn appoint the directors (34). This separation of ownership and control raises the question whether the objectives of the shareholders and management are identical. According to the management utility theory, management do not view the maximisation of shareholder's wealth as of primary importance. Instead emphasis is placed on objectives such as growth in sales, assets or number of employees.

Bhana (5) conducted research on the takeover objectives of acquiror companies on the JSE and found that a major objective of takeovers by acquiror companies is to maximise the growth in size of the company rather than the increase in its profitability. He also concluded that the greater the takeover intensity the greater the tendency towards growth maximisation. This is clearly indicated in the following table (5):-

TABLE 1.1 - TAKEOVER INTENSITY

TAKEOVER OBJECTIVE	LOW	AVERAGE	HIGH
Management interest			
Sales maximisation)			
Growth maximisation)	41,9%	49,1%	66,67%
Increase in assets)			
Shareholder interest			
Wealth maximisation)			
Profit maximisation)	58,1%	50,9%	33,33%
Increase in earnings) per share)			
TOTAL	100%	100%	100%

CHAPTER 2

BACKGROUND

CHAPTER 2 - BACKGROUND

2.1 Introduction to efficient markets

Capitalist economies have a significant portion of their assets traded on stock exchanges and thus the proper functioning of these exchanges is of vital importance to the valuation of shares and the allocation of capital.

An efficient market is a forum in which participants which have similar investment objectives and access to the same information compete in an entrepreneurial manner. This market incorporates any new, publicly available information, whether it be at the macro-economic or micro economic level, speedily and accurately into the market price. Therefore in an efficient market, prices will fully reflect all available information and current share prices are the best estimate of future benefits flowing from the shares.

2.2 The efficient market hypothesis

The efficient market hypothesis states that, as the price of a share reflects the composite judgement of numerous competing profit orientated investors it would be impossible to consistently outperform the market. The process of share price formation is therefore represented by a dynamic equilibrium model in which the expectation of all investors are the determining factors. When new information relevant to a share is publicly disseminated, this is evaluated immediately by the market and its impact speedily impounded in the share price. Any over or under adjustment and time delay in responding to the newly disseminated information is small and randomly distributed. Jensen (30) provides a useful definition:-

"A market is efficient with respect to a given information set if it is impossible to make profits by trading on the basis of that information set. By economic profits is meant the risk-adjusted returns net of all costs."

2.3 Three forms of the efficient market hypothesis

There are three forms of the efficient market hypothesis (17):-

(a) Weak form;

(b) Semi-strong form; or

(c) Strong form.

The following is a statement of the hypothesis under the three forms of the efficient market hypothesis. The empirical tests and research conducted on each form of the hypothesis are reviewed in Chapter 3.

Weak Form

The weak form of the efficient market hypothesis states that the pattern of historical changes of a share's price cannot be used to forecast its future price.

Semi-strong Form

As an efficient market incorporates any new publicly available information speedily and accurately into the market price, the semi-strong form of this hypothesis, posits that the analysis of publicly available information is worthless because all such information is already reflected in the share price.

Strong Form

This form of the efficient market hypothesis states that even investors with privileged information (inside information) cannot utilise it to earn above average returns consistently.

2.4 Why is an efficient market required?

The pricing mechanism of the stock exchange serves a number of important functions. Therefore it's efficiency is of particular relevance. These functions, inter alia, include (32):-

(a) The stock exchange provides a unique mechanism for the separation of ownership and management of real capital assets. The management of these assets is delegated by the shareholders to individuals who are knowledgeable in making decisions regarding the use of these assets. The share price is therefore an indication of the relative effectiveness of the discharge by management of the responsibility delegated to them.

(b) Investors may be willing to invest in a company for a short period only. Where the investor wants to withdraw from the investment this does not affect the daily operation of the company as that investor will have to find another investor who will be willing to invest in the company. A stock exchange provides the forum where buyers and sellers meet and an efficient market is required to ensure that the price at which the transaction is recorded impounds all the publicly available information about the share. The transfer of funds is therefore facilitated with the minimum of cost and administrative effort.

(c) The pricing mechanism of a stock exchange provides management with an indication of the cost of capital for making investment decisions.

(d) The pricing mechanism also indicates the relative strength of a company to investors and lenders. If a company utilises its assets efficiently then this will be reflected in its profitability and share price performance. Lenders will be more willing to lend money and negotiate interest rates with a company operating efficiently and whose share price is buoyant compared to a company whose assets are not efficiently utilised. The price of the share in this case is a barometer of the company's riskiness.

(e) Sub-optimal asset utilisation by a company will result in the poor performance in it's share price relative to it's optimal utilising counterparts. This will expose the former to a takeover by the latter. Therefore the pricing mechanism results in a reallocation of resources from less efficient to more efficient utilisers.

2.5 Requirements of an efficient market

The major requirements of an efficient market are (16):-

(a) homogeneity of the goods;
(b) many buyers and sellers;
(c) relatively insignificant transaction costs promoting the freedom of entry and exit into and out of a share;
(d) unlimited supplies of shares; and
(e) perfect knowledge.

The JSE, appears to have complied with criteria (a) and (b) above. Specifically there is homogeneity of goods, one ordinary share in Barlow Rand Limited confers the same rights as any other ordinary share in that company.

The regulations of the Johannesburg Stock Exchange specify that a minimum number of shares are required to be held by the general public (49). This promotes, to an extent, a spread of shareholders in each company. However research performed by Strebel and Saloner (46)(47)(43) indicates that the JSE is efficient in relation to shares with an annual trading volume exceeding 200 000 shares. Approximately fifty percent of shares listed on the JSE fall into this category.

Transaction costs incurred in buying and selling shares are fixed, determinable and unlikely to mitigate against the sale and purchase of shares. Therefore investors can acquire or dispose of shares without undue concern about the cost of such acquisitions or disposals.

As regards criterion (d) above, this may be problematic. The huge weight of institutional cash flows and their large demand for shares appear to create a general shortage of scrip on the JSE and it is often contended that part of the price paid may be attributed to a scrip shortage. However, it may be argued that as there are alternative unlisted investments which these institutions could make, only a limited premium will be paid for the acquisition of shares on the JSE. Also prior research indicates that shares with an annual trading volume in excess of 200 000 shares are efficiently priced. This study will be limited to takeovers in which both the acquired and acquiror have annual trading volumes in excess of 200 000.

The fifth condition, perfect knowledge, requires that all knowledge relating to the earnings potential of the company (eg current asset values, future earnings) is equally available to both buyers and sellers. Fundamental analysts, whose role in investment analysis will be discussed in paragraph 2.6, will point out that this requirement is not met. By the very nature of an everchanging world this limitation exists not only on the JSE but on all the major stock exchanges of the world. However, all of them have managed to provide 'reasonable' share pricing.

Cornell & Roll (11) show that the existence of costly information and the presence of an industry for gathering it is not inconsistent with market efficiency.

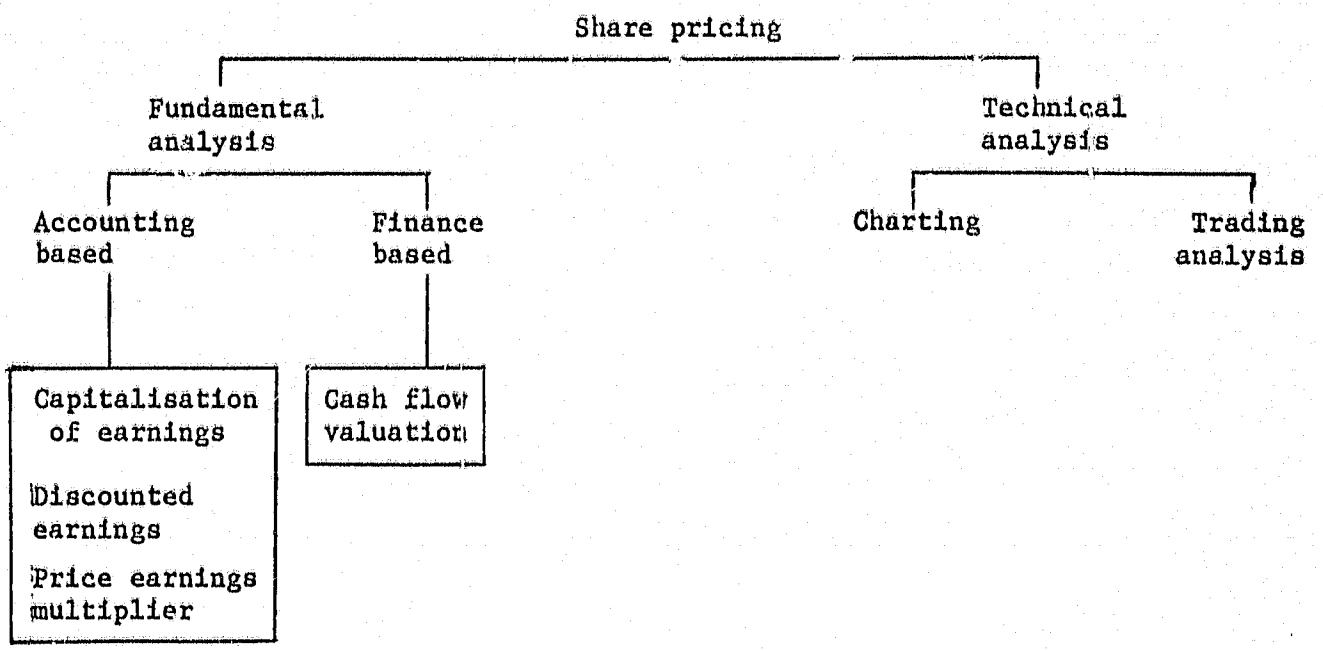
2.6 Approaches to investment analysis

There are two approaches to investment analysis: fundamental and technical (26).

Fundamental investment analysts believe that the market is inefficient in the semi-strong and strong forms and therefore corroborate their predictions of share price behaviour by circumstances which are applicable to a company, its industry or the economy. A fundamental investment analyst may advise the purchase of a company's shares after consideration of the debt equity structure of a company and an impending decrease in the prime overdraft rate.

Technical investment analysts, in opposition, believe that the market is inefficient in the weak form and assert that all the fundamental circumstances affecting a share are reflected in the market price of the share. Therefore they argue that a study of the historical pattern of share price movements, as opposed to the financial characteristics of the company, assists in predicting future share price movements. A technical analyst may advise the purchase of a company's shares based on historical price and volume information.

The diagram below indicates the contrast in the share pricing techniques of fundamental and technical analysts (41).



Accounting based valuations mainly use earnings as a determinant of value. Earnings reflect the results of a company based on its adopted accounting policies and usually require amendment before it can be used for valuation purposes. Earnings do not take into account the time value of money or the risks involved in achieving these earnings. These factors are adjusted for on a subjective basis in the discount rate used for the capitalisation of earnings.

Finance based valuations use cash flows anticipated by the shareholder mainly in the form of dividends instead of earnings and predict share prices on the timing, growth and the risks associated with the cash flows. The value of a share on this basis is therefore the present value of all dividends that the market expects will be paid to shareholders. This approach has the same limitations as accounting based valuations in that the discount rate used for the capitalisation of cash flows is subjective. In addition Modigliani and Miller have put forward a comprehensive argument for the irrelevance of dividends in the pricing of shares. They stress that the share value is determined solely by the earning power on the company's assets. The manner in which the earnings are split between dividends and retained earnings are irrelevant and therefore the investor is indifferent as to whether he receives his return in the form of dividend income or capital gain. However there are certain assumptions made by Modigliani and Miller, for example, the reinvestment of earnings for a return in excess of the company's cost of capital, which may be inappropriate in all instances.

Technical analysts analyse the volume of shares traded or the cycle of historical share price movements and use these analyses to predict future share price movements. Numerous researchers have performed research into the techniques adopted by technical analysts and, as will be highlighted in Chapter 3, have come to the conclusion that technical analysis remains without theoretical or empirical support.

The modern approach to investment analysis is embodied within the framework of the efficient market hypothesis in which models such as the mar. . model and capital asset pricing model have been developed. These models will be discussed in some detail in Chapter 4.

CHAPTER 3

SURVEY OF EMPIRICAL LITERATURE ON THE EFFICIENT MARKET HYPOTHESIS

CHAPTER 3 - SURVEY OF EMPIRICAL LITERATURE ON THE EFFICIENT MARKET HYPOTHESIS

3.1 Introduction

Chapter 2 introduced the concept of efficient markets and the need and desirability of such markets. The purpose of this chapter is to review some of the more important empirical research on the behaviour of share prices within the efficient market framework with some emphasis on studies related to takeovers. The review includes empirical literature on the weak and strong forms of the hypothesis, but as this dissertation is a study of the semi-strong form, more emphasis is placed on the literature on the semi-strong form. The survey includes research performed in the United Kingdom, United States, France and South Africa.

The academic research conducted into the efficient market hypothesis has focused on the testable implications of the model. These can be categorised under four types. The first two are specifically classified weak form tests of the efficient market model, the third applicable to testing the semi-strong form and the fourth to the strong form of the theory (9)(11)(16)(17).

3.2 Weak form of the efficient market hypothesis

3.2.1 Statistical analyses of the dependence of price changes.

3.2.2 Testing the ability of specific mechanical investment strategies (trading rules) to outperform average market returns.

3.3 Semi-strong form of the efficient market hypothesis

Examining whether share prices react accurately and speedily to specific newly disseminated public information.

3.4 Strong form of the efficient market hypothesis

Testing the performance of portfolios and of fundamental analysts' share recommendations.

Each of the above will be reviewed in turn under the following major headings:-

Hypothesis under each test
Objective of the research
Research methodology
Significant prior research

Empirical research into the weak form of the efficient market hypothesis

3.2.1 Price dependence testing

Hypothesis

The hypothesis in price dependence testing is that if a significant correlation can be detected in historical share price movements, either between time periods or certain events, then the market is inefficient as this correlation in historical share prices could be utilised to project future share price movements, and by acting on that information consistent superior returns could be achieved.

Objective

The objective of the empirical research conducted on this form of the efficient market theory is to establish whether historical share price behaviour can be successfully used to predict future share price movements. Emphasis is placed on the distribution of share price changes because (15)(32):-

(i) if the distribution can be found to be stationary then probability statements about future share prices could be made;

(ii) the validity of the statistical tools used can be ascertained.

Research methodologies

The major research methodologies adopted in price dependence testing are (15):-

Serial correlation techniques

The serial correlation technique provides a measure of the relationship between the value of a random variable r at time t and its value p periods earlier. This technique is applied for various differencing intervals. The differencing interval defines the measurement period between successive price changes eg day-to-day, month-to-month or after a volume surge.

Spectral analysis

The basic premise of this methodology is that values of one variable are known at various times t1, 2, 3 .... n, and a number of functions based on this series can be calculated. These can then be used as a basis for hypothesis regarding the actual structure of the time series.

Runs tests

Another approach adopted in testing for price dependence entails analysing the duration of successive price increments and successive price decreases. The results of these for individual shares are then compared against the mathematical expectation of the duration based on probability theory. If any significant deviation exists between the actual runs and those expected then this implies that patterns are present in the data and an analysis of these patterns could result in a viable mechanical trading strategy which would yield above average returns.

Significant prior research

The following is a summary of the major research conducted in France, the United States, United Kingdom and South Africa into price dependence testing.

FRANCE

Internationally Bachelier was the first to conduct research into the efficient market hypothesis although it was not known as such then.

Bachelier (1900) (2) studied the random character of commodity prices. He found that recent historical price data were useless for predicting future price changes.

UNITED STATES

Slutsky (1927) and Roberts H. (1959) (26) concluded that randomly generated price changes resemble actual stock price movements and seem to exhibit cycles and other patterns.

Cowles and Jones (1937) (26) examined movements in successive price changes. They gave authoritative support to technical analysis when they reported that stock prices moved in predictable trends.

Cootner (1962) (26) focussed attention on the differencing interval and emphasised that there is not one random walk model but one for each definition of "past" and "future". When Cootner defined "past" and "future" as "one week" his test of the random walk model indicated that price changes were random. But when "past"was defined as "fourteen weeks" the random walk model was not valid.

Fama (1965) (13) studied the validity of the random walk model and found no evidence of trends in stock prices for any differencing interval. This was the first study which expanded on the economic rationale of the random walk model.

Niederhoffer and Osborne (40) studied the dependence of price changes on successive transactions on the ticker tape. They indicated that successive transactions display several non-random characteristics. However the percentage dependencies are insignificant and are eroded by transaction costs so that the returns of buy and hold strategy could not be surpassed.

UNITED KINGDOM

Kendall (1953) (31) studied the relationship between past share prices by performing serial correlation tests using differencing intervals of 1, 2, 4, 8 and 16 weeks. Kendall concluded that stock price changes behaved almost as if they had been generated by a suitably designed roulette wheel. Each outcome was statistically independent of previous outcomes.

SOUTH AFRICA

One of the first share market tests in South Africa was published by Affleck-Graves and Money (1) in 1974. They performed serial correlation tests on the returns of 50 shares listed on the JSE. They concluded that the dependence was insignificant and would be useless to a technical analyst attempting to earn an abnormal return by analysing historical prices. Affleck-Graves also performed runs tests on the same data used in the serial correlation tests. His results confirmed that the JSE was efficient in weak form.

Hadassin (25) investigated the correlation between earnings and share prices of listed companies. Hadassin concluded that:-

(i) there is a definite correlation between past and future changes in earnings and share prices but the exact relationship between them is unknown;
(ii) superior analysts could investigate this relationship and earn above market returns; and
(iii) based on the above the JSE is not an efficient market.

Gilbertson and Roux (23)(24) reviewed existing studies of the major categories of tests devised to provide evidence that the JSE is an efficient market. In the case of the statistical tests on price change sequences, evidence of deviations from strict independence were found. As the degree of dependencies observed were insignificant, Gilbertson and Roux considered them insufficient to refute the efficient market hypothesis. In the evaluation of trading rules and portfolio performance tests they

concluded unequivocally that neither trading rules nor mutual fund managers were able to consistently outperform the market.

3.2.2 Mechanical investment strategies

A mechanical investment strategy 'or trading rule' is a rule which provides objective indicators for buying and selling shares.

Hypothesis

The hypothesis in the testing of mechanical investment strategies is that, if the adoption of a certain mechanical investment strategy for investment purposes yields consistent superior returns, then the market is inefficient. This is paradoxical because if a well publicised mechanical investment strategy yielded consistent above average returns, then all investors will utilise this strategy. This would in turn lead to market efficiency rather than inefficiency.

The immediate limitation of this type of testing is that the results are only applicable to the data being used in the tests and cannot be inputed to all other data.

Research methodologies

The trading rules that have been tested are (15):-

(a) Filter rules

These provide buy and sell indicators where share prices have moved a certain percentage away from a high or low point. Some researchers have found small profits emanating from this type of investment strategy but these have all disappeared after transaction costs are accounted for.

(b) Moving averages

This strategy involves buying or selling shares as their share prices move above or below their moving average. Despite rigorous tests of various methods of computing the averages, a strategy based on this technique which consistently earns above average returns has not yet been devised.

(c) Relative strength tests

This strategy entails prioritising shares in terms of price performance over a certain time period and investing in the top performers and divesting from the poor performers. The assumption supporting this strategy is that top performers will repeat such performance and by investing in such shares superior returns would be earned consistently.

Significant prior research

The following is a summary of the major research conducted in the United States, United Kingdom and South Africa into the viability of mechanical investment strategies.

UNITED STATES

Alexander (1961) (26) evaluated his filter techniques with Kendall's data and reported that it was more successful than a buy and hold strategy if transaction costs were ignored. He concluded that if transaction costs are brought into the analysis the buy and hold strategy was superior.

Van Horne and Parker (26) examined 'Breakouts' from moving averages as a basis for earning above average returns. They concluded that profitability, after transaction costs, of a buy and hold strategy could not be surpassed.

Levy (26) reported that stocks with relatively above (or below) average price performance in the "past" six months tended to maintain above (or below) average performance in the next six months and this refutes the weak form of the hypothesis. Jensen studied Levy's work and revealed that Levy had over-stated the returns in his study and after correction of the returns, none of Levy's "profitable" trading rules showed greater returns, after transaction costs, than those of a buy and hold strategy.

SOUTH AFRICA

Bennet (4) examined the trading rules formulated by the Business Times. The trading rules did not consistently earn above average market returns and that the JSE is efficient in its weak form.

Brown (8) studied the effectiveness of technical share analysis. He concluded that trading rules could generate adequate returns. However he does not state this unequivocally and recommends that investment should only be made after a reasonable margin of error is taken into account.

Clark 1979 (9) researched whether volumes traded on the JSE could be used as a predictor of movements in the share price and whether a viable trading rule could be developed. Clark found some correlation and developed a trading rule. However the correlation was small and the time requirements of the trading rule were often so long that it was not possible to capitalise on the rule and on average the trading rules did not outperform the buy and hold strategy.

3.3 Empirical research on the semi-strong form of the efficient market hypothesis

3.3.1 Nature of test

The empirical research conducted on this form of the efficient market hypothesis has focused on how rapidly and accurately market prices adjust to new publicly available information (15-20)(23)(24).

3.3.2 Hypothesis

The hypothesis has been that if share prices do not reflect new publicly available information accurately and speedily then this market inefficiency can be utilised by investors to achieve consistent superior investment performance.

3.3.3 Research methodology

The general research methodology used in these studies has been to take a measurable or reasonably measurable economic event such as an earnings announcement or takeover announcement and measure its impact on the share price. The impact is derived by residual analysis (described in detail in Chapter 4) which measures the difference between the actual change in price on making the new information public and the change in price that would have prevailed, after removing the general market influence, had there been no such information. The expected price of a share, had no such event occurred, has usually been calculated using Sharpe's market model or the capital asset pricing model. If the market is efficient, then in the absence of any company specific news, actual returns should equate projected returns. This balance would be disturbed by company specific news.

Significant prior research

The following is a summary of the significant prior research conducted into the semi-strong form of the efficient market hypothesis in the United States, United Kingdom and South Africa.

UNITED STATES

Brown and Ball (1968) (26) studied the relationship between earnings and stock prices. They found that by the time earnings were announced, the market price had almost fully reacted to the contents of the report.

Pettit (1971) (26) researched the impact of dividend announcements on subsequent earnings and price performance. He concluded that the market's assessment of the informational content of a dividend announcement is impounded into the share price as of the end of the announcement month. Therefore superior returns could be earned during that period.

Fama (1969) (14) examined the effect of capitalisation issues on share prices. He found that information on capitalisation issues is not useful economic information, as capitalisation issues are a consequence, and not a cause of rising share prices.

Hogarthy (28) examined the profitability of corporate mergers. He concluded that the investment performance of firms involved in a high level of merger activity is generally worse than the average investment performance of firms in their respective industries. Relatively few successful acquirers obtain very large returns and the prospect of these large returns tempts other firms to engage in merger activity. Therefore his study is not consistent with a high level of merger activity.

UNITED KINGDOM

Firth studied the impact of different economic events on the share price of various companies. Some of the studies conducted include:-

(a) The impact of large investment holdings being built up in a firm on its share price. Although no precise yardstick of what should happen when an announcement of a large holding is made an increase in the share price is expected. This was found to be the case (20).

(b) The impact of earnings announcements on the share price of similar type companies. The reaction was in the correct direction although it is impossible to comment on the magnitude of the change. At least the study showed that the market used relevant information in establishing share prices (18).

(c) The impact of capitalisation issues on total market capitalisation. The study concluded that capitalisation issues have no impact on total market capitalisation (19).

(d) The profitability of takeovers and mergers within the efficient market framework (15). Firth found that, on average there were no gains associated with takeovers but rather a very small loss, possibly due to takeover expenses. Furthermore, no financial benefits appeared from the takeover, even twenty four months after the takeover. On allocating gains and losses between acquired and acquiror companies it was found that the former made significant profits while the latter made equivalent losses. However his manner of allocating gains and losses between the parties did not take into account the movement in the market index between the period before the takeover announcement and after the takeover announcement.

Newbould (39) found that when measured against the year's high, the share prices of acquired companies, four weeks prior to the takeover offer were significantly lower on average than the share prices of the acquiror company four weeks before the bid. As regards share price movements between the date of the original offer and the final offer, he found that the takeover price was set substantially above the existing share prices and that offers which were rejected by the directors or contested by third parties had the largest price increase.

Barnes (3) found that the market originally interpreted mergers as 'good news' but as a result of later information, expectations were substantially revised downwards. Although this downward revision may be attributed to market inefficiency and incorrect investor interpretations, it was identified that at the merger announcement date, not all the information was available to make an accurate assessment. Barnes also studied the benefits accruing to the company as a result of a merger and concluded that anticipated

merger gains were not realised. While share prices increased at around the merger time, there were substantial and significant price decreases in the longer term after the merger.

SOUTH AFRICA

Wankel (53) studied the movement of share prices around the time that earnings announcements were made. He found that:-

(i) the major part of the share price adjustment is initiated and complete by the end of the first day of trading; and

(ii) the share price does not fully reflect the informational content of interim earnings announcement as the share price moves after the announcement. The above is contrary to the findings of Brown and Ball in the United States, who found that, by the time earnings are announced, the market had almost fully anticipated the contents of the report.

Knight and Affleck-Graves (33) studied the markets assessment of the informational content of a switch to the LIFO basis of stock valuation. They concluded that:-

(i) the efficient market hypothesis is not valid for the JSE. The market is learning to interpret the change to LIFO but it cannot be assessed whether this arises from a greater appreciation of LIFO or growing efficiency in the market itself; and

(ii) a switch to LIFO has a negative impact on share returns directly proportional to the negative impact on earnings. The market is therefore more concerned with accounting information rather than the economic benefits associated with the switch.

3.4 Empirical research into the strong form version

3.4.1 Hypothesis

The strong form version of the efficient market hypothesis postulates that significant superior investment performance implies that some portfolio manager either has privileged information in his possession, or exceptional skill in which case the efficient market theory would anticipate capital to be channelled to that portfolio manager to maintain market efficiency (16)(17)(22).

3.4.2 Nature of tests

The regulations laid down by the JSE and the Companies Act deem insider trading illegal. This provides the legal buttress to ensure that persons with priviledged information do not consistently earn above average returns. However this does not mean that there is no insider trading. Practically it would be difficult, if not impossible, to monitor the share transactions of every insider, his friends and relatives.

As there is little support for this version of the efficient market hypothesis, research in this area is limited when compared to the other two forms of the hypothesis.

The tests have generally focused on:-

(i) the performance of professionally managed portfolios, particularly mutual funds;

(ii) the performance of individual investment analysts and investment advisory services; and

(iii) insider dealing and the profits associated therewith.

3.4.3 Significant prior research

The following is a summary of the significant prior research conducted in the United States and South Africa on this version of the efficient market hypothesis.

UNITED STATES

Rogoff (26) examined the relationship between the activities of insider traders and subsequent stock price performance. In the case of insider buying the stock generally outperformed the market during the next six months. In the case of insider selling, the stock underperformed relative to the market in the subsequent six months. Lorie and Niederhoffer (35) confirmed that insiders buying and selling yielded above average performance.

SOUTH AFRICA

Taylor (48) examined the performance of South African Mutual funds and Investment Trusts during 1967 - 1977. He concluded that mutual funds and investment trusts did not generate returns superior to the market. The JSE is therefore efficient even in the strong form.

Gilbertson and Roux (22) investigated the performance of eleven South African Mutual funds during the period 30 June 1973 to 30 September 1976. There is no evidence that any individual fund consistently outperformed any other fund or the market. The market is therefore efficient even in its strong form.

3.5 Additional consideration in determining market efficiency on the JSE

The shares of certain companies on the JSE are not traded very frequently or are traded in insufficient volumes. The question therefore arises whether the prices at which these shares are traded are volume dependent.

Strebel (46)(47) evaluated studies conducted in providing evidence for and against the efficient market hypothesis on the JSE, with particular reference to the effect of annual trading volumes on the tests performed. He concluded that at best, the efficient market hypothesis applies to only half the shares traded on the JSE i.e. those with average annual trading volumes in excess of at least 250 000.

Saloner (43) studied the impact of trading volumes on share price movements and found that:-

(i) 50% of listed shares have an average annual trading volume of less than 200 000 while 20% have an average annual trading volume of less than 50 000;

(ii) Shares with low trading volumes indicate non-random behaviour. This implies market inefficiency for low volume shares; and

(iii) There is a strong risk-return relationship on highly traded shares but no significant relationship exists for shares with low trading volumes. This is a further sign of market inefficiency for low volume shares.

CHAPTER 4

RESEARCH METHODOLOGY

CHAPTER 4 - RESEARCH METHODOLOGY

4.1 Introduction

Chapters 1 - 3 laid the foundation for this study by discussing the background to takeovers, the conceptual framework of the efficient market hypothesis and reviewing the empirical research into the hypothesis.

In this chapter the specific objectives of this study are listed together with the problems associated in achieving these objectives.

The market model which is the model used in this study is described in this chapter. In addition certain alternatives which could have been used are discussed briefly. Reasons for not using these alternatives are submitted.

The basic methodology used in this study is to measure the difference between actual share returns and expected share returns, had the takeover not been consumated, around the date of the announcement of the takeover. Any significant differences found around this date are attributed to the informational content of the takeover.

4.2 Specific objectives of this study

The objectives of this dissertation are:-

(a) To approximate the number of months prior to the closing date of the takeover offer that the market begins to anticipate the takeover; and

(b) To provide investors and management with information relating to the impact of takeovers on the share returns of the acquired and the acquiror company.

The practical way to achieve these objectives is to:-

(a) Measure the returns earned over a certain period before and after the takeover news and compare them against what they would have been had a takeover not been consumated. The month in which excessive returns are first earned would be the month in which the market begins to anticipate the takeover.

(b) Assess the speed and accuracy with which the market impounds the news of the takeover into the share price of the acquired and the acquiror company.

(c) Review the size of the residuals before the takeover is discounted and their departure from their normal market relationship after the takeover is discounted by the market.

4.3 Associated problems

Achievement of the above objectives poses certain immediate problems:-

4.3.1 The measurement of share performance had a takeover not been consumated.

4.3.2 Selection of the base date from which to measure the impact of the takeover.

4.3.3 Selection of a surrogate for the market return.

4.3.4 Calculation of beta and alpha coefficients for the companies selected in the sample.

4.3.5 The measurement of the speed and accuracy with which the market impounds the news of the takeover into the share price of the acquired and the acquiror company.

4.3.1 Measurement of share performance

The measurement of share performance had a takeover not been consumated is an intricate task as there is no reality to compare the extrapolated results to. Nevertheless there are a number of methodologies that can be used to extrapolate performance but the major ones are:-

4.3.1.1 Single equation causal regression models.

4.3.1.2 Measurement of share price performance against a market or industry index.

4.3.1.3 The capital asset pricing model.

4.3.1.4 The Sharpe-Linter or market model.

4.3.1.1 Single equation casual regression models

Single equation casual regression models attempt to identify and measure the underlying factors which determine share prices. The model developed by Weaver and Hall and Whitbeck and Kiser (refer below) gives an indication of the nature of the variables utilised in this type of model. Once a sound model has been developed it can be used to extrapolate future share prices. The existence of residuals between the projected price according to the model and the actual price provides buy or sell signals or indicates that some factor not discounted into the model (eg takeover) has affected the share price (16).

Weaver and Hall developed the following casual regression model which attempts to forecast dividend yields.

$$\log z = a + b \log y + c \log x + d \log w + e \log v + f \log u$$

where

z = mean dividend yield
y = mean dividend payout rati
x = forecast short term earnings growth rate
w = forecast long term dividend growth rate
v = historical earnings variability
u = historical earnings growth rate
a-f = weights attached to the various coefficients.

Whitbeck and Kiser developed the following model to predict the price earnings ratio:-

Theoretical PE = 8,2 + 1,5x + 6,7y - 0,2z

x = earnings growth percentage
y = dividend payout percentage
z = standard deviation in growth rate percentage

Whitbeck and Kiser found that the model provided profitable investment decisions when the actual ratio was below 85% or more than 114% of the price earnings ratio derived from the above model.

Generally the productive capabilities of this type of model is limited. This may be due to:-

(a) additional variables that have to be incorporated since the development of the model (ie business is not a static but a dynamic process);

(b) the weighting of the variables may change over time; or

(c) the fact that these are models to predict the long term price of a share.

In this study a model which is sensitive enough to measure share price performance over monthly periods is required. The above model requires information concerning the trend of earnings, gearing, return on assets etc. which information is normally measured over long periods of time and do not change dramatically from month to month. Thus single equation causal regression models are unsuitable for evaluating share price performances required in this study.

4.3.1.2 Measuring share-price performance against those of a market or industry index

It can be hypothesised that a company's share price should rise by a similar amount to that of the market index. If a residual arises between the rate of return in the market index and the rate of return on an individual share, then it may be assumed that some specific event such as a takeover, is in the air. Although this may be conceptually acceptable, often even when nothing specific is occuring in the company, share prices do not vary in exactly the same proportion as the market index. Regression analyses run in the United Kingdom on share price data have shown that share prices do not move proportionately to the market index. A review comparing the movement of certain share prices and the movement in the market index on the same days indicate that some share prices hardly move at all for changes in the market index, while others change significantly for insignificant movements in the market index. This may be caused by what is referred to as unsystematic or company specific risk (described below). No market index can capture the company specific risks exactly (16).

4.3.1.3 The Sharpe-Lintner or market model

The rationale behind the Sharpe-Lintner model is that the major factor affecting a shares price is the movement in the market index. By controlling the impact of movements in the market index, the market model allows the impact of items specific to the particular share to be isolated (45).

This methodology overcomes the limitations of measuring share performance against the market index where it is assumed that a share's performance varies in exactly the same proportion as the market index. In modern portfolio theory returns are correlated with the extent of risk assumed. A share whose return is unlikely to depart significantly from its expected return is classified as a low risk share. Risk is therefore the uncertainty of achieving a certain return and in statistical terms is measured by the standard deviation.

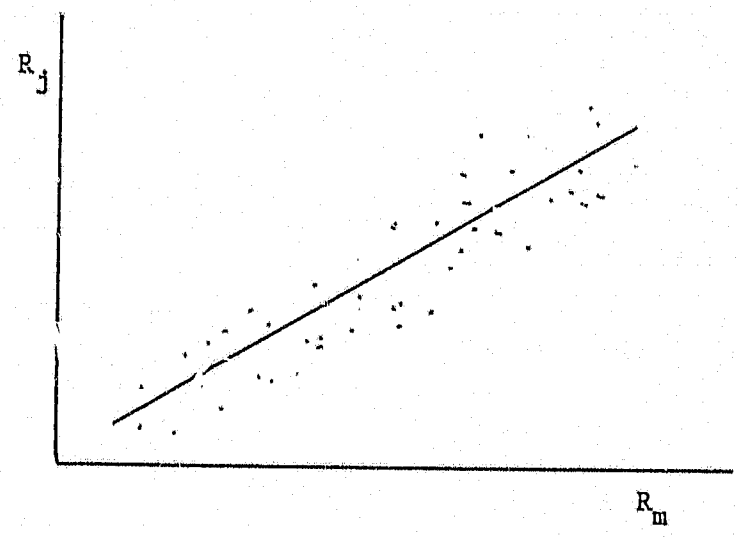
Risk

The total risk associated with a share is dicotymised into:-

(a) systematic risk (also referred to as market risk); and
(b) specific risk (also referred to as non-market risk).

(a) Market risk

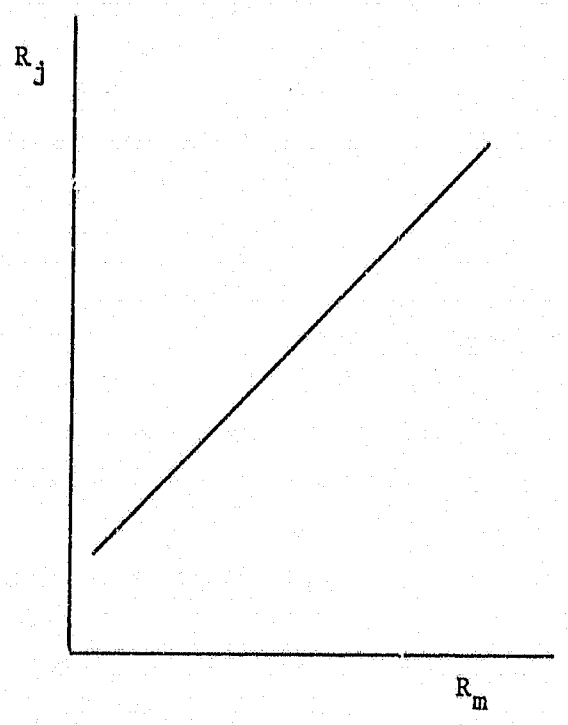
The extent of a relationship between two sets of data, is referred to as the correlation coefficient (r) and its square (r^2) is referred to as the coefficient of determination. The closer r and r^2 are to 1 the stronger the relationship. If historical returns from a share are correlated with the returns from the market as a whole an r^2 of 1 would indicate a perfect relationship between a share's return and those of the market. In graph 4.1 the historical returns of a share (Rj) are plotted against the market returns (Rm) during the same period. Prior research indicates that the overall relationship is linear (14).



GRAPH 4.1
RELATIONSHIP BETWEEN SHARE RETURN AND MARKET RETURN

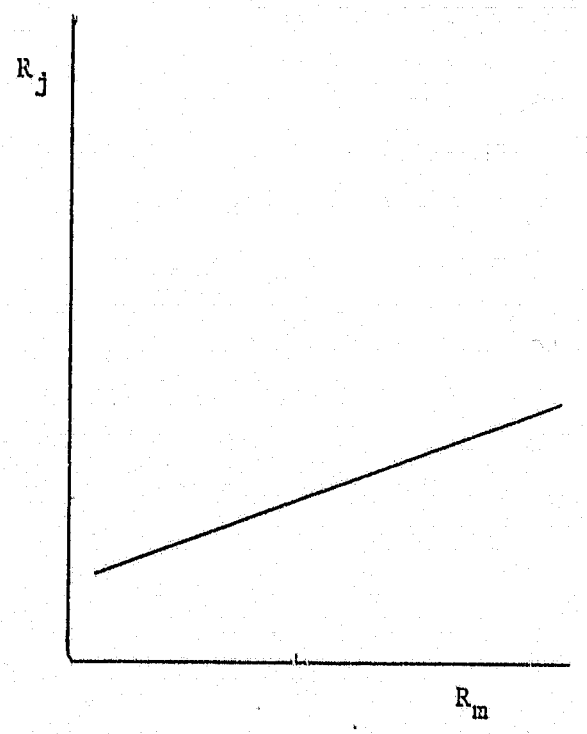
If linear regression techniques were to be applied to identify a line of "best fit" around the cluster of points this line could be utilised to predict the expected return of a share for a certain market return. In this sense the gradient of the line, referred to in modern portfolio theory as the market related risk or beta, will show us the volatility of share return fluctuations for a given market return fluctuation. This is only applicable to that portion of share return fluctuations that are explained by the share's relationship with the market ie. it is not a measure of total return on a share.

Graphs 4.2 to 4.4 illustrate the effect of different beta values on a share's return:-



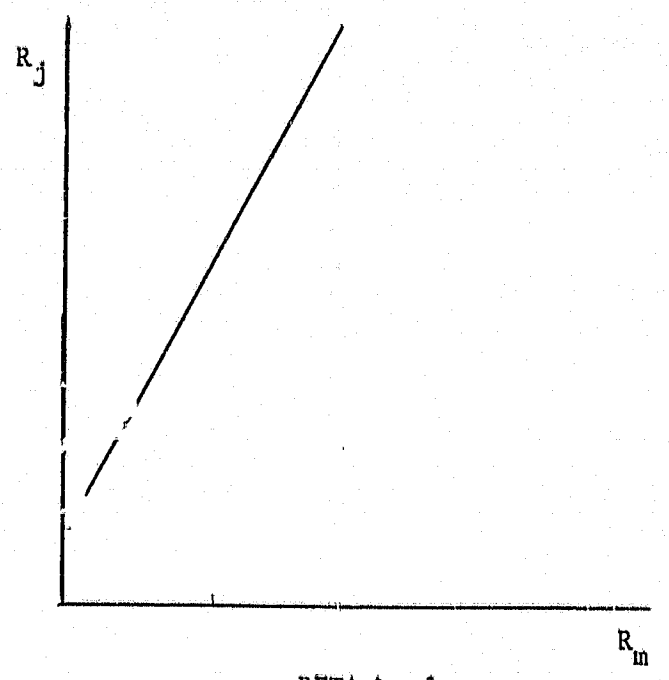
BETA = 1

GRAPH 4.2



BETA < 1

GRAPH 4.3



BETA > 1

GRAPH 4.4

RELATIONSHIP BETWEEN SHARE RETURNS AND MARKET RETURN FOR DIFFERENT BETA VALUES

The price of a share with a beta of 1 (Figure 4.2 referred to as a 'neutral share') varies directly in proportion to the market ie if the market index increases by 10% then the price of the individual share will also increase by 10%. The share price of a share with a beta value of less than one (Figure 4.3 referred to as a defensive share) varies by a lower amount for a given change in the market index eg a share with a beta value of 0,5 will appreciate or depreciate by only 5% if the market index changes by 10%.

The share price of a share with a beta value of greater than one (Figure 4.4 referred to as an 'aggressive' share) varies by a higher amount for a given change in the market index eg a share with a beta value of 1,5 will appreciate or depreciate by 15% if the market index changes by 10%.

(b) Specific risk

The specific risk of a share, measured by alpha (a), is the risk associated with a share which cannot be explained by general market movements. It can best be understood by the risk an investor is faced with by investing all his funds in one share. This type of risk is usually caused by factors unique to the share, like management, excessive gearing, extraordinary losses (profits) and factors such as the activities of the company's competitors. The market does not reward an investor for specific risk taken because this can be avoided by diversification (7).

Returns

In terms of returns, the total return of a share can be tricotymised into:-

(a) market associated return;
(b) return associated with a specific share; and
(c) return associated with a specific event (eg. takeover).

The regression model measuring the return of a share is given by:-

$$R_{j,t} = a_j + B_j R_{m,t} + U_{j,t}$$

where

$R_{j,t}$ is the return for period t on the jth share.

$R_{m,t}$ is the average return on the market for period t.

a_j and B_j are measures of the specific return and market volatility respectively.

$B_j R_{mt}$ is the market associated return

$U_{j,t}$ is the residual term which measures the return associated with a specific event (eg. takeover news). $U_{j,t}$ is assumed to satisfy the normal requirements of a linear regression model viz:-

(a) that U_{jt} is serially independent;
(b) the distribution of $U_{j,t}$ is independent of market return; and
(c) $U_{j,t}$ has an expected value of zero and value independent of t.

For this study actual returns and expected returns are required. The manner in which each are calculated are explained below.

Actual returns

On a historical basis the actual returns are normally measured by the following model:-

$$R_j = \frac{(P_t + D) - P_{t-1}}{P_{t-1}} \times 100$$

Where

R_j = return on share j for time period t.

P_t = price of the share at the end of period t.

D = Dividend paid on the share during period t.

P_{t-1} = Price of the share at the beginning of period t.

This model can be used to measure the percentage return from a share over a period of time. This is illustrated by the following example:-

Example:

Actual price of share j at month end	1	400 cents
Actual price of share j at month end	2	420 cents
Dividend declared and paid during months	2	5 cents

Therefore the percentage return on share j for month 2 is as follows:-

$$\frac{(420 + 5) - 400}{400} \times 100$$

= 6,25%

Expected returns

The expected returns are normally calculated for the similar period as the actual returns. The expected returns are given by the market model.

$$R_{j,t} = a_j + B_j R_{m,t}$$

Where

$R_{j,t}$ = expected return on share j for time period t;

a_j = the specific risk return of share j.

$B_j R_{m,t}$ = the market related return of share j.

B_j = the volatility of the returns on share j to changes in the market index. This is found by regressing the proportionate change in the share price of security j on proportionate changes in a market index.

$R_{m,t}$ = the average return on the market for period t

On historical basis $R_{m,t}$ is given by the following equation:

$$R_{m,t} = \frac{I_t - I_{t-1}}{I_{t-1}}$$

Where

$R_{m,t}$ = the return on the market during period t
I_t = the market index at the end of period t
I_{t-1} = the market index at the beginning of period t

Residuals

The residual between actual returns and projected returns is represented by the term $U_{j,t}$ which is calculated as follows:-

$$U_{j,t} = R_{j,t} - R_{j,t}$$

where Uj,t residual return on share j.

$R_{j,t}$ = expected return on share j during period t.

$R_{j,t}$ = actual return on share j in time period t.

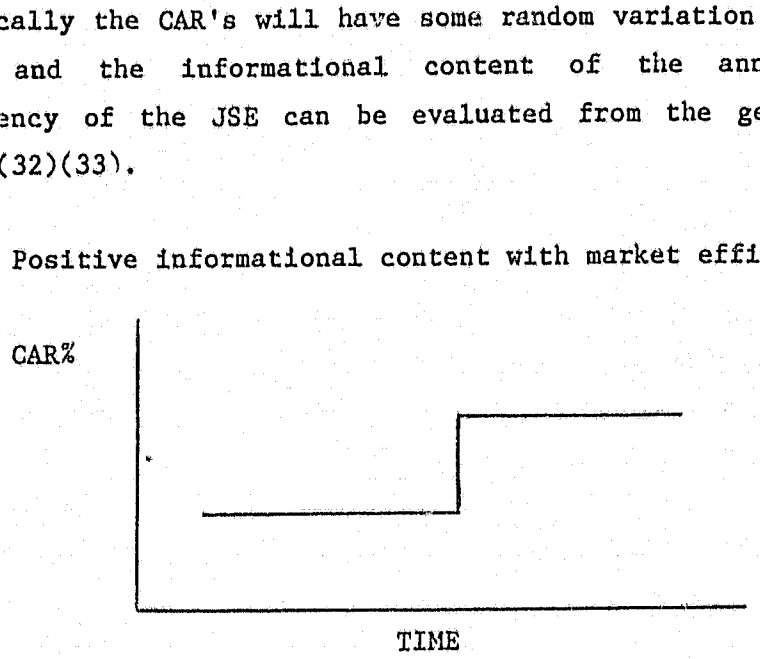
The residual between the actual and expected return of a share is ascribed to specific factors relating to the individual share. In this study the residual is ascribed to takeover news.

The residuals of each share for each month are cross sectionally averaged over all the shares to derive conclusions about the overall market.

Cross sectional average residuals (CAR's) and the cumulatives of these average residuals are analysed in order to ascertain the impact of the news on prices and whether this adjustment is done speedily and accurately. In some cases it may be stated that the share price movement effected is done speedily and accurately (eg capitalisation issues) while in other cases it may only be possible to conclude whether the share price has moved in the right direction (eg the impact of large blocks of shares being bought).

If CARs are plotted on a vertical axis against time on the horizontal axis then theoretically the following reactions are expected based on different informational values of the takeover. Theoretically the expected value of each month's abnormal return is zero and thus the cumulative values of these CAR's should also be zero. However, practically the CAR's will have some random variation around the straight lines and the informational content of the announcement and the efficiency of the JSE can be evaluated from the general shape of the CAR's (32)(33).

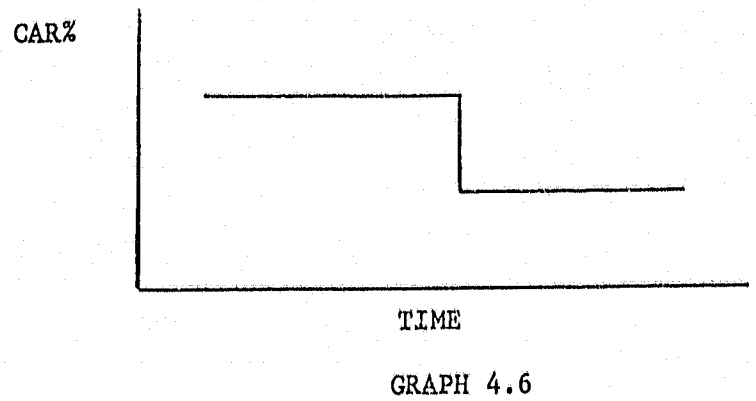
(a) Positive informational content with market efficiency



GRAPH 4.5

The CAR's prior to the takeover are constant and on the announcement of the specific event move to a higher but again constant level. The market is efficient as it adjusts instanteously to the newly available public information.

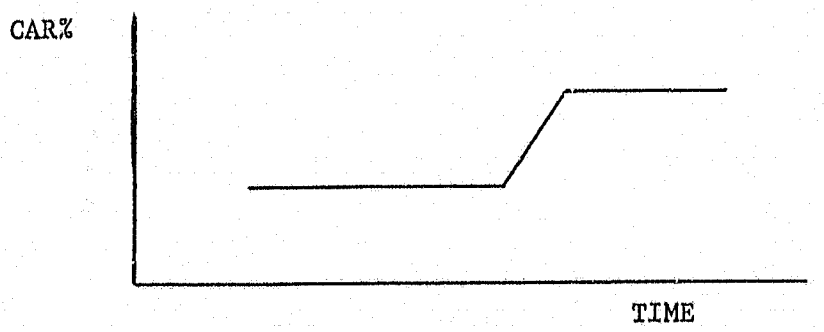
(b) Negative informational content with market efficiency



GRAPH 4.6

As with the case of positive informational value under an efficient market, the CAR's under a negative informational content system are constant before and after the announcement of the specific event, but at a lower level. The market is efficient as it instanteously impounds the informational content of the announcement into its share price.

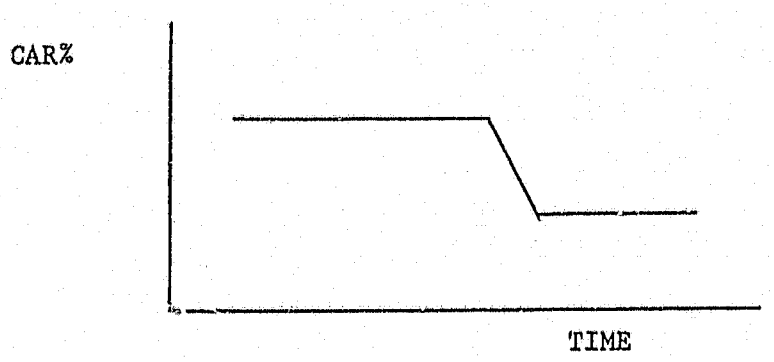
(c) Positive informational content with market inefficiency



GRAPH 4.7

Under this situation the informational content of the specific event is positive but the market is inefficient and takes time to react to the newly published information. Potential therefore exists for investors to obtain superior investment performance.

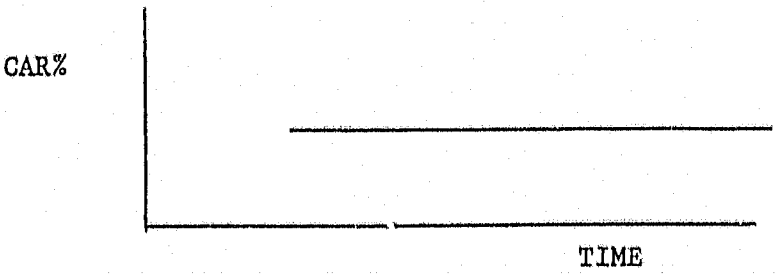
(d) Negative informational content with inefficient market



GRAPH 4.8

This figure displays exactly the same circumstance as under (c) above, except that the informational content is negative.

(e) Informational content of announcement is zero



GRAPH 4.9

In this case the specific event announcement has had no effect on the share price, that is, there is no informational content in the announcement. It is therefore not possible to reach any conclusion on market efficiency under this circumstance except in cases where a positive or negative reaction is anticipated but because of market inefficiency no adjustment is made for the informational content of the specific event.

4.3.1.4 The capital asset pricing model

The capital asset pricing model (CAPM) is a derivative of the market model. The model states that the expected return on a share should exceed the riskless rate of return by an amount which is directly proportional to the share's beta. The return above the risk free rate referred to as the risk premium is the extent to which investors are rewarded for investing in a risky asset (16).

In mathematical terms CAPM is notated as follows:-

$$R_j = R_f + B\,(R_m - R_f)$$

where R_j = expected return on security j
R_f = risk free rate of return
B = volatility of the returns on share j to changes in the market index
R_m = market return

Jensen (29) summarises the assumptions of the model as follows:-

(a) All investors are single period wealth maximises who choose amongst alternative portfolios on the basis of the expected means and variances of the portfolios;

(b) All investors can borrow or lend at an exogenously given risk free rate of interest and there are no restrictions on short sales of any asset;

(c) Consensus exists amongst investors regarding means, variances and covariances amongst assets;

(d) All assets are perfectly divisible, perfectly liquid and there are no transaction costs;

(e) There are no taxes; and

(f) All investors are risk averters.

The above assumptions appear highly restrictive and may mitigate against the validity of the model. However Jensen (29) and Francis point out that some assumptions can be relaxed without seriously impairing the validity of the model.

The coefficient beta (B) in the market model is similar in nature to the beta (B) of the CAPM but is by definition not the same variable. B in CAPM measures the covariance of the return on an asset with the return on the market divided by the market returns' variance. B in the market model measures responsiveness of the asset's return to changes in the market index (37).

Unlike the CAPM, the market model is not based on a set of assumptions and a developed theoretical foundation. The market model merely dicotymises risk into specific and market related risk and applies linear regression techniques to separate these two elements of return. The model states nothing about concensus amongst investors, borrowing or lending opportunities or about efficient portfolios and therefore in this study, it is preferred to CAPM.

4.3.2 Selection of the base date

A base date from which to assess the market's anticipation of the takeover is required (market anticipation base date).

A desirable requirement of the market anticipation base date is that to be useful in the future, it must be fixed. The alternatives for the market anticipation base date are the takeover announcement date and the closing date of the offer. The former is difficult to identify as there may be comments made by various senior officials of the company through different media and at different times. It may therefore, be difficult to highlight the exact date when the takeover was announced. Therefore the closing date of the offer has been chosen as the date from which to measure the market's anticipation of the takeover.

The time period taken, based on the abovementioned identified takeover date, for the residuals to settle to normal would be an indicator of the efficiency, or otherwise, of the JSE.

4.3.3 Selection of a surrogate for market return

One of the inputs required to drive the market model is the market return.

This can normally be obtained by:-

(a) Selecting a well developed portfolio of shares which totally eliminates company specific risk and measuring the returns thereon; or

(b) Using an established index such as the JSE Actuaries Index that measures the market returns.

Alternative (b) is considered as a better choice. The following is a brief exposition of the basis of calculation of the JSE Actuaries Index.

4.3.3.1 JSE Actuaries Index

The JSE provides information on the market returns through the JSE Actuaries Index (51). These indices are intended to display the performance of the South African ordinary share market as a whole, as well as that of individual sectors or groups of shares that are held to be affected by similar economic fortunes.

This is achieved by selecting from the total number of companies listed on the JSE, a relatively small number of companies and to combine them into an index in such a way that movements in their share prices will be representative of movements in the market, both in the direction of the movement and its magnitude. In particular a selection is made from each sector of the JSE, commencing with the company with the largest market capitalisation in that sector and successively selecting the next largest until approximately 80% of the market capitalisation in that sector has been included in the index.

The weighting of individual constituents of the index is important. As the objective of the JSE Actuaries Index is to measure market returns, share price movements of larger companies should have a greater effect on market performance and sentiment than share price movements of smaller companies. This is achieved in the JSE Actuaries Index by ensuring that the proportion invested in each constituent is the ratio of its market capitalisation to the total market capitalisation of all shares included in the index.

A mathematical exposition of the basis of calculation of the market return on the JSE is as follows:-

$$\text{Dividend yield } \% = \frac{\sum_{j=1}^{n} (W_{j,0}\ D_{j,0})}{\sum_{j=1}^{n} (W_{j,0}\ P_{j,0})} \times 100$$

where n = number of shares in the market;

$P_{j,t}$ = price of the jth share at time t;

$W_{j,o}$ = number of shares in issue for the jth constituent at time 0;

$D_{j,t}$ = annual dividend (in cents per share) of the jth share at time t.

To ensure that both the constituents and their weightings are current, detailed rules have been prepared by the JSE for the periodic review of constituents and their weightings. This provides assurance that the JSE Actuaries Index can be continuously used as a surrogate for the market returns on ordinary shares in South Africa.

4.3.4 Calculation of beta and alpha co-efficients

Beta and alpha co-efficients for both the acquired and acquiror company are required in order to derive expected share returns using Sharpe's market model. These co-efficients are calculated by regressing the monthly returns of the acquired and acquiror companies against the monthly return on the JSE Actuaries Index over a period of 35 months, commencing 47 months and terminating 12 months prior to the closing date of the offer. As a beta coefficient that is not affected by any takeover news is required, the twelve months immediately proceding the closing date of the offer has been excluded as a portion of that period includes an abnormal return, being the impact of the takeover announcement.

Fama (13) excluded certain time periods around the "new" information announcement date in their estimates of beta coefficients. They admit that the criteria for determining the period to be excluded is arbitrary. They also found that when using regression estimates for which no data were excluded, the results were much the same and they supported the same conclusions. However their study concerned the affect of the announcement of share splits and dividend announcements on company returns. Generally speaking, news of a takeover has far greater impact on the acquired companies' returns than a share split or dividend announcement and therefore it is considered advisable to exclude the period of these abnormal returns.

The beta coefficient (Bj) was calculated by the following linear regression formula (21):-

$$Bj = \frac{n\left(\sum_{j=1}^{n} R_m R_j\right) - \left(\sum_{j=1}^{n} R_m\right)\left(\sum_{j=1}^{n} R_j\right)}{n\left(\sum_{j=1}^{n} R_m^2\right) - \left(\sum_{j=1}^{n} R_m\right)^2}$$

where

n = number of months included in the regression;
R_m = market return during period t;
R_j = shares return during period t.

The alpha coefficient (Aj) was calculated for the similar period by the following formula (21):-

$$Aj = \frac{\sum_{j=1}^{n} R_j - Bj \sum_{j=1}^{n} R_m}{n}$$

The alpha and beta coefficients and the related r squared values for both the acquired and acquiror companies comprising the sample are included in Appendices B and C respectively.

4.3.5 The accuracy of the profit

Unlike events, such as capitalisation issues and rights issues where the adjustment to the share price can be exactly determined and checked, the accuracy of the impact of the takeover on share returns cannot be verified. All that can be checked is whether the takeover information caused the share price and returns, adjusted for movements in the market index, to move in the right direction. This movement is generally anticipated to be upwards.

4.4 Spreadsheet model

A spreadsheet model using Lotus 123 was developed to calculate the following for both the acquired and acquiror companies:-

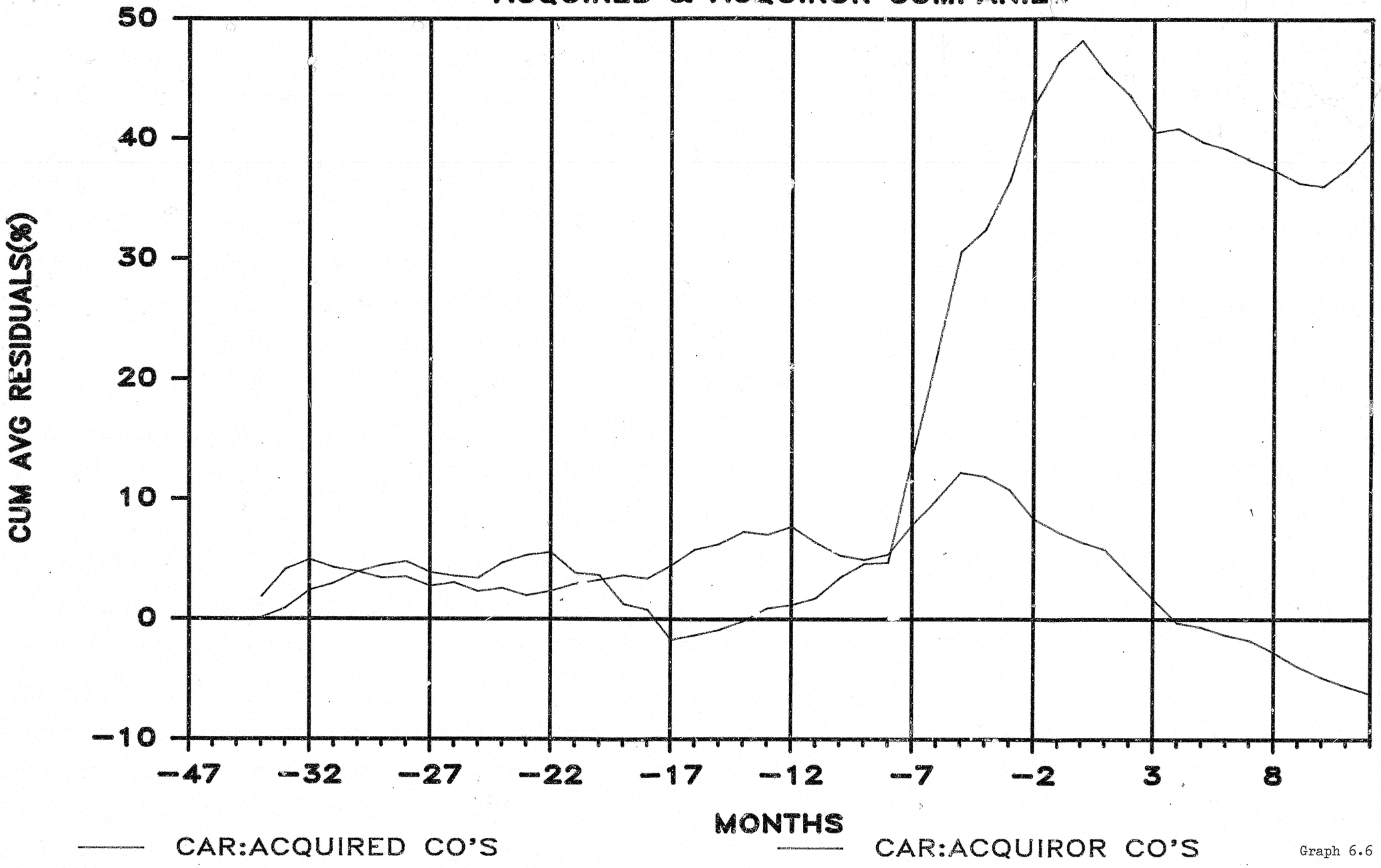
(a) market returns;
(b) actual share returns;
(c) beta coefficients;
(d) company specific returns (i.e. alpha values);
(e) correlation coefficients;
(f) average monthly share returns for the 35 month period commencing 47 months and terminating 12 months prior to the closing date of the offer;
(g) standard deviation of returns;
(h) range of actual returns;
(i) company residuals;
(j) companys cumulative average residuals;
(k) population residuals; and
(l) population cumulative average residuals.

The values obtained on the spreadsheet model for each of the above were tested and compared on the statistical facility of SAS, a computer package, at the University of the Witwatersrand. This indicated that the Lotus spreadhseet developed was performing the calculations correctly and accurately.

CHAPTER 5

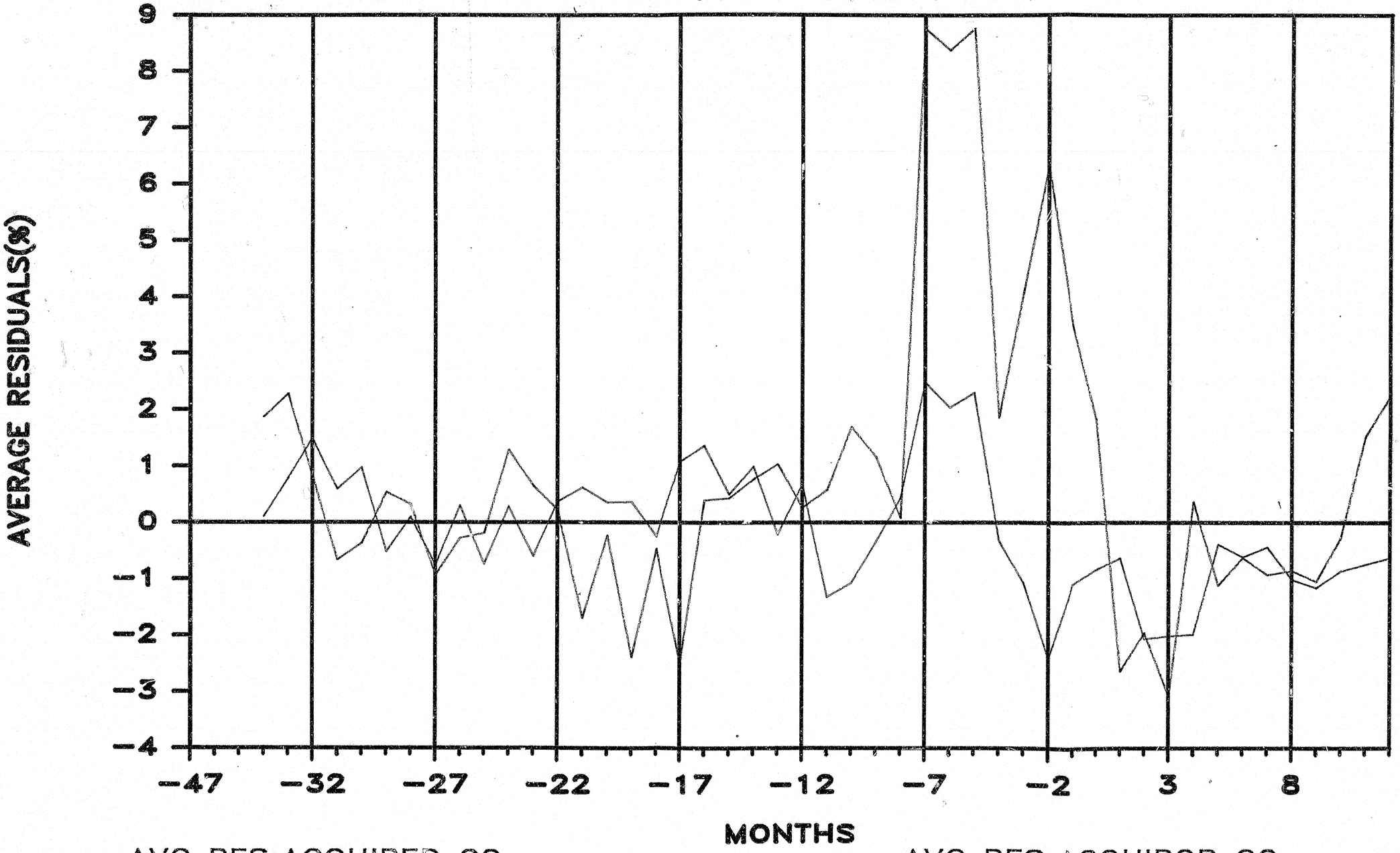
DATA COLLECTION

CUMULATIVE AVERAGE RESIDUALS OF ACQUIRED & ACQUIROR COMPANIES



Graph 6.6

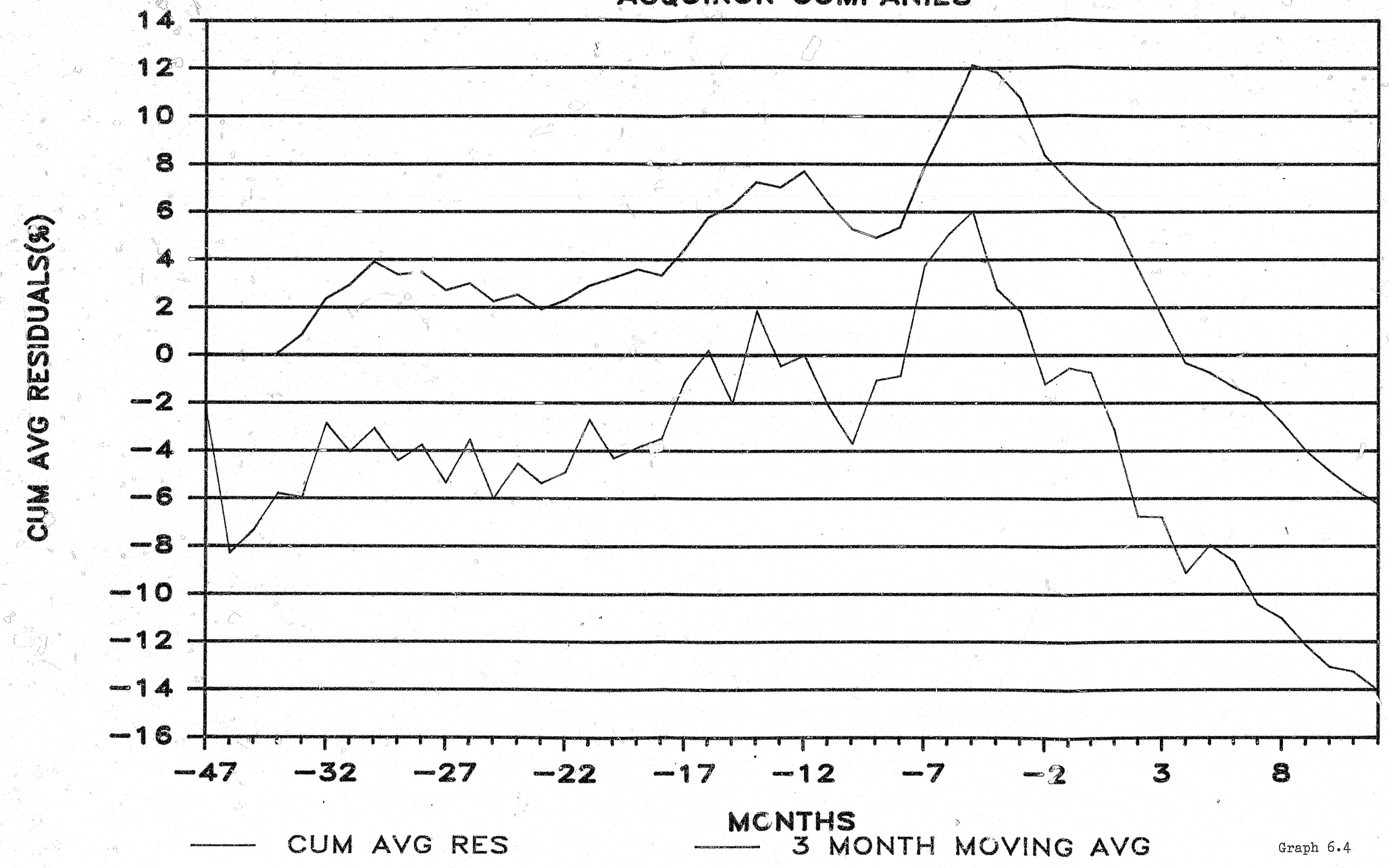
AVERAGE RESIDUALS OF ACQUIRED & ACQUIROR COMPANIES



Graph 6.5

CUMULATIVE AVERAGE RESIDUALS

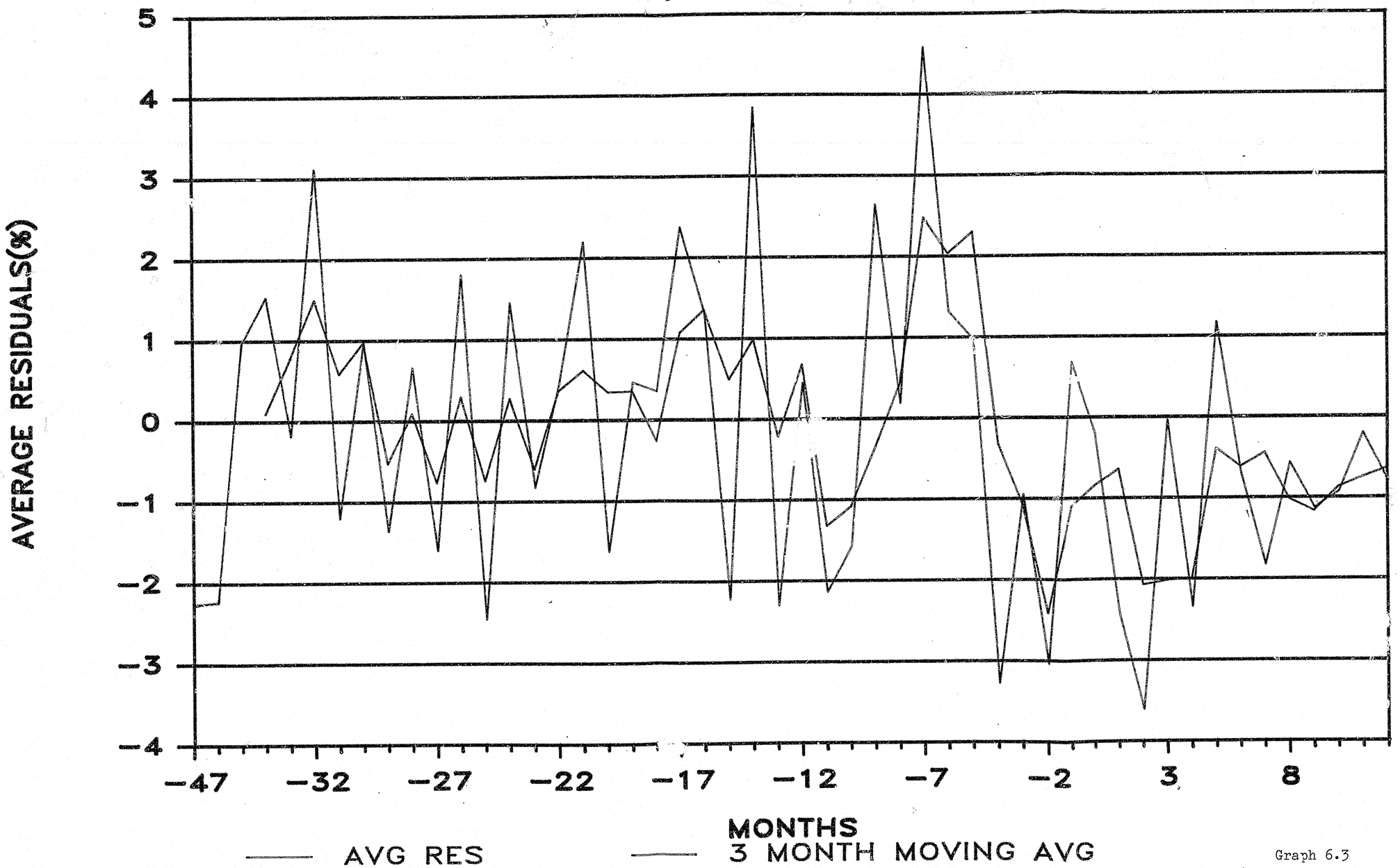
ACQUIROR COMPANIES



Graph 6.4

AVERAGE RESIDUALS

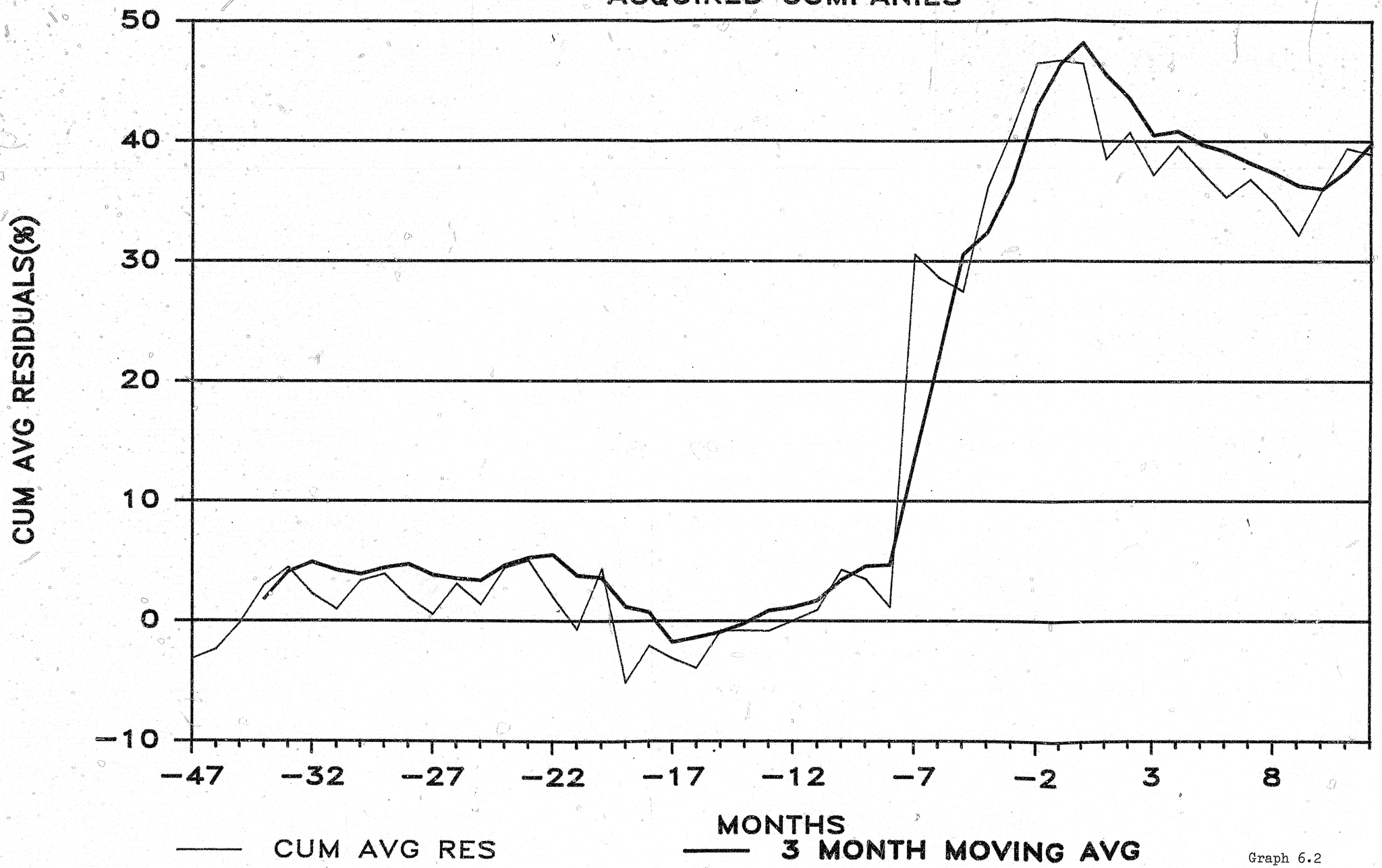
ACQUIROR COMPANIES



Graph 6.3

CUMULATIVE AVERAGE RESIDUALS

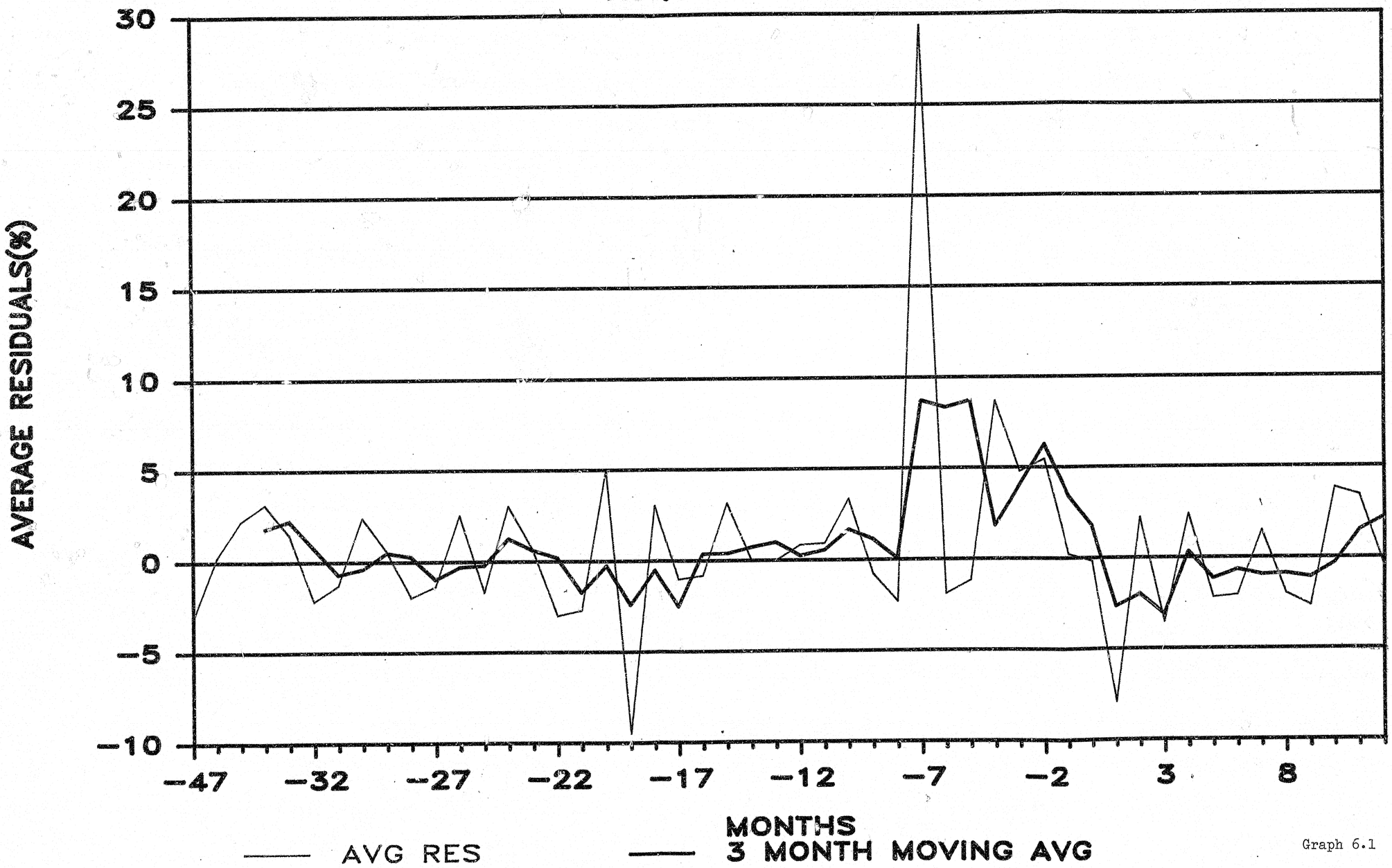
ACQUIRED COMPANIES



Graph 6.2

AVERAGE RESIDUALS

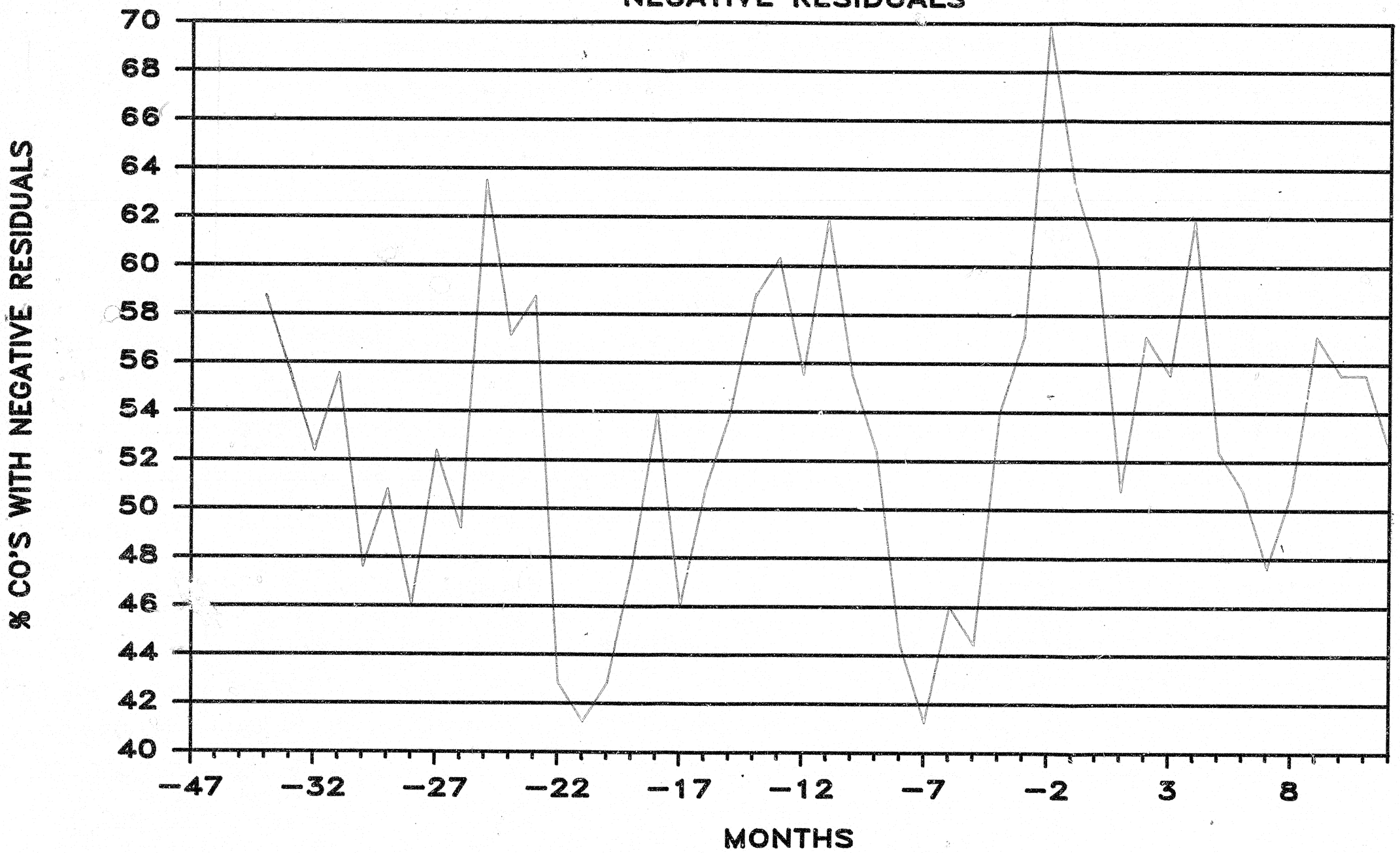
ACQUIRED COMPANIES



Graph 6.1

ACQUIROR COMPANIES REPORTING

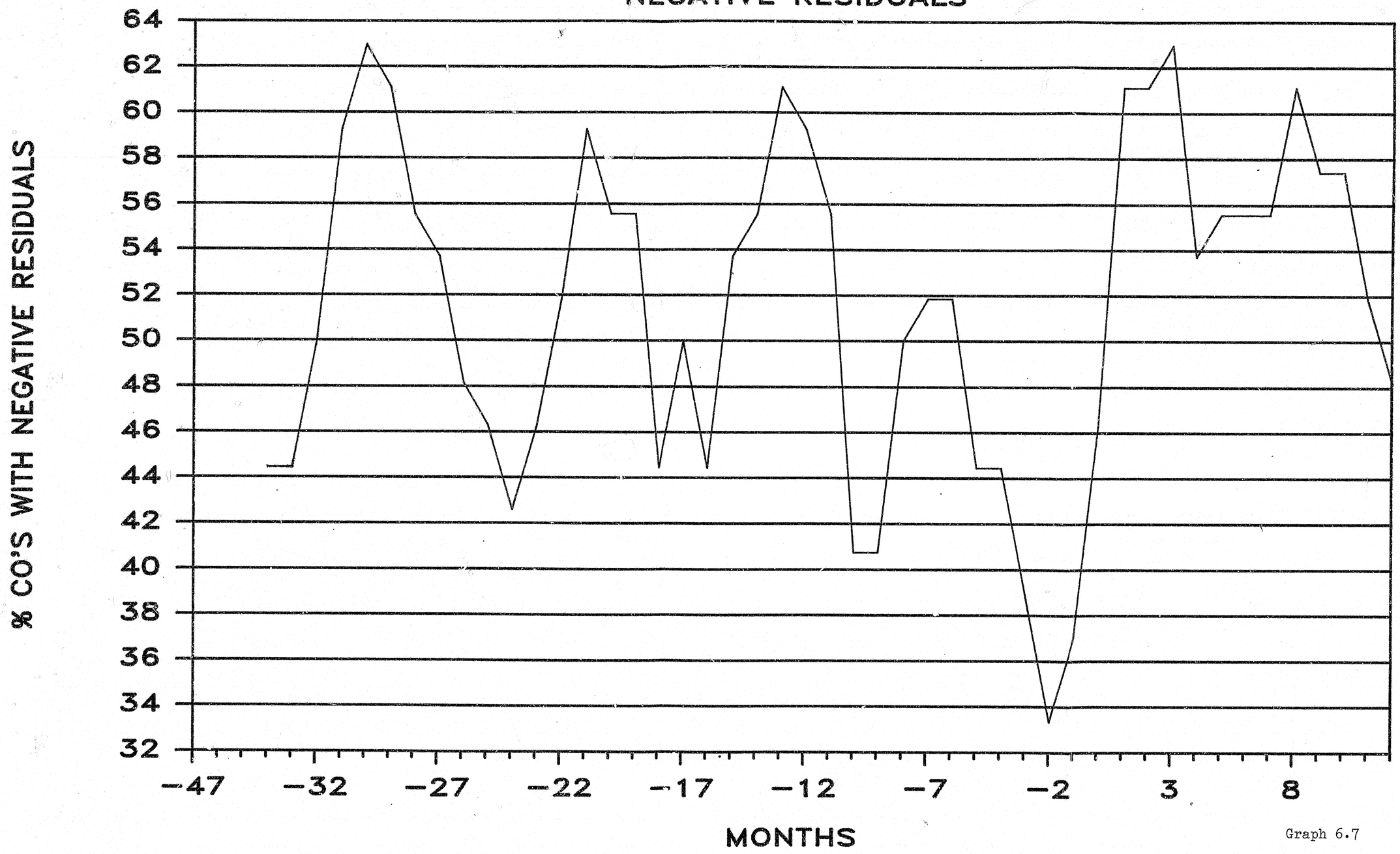
NEGATIVE RESIDUALS



Graph 6.8

ACQUIRED COMPANIES REPORTING

NEGATIVE RESIDUALS



Graph 6.7

CHAPTER 5 - DATA COLLECTION

5.1 Source of sample selection

Each December issue of the JSE Monthly Bulletin lists historical information on companies for the preceding ten years. This information includes inter alia:-

(a) Details of reductions of capital;
(b) Details of sub-divisions issues;
(c) Capitalisation issues;
(d) Rights issues;
(e) Takeover offers;
(f) Listing withdrawals;
(g) Name changes.

The December 1984 (50) issue of the aforementioned booklet was used to select takeovers within the context of this study.

5.2 Criteria for sample selected

The sample was selected from this Bulletin based on the following criteria:-

(a) The closing date of the offer must be after 1 January 1979 and before 30 June 1984;

(b) Both the acquiror and the acquired must be listed on the JSE. This limited number of takeovers as the acquisition of an unlisted company by a listed company were excluded. This was specifically done because shares in unlisted companies are not actively traded and therefore market values or their market model betas are not available for input into the market model;

(c) Both the acquiror and the acquired must have been listed continuously for a period of 36 months before the closing date of the offer and twelve months subsequent to that date;

(d) Originally the criteria was that neither the acquired company nor the acquiror company should be involved in any takeover activity three years preceding and one year subsequent to the closing date of the offer. This was done because in order to calculate the gains from a specific takeover, share prices are required for the companies involved and these should only reflect the influence of a specific takeover. Expected or realised effects of other takeovers occuring shortly before or after the one under consideration would contaminate the price data. However this was not practical as the major portion of takeovers on the JSE is conducted by conglomerates who regularly feature in takeovers;

(e) The sector classification of both the acquired and acquiror company must not have changed during the 47 months prior to the takeover date. An example of such a change in classification is Indumeni Limited (now called Ventron Limited) a company which was listed in the coal sector. This company was used as a vehicle for the consolidation of the activities of an electronics group and its listing was moved to the electronics sector. Such a change in classification would be based on the changed nature of the company so that its specific risk and market related risks would henceforth be different. Therefore conceptually historical share returns cannot be used to predict future share returns within the context of the market model; and

(f) The annual trading volume of both the acquired and acquiror companies shares must be at least 200 000. This would eliminate companies whose share prices are not efficiently determined, but are rather volume dependent.

Based on the above criteria, 17 takeovers comprised the population all of which were selected in the sample. A list of the companies selected are included in Appendix A.

5.3 Data collected

Share prices at the end of each month for the 48 months preceding and the 12 months subsequent to the closing date of the offer were recorded.

Monthly returns were calculated based on the above closing share prices.

CHAPTER 6

RESULTS OF THE STUDY

CHAPTER 6 - RESULTS OF THE STUDY

6.1 Introduction

The results of the empirical study will be presented in this chapter. These will be presented in relation to the objectives of the study i.e. firstly addressing the issue of the number of months prior to the closing date of the offer that the market begins to anticipate the takeover and secondly the measurement of the impact of the takeover news on the share price of the acquiror and the acquired company.

6.2 Market anticipation of takeover

The average residuals and cumulative average residuals of both acquired and acquiror companies for 47 months preceding and 12 months subsequent to the closing date of the offer are presented in Tables 6.1 to 6.4. Table 6.1 is a summary of the average residuals of acquired firms and Table 6.2 reflects the cumulative average residuals of these firms. Table 6.3 presents comparable information to 6.1 and 6.2 but from the acquiror company's viewpoint.

The month numbers (column 1) relate to the number of months before or after the closing month of the takeover offer. The months before are prefixed by a minus sign and the months after are prefixed by a plus sign e.g. month -2 relates to the residual for the period two months prior to the closing month of the takeover offer whilst +2 records the residual for the period two months subsequent to the closing month of the takeover offer. Month 0 relates to the closing month of the offer. Column 2 represents the cross sectional average residuals or cumulative average residuals derived from the market model. The residuals reported are very erratic. To facilitate a proper analysis of the residuals, a three month moving average was calculated to smooth out the peaks and troughs. These are reflected in column 3. Column 4 indicates the percentage of companies in the population reporting negative residuals in each of the 47 months before and the 12 months after the closing date of the takeover offer.

Month (1)	Average residual (2)	Three month moving average of residuals (3)	Percentage of firms reporting negative residuals (4)
-47	-3.21		
-36	0.25		
-35	2.22		
-34	3.14	1.87	44
-33	1.49	2.28	44
-32	-2.18	0.82	50
-31	-1.31	-0.67	59
-30	2.39	-0.36	63
-29	0.55	0.55	61
-28	-1.96	0.32	56
-27	-1.38	-0.94	54
-26	2.53	-0.28	48
-25	-1.71	-0.19	46
-24	3.04	1.29	43
-23	0.63	0.65	46
-22	-3.01	0.22	52
-21	-2.71	-1.70	59
-20	5.03	-0.23	56
-19	-9.48	-2.38	56
-18	3.04	-0.47	44
-17	-1.03	-2.49	50
-16	-0.83	0.39	44
-15	3.15	0.43	54
-14	-0.01	0.77	56
-13	-0.02	1.04	61
-12	0.82	0.26	59
-11	0.93	0.58	56
-10	3.34	1.70	41
- 9	-0.78	1.16	41
- 8	-2.32	0.08	50
- 7	29.38	8.76	52
- 6	-1.92	8.38	52
- 5	-1.17	8.76	44
- 4	8.68	1.86	44
- 3	4.79	4.10	39
- 2	5.47	6.31	33
- 1	0.20	3.49	37
+ 0	0.19	1.83	46
+ 1	-7.91	-2.63	61
+ 2	2.23	-1.96	61
+ 3	-3.54	-3.07	63
+ 4	2.40	0.37	54
+ 5	-2.21	-1.12	56
+ 6	-2.06	-0.62	56
+ 7	1.49	-0.93	56
+ 8	-1.99	-0.85	61
+ 9	-2.65	-1.05	57
+10	3.83	-0.27	57
+11	3.41	1.53	52
+12	-0.51	2.24	48

TABLE 6.1 - SUMMARY OF AVERAGE RESIDUALS - ACQUIRED COMPANIES

Month (1)	Cumulative average residual (2)	Three month moving average of residuals (3)
-47	-3.21	
-36	-2.39	
-35	-0.18	
-34	2.96	1.87
-33	4.45	4.15
-32	2.28	4.97
-31	0.97	4.30
-30	3.36	3.94
-29	3.91	4.49
-28	1.93	4.81
-27	0.55	3.87
-26	3.09	3.60
-25	1.37	3.41
-24	4.41	4.70
-23	5.04	5.35
-22	2.03	5.57
-21	-0.68	3.87
-20	4.35	3.64
-19	-5.13	1.25
-18	-2.08	0.79
-17	-3.12	-1.70
-16	-3.95	-1.31
-15	-0.79	-0.88
-14	-0.81	-0.11
-13	-0.82	0.93
-12	-.00	1.20
-11	0.93	1.78
-10	4.27	3.47
- 9	3.49	4.64
- 8	1.17	4.72
- 7	30.55	13.48
- 6	28.64	21.86
- 5	27.46	30.62
- 4	36.14	32.49
- 3	40.93	36.59
- 2	40.40	42.90
- 1	46.60	46.39
+ 0	46.41	48.21
+ 1	38.50	45.58
+ 2	40.73	43.62
+ 3	37.19	40.55
+ 4	39.60	40.91
+ 5	37.38	39.80
+ 6	35.32	39.17
+ 7	36.81	38.25
+ 8	34.83	37.40
+ 9	32.18	36.35
+10	36.01	36.08
+11	39.42	37.61
+12	38.91	39.85

TABLE 6.2 - SUMMARY OF CUMULATIVE AVERAGE RESIDUALS - ACQUIRED COMPANIES

Month (1)	Average residual (2)	Three month moving average of residuals (3)	Percentage of firms reporting negative residuals (4)
-47	-2.26		
-36	-2.22		
-35	0.97		
-34	1.54	0.09	59
-33	-0.18	0.78	56
-32	3.12	1.49	52
-31	-1.20	0.58	56
-30	0.97	0.97	48
-29	-1.36	-0.53	51
-28	0.66	0.09	46
-27	-1.59	-0.76	52
-26	1.81	0.39	49
-25	-2.45	-0.74	63
-24	1.46	0.27	57
-23	-0.82	-0.60	59
-22	0.45	0.36	43
-21	2.21	0.61	41
-20	-1.62	0.34	43
-19	0.47	0.35	48
-18	0.36	-0.26	54
-17	2.38	1.07	46
-16	1.32	1.35	51
-15	-2.21	0.49	54
-14	3.85	0.99	59
-13	-2.30	-0.22	60
-12	0.46	0.67	56
-11	-2.13	-1.32	62
-10	-1.57	-1.08	56
- 9	2.65	-0.35	52
- 8	0.19	0.42	44
- 7	4.59	2.48	41
- 6	1.32	2.03	46
- 5	0.98	2.30	44
- 4	-3.27	-0.32	54
- 3	-0.94	-1.08	57
- 2	-3.04	-2.42	70
- 1	0.68	-1.10	63
+ 0	-0.19	-0.85	60
+ 1	-2.42		51
+ 2	-3.61		57
+ 3	-0.03		56
+ 4	-2.34		62
+ 5	1.18		52
+ 6	-0.69	-0.62	51
+ 7	-1.82	-0.44	48
+ 8	-0.56	-1.02	51
+ 9	-1.12	-1.17	57
+10	-0.92	-0.87	56
+11	-0.20	-0.75	56
+12	-0.79	-0.64	52

TABLE 6.3 - SUMMARY OF AVERAGE RESIDUALS - ACQUIROR COMPANIES

Month (1)	Cumulative average residual (2)	Three month moving average of residuals (3)
-47	-2.26	
-36	-8.30	
-35	-7.33	
-34	-5.79	0.09
-33	-5.97	0.87
-32	-2.85	2.36
-31	-4.04	2.95
-30	-3.07	3.91
-29	-4.43	3.39
-28	-3.77	3.48
-27	-5.36	2.72
-26	-3.55	3.01
-25	-6.00	2.27
-24	-4.54	2.54
-23	-5.36	1.93
-22	-4.91	2.30
-21	-2.71	2.91
-20	-4.33	3.25
-19	-3.86	3.60
-18	-3.50	3.34
-17	-1.12	4.41
-16	0.20	5.76
-15	-2.01	6.26
-14	1.84	7.24
-13	-0.46	7.02
-12	.00	7.69
-11	-2.13	6.37
-10	-3.70	5.29
- 9	-1.05	4.94
- 8	-0.86	5.36
- 7	3.73	7.84
- 6	5.05	9.87
- 5	6.03	12.17
- 4	2.76	11.85
- 3	1.81	10.77
- 2	-1.22	8.35
- 1	-0.54	7.25
+ 0	-0.73	6.40
+ 1	-3.15	5.76
+ 2	-6.75	3.69
+ 3	-6.78	1.67
+ 4	-9.12	-0.32
+ 5	-7.94	-0.71
+ 6	-8.63	-1.33
+ 7	-10.45	-1.77
+ 8	-11.01	-2.79
+ 9	-12.13	-3.96
+10	-13.05	-4.83
+11	-13.25	-5.58
+12	-14.04	-6.22

TABLE 6.4 - SUMMARY OF CUMULATIVE AVERAGE RESIDUALS - ACQUIROR COMPANIES

To impress the period in which the market begins to anticipate the takeover and to judge the efficiency or otherwise of the market to the takeover information, the average residuals and cumulative average residuals in Table 6.1 to 6.4 are graphically presented in graphs 6.1 to 6.6. Graphs 6.1 and 6.2 graphically illustrate the cross sectional average residuals and cumulative average residuals respectively of acquired companies while graph 6.3 and 6.4 reflects the comparable information from the acquiror companies' viewpoint. Graphs 6.4 and 6.5 present the average residuals and cumulative average residuals respectively of both the acquired and acquiror companies. These graphs are useful in assessing the overall efficiency of the market for the takeover information. The lines joining the data points between the time periods should not be interpreted as a linear relationship between the periods. The data points have been joined purely to emphasise the significance of the movements in the residuals between succeeding periods.

6.2.1 Analysis of residuals of acquired companies

Table 6.1 and graph 6.1 indicate that the three month moving average residuals in the 24 month period up to 12 months before the closing month of the offer range closely between -2.5% and +2.5% and this represents the normal disturbance of the returns. Even up to 8 months prior to the closing date of the offer there was no unusual activity in the cross sectional average residuals. The situation reverses dramatically in period -7 where a positive residual of 8,76% is reported. This is the largest disturbance up to the closing date of the offer which implies that the market begins to anticipate the takeover approximately seven months prior to the closing month of the takeover.

Table 6.2 and graph 6.2 reflect similar information as table 6.1 and graph 6.1. The period in which the slope becomes extremely steep, period -7, indicates the period when the market anticipates the takeover.

This finding is in line with Halpern's (27) and Mandelker's (38) studies on the profitability of mergers in the United States which also reported that the market anticipated the takeover 7 months prior. The long lead time may be due to the anticipatory skills of investors or, more likely, leakage of information about the takeover. However this finding is not in line with Firth's study on takeovers in the United Kingdom. Firth (15) found that prior to one month of the takeover announcement date, share prices did not discount any takeover possibilities. However this contrast in findings may be attributable to the definition of period 0. While Halpern, Mandelker and this study defines period 0 as the closing month of the offer, Firth's study defines period 0 as the month in which the average residuals deviate from their normal relationship which, by definition, would reflect the largest residuals in period 0.

Insignificant corrections of the residual in month -7 are made in months -6 and -5 and as the takeover becomes more likely, further positive returns are earned. This is evidenced by the positive average residuals reported in period -4 to -2. The period -2 is generally the month when the firm makes the takeover announcement as there is approximately a six to eight week time gap between the takeover announcement and the closing date of the offer. The residuals after period 0 return to the normal relationship similar to the period before the takeover was discounted. This strongly proves that the JSE is efficient as far as the discounting of takeover information of the acquired company is concerned. Comment cannot be passed on the accuracy of the adjustment as the effect of a takeover is not an exactly measurable economic event. Market efficiency can therefore in this case be accepted as a movement of the share returns at least in the right direction.

The negative residuals during the 24 month period up to 12 months before the closing month of the offer are indicative of the fact that the acquired companies' actual returns are falling short of the market expectations. This implies sub-optimisation of assets during that period and this may have caused them to become takeover targets. This is also consistent with Graph 6.7 which indicates that a large proportion of the companies earned negative returns up to twelve months prior to the closing date of the offer. This evidence is consistent with that found by Mandelker in his study of mergers in the United States and Firth in the United Kingdom i.e. acquired companies had poor stock market performances prior to the takeover.

6.2.2 Analysis of residuals of acquiror companies

The residuals of the acquiror companies, which are reflected in Table 6.3 and 6.4 graphs 6.3 and 6.4, also indicates that the market begins to anticipate the takeover seven months prior to the closing date of the offer. Again this finding is in line with the findings of Halpern (27) and Mandelker and in contrast with the findings of Firth. Halpern and Mandelker (38) found that the residuals of acquiror firms rose sharply in the period before the takeover whereas Firth's study found that they rose sharply in the month of the takeover announcement. However this may again be attributable to the different definition accorded to the period 0.

The average residuals during period -47 and -12 range between +1.5% and -0.8% and this is considered to be their normal variation. There are large swings in the residuals between -14 and -9 mainly in the negative direction. This implies that the acquiror companies' returns are falling short of the market's anticipations and it may be speculated that because of this fact they decide to take over another company hoping that their own returns would improve. The market views this action in a favourable light and the share begins to report positive residuals between -7 and -5. However this is short lived as after period -5 the acquiror companies consistently earn negative returns. This is also borne out by table 6.3 and graph 6.8 which indicates that a large proportion of acquiror companies report negative residuals after period -5 than before. The short lived period of positive residuals may be attributable to:-

(a) speculators in the market pushing up the share price in anticipation of a takeover;
(b) information leakage that the company is going to be involved in a takeover.

The share's normal residual relationship returns only after period +4 and it may be stated that whilst the market has timeously reacted to the takeover anticipation and is therefore efficient in that sense, it is inefficient as far as the accuracy of the adjustment is concerned. It can therefore be concluded that the market does not know how to react to takeover information in the acquiror company.

The fact that a high proportion of acquiror companies earn negative returns after the takeover anticipation appears to conflict with the wealth maximisation theory. The decision to effect a takeover has not improved the wealth of the shareholders of the acquiror company. Bearing in mind that a large proportion of the companies selected are directly or indirectly linked to a conglomerate, the management utility theory may be more appropriate.

6.2.3 Acquired and acquiror residuals viewed together

Graph 6.5 views the residuals of the acquired and acquiror companies simultaneously. It brings home the point of market efficiency succinctly as it indicates that the market anticipates the takeover at approximately the same time (period -7) for both the acquired and acquiror. This is an indication that the JSE is efficient in the semi-strong form as regards takeover information for the companies selected.

CHAPTER 7

CONCLUSIONS

CHAPTER 7 - CONCLUSIONS

7.1 Introduction

This chapter provides a summary of the research results in Chapter 6 and is intended to tie up these with the overall objectives of the study. The limitations of the study are discussed and some areas for future research identified.

7.2 Conclusion

Specifically the study was set out to provide a test of the efficient market hypothesis in the semi-strong form by attempting to identify the number of months prior to the closing date of the offer that the market begins to anticipate the takeover and to provide management and investors of the acquired and acquiror companies with information relating to the impact of takeovers on the share returns of the companies involved in the takeover.

It was found that the market anticipated the takeover seven months prior to the closing date of the offer. This was evidenced from the behaviour of the cross sectional average residuals of the acquired and acquiror companies before the closing date of the offer. As both the acquired and acquiror companies residuals reflected the discounting of the takeover into it's share price in the same period, it is concluded that the JSE reacts speedily to takeover information in the share price formation process. It may therefore be concluded that the JSE is efficient in the semi-strong form of the efficient market hypothesis, as regards the speed with which adjustments to takeover information are made.

The possibility of the efficient market hypothesis not being valid in the semi-strong form as far as the dissemination of information to the general public cannot be ruled out. A market anticipation period of seven months prior to the closing date of the offer appears to be significant and this may be due to a limited body of investors having and acting on priviledged information.

The efficiency of the JSE as regards the accuracy of the adjustment process is not conclusive but at least the movement of the share price is in the right direction. Takeover information is generally interpretated as "favourable news" and when it is initially announced there is an upward surge in share prices and returns of both the acquired and acquiror companies. However as a result of later information, particularly in the case of the acquiror company, expectations are substantially revised downwards. One is tempted to interpret such a reversal of expectations in terms of market inefficiency and incorrect investor interpretations, but it must be borne in mind that the upward surge in share prices and consequent returns occurs in the absence of any financial information about the takeover. Therefore the market adjustment may be inaccurate and the eventual outcome and success of the takeover may well be substantially different from initial expectations.

The downward revision in the case of acquiror companies particularly after the financial information is published (± period -2) is significant and may be due to the tendency of management to overestimate their abilities to realise synergies or pay excessive premiums. The latter tendency supports the management utility theory.

7.3 Limitations of the study

The major limitations of the study are:-

(a) The conclusions reached apply only to companies listed on the JSE which have an annual trading volume in excess of 200 000 shares. The results of the study therefore cannot be extrapolated to takeovers where the annual trading volume of either the acquiror or acquired firm is less than 200 000 shares;

(b) The conclusions reached are not applicable to unlisted companies taking over listed companies and vice versa;

(c) The sample included companies that are regularly involved in takeover activities. It may therefore occur that the residuals of such acquiror companies may not have returned to their normal market relationship before another takeover is consumated.

7.4 Areas of future research

This dissertation has reviewed some of the major empirical tests on the various forms of the efficient market hypothesis. The empirical evidence, in the United States and United Kingdom generally indicates that markets are efficient in their weak and semi-strong forms. The hypothesis of the weak and semi-strong form have therefore not been refuted. The evidence for efficiency on the JSE is not conclusive. Whilst a fair amount of testing has been conducted on the weak form of the hypothesis, very little work seems to have been done to determine whether the JSE is efficient in the semi-strong form. In addition the work done by Strebel and Saloner (46)(47)(43) seems to indicate that any study attempting to prove the efficiency or otherwise of the JSE, must consider the annual trading volume of individual shares. Studies which have not addressed the issue of volume dependence are therefore of marginal significance.

There still appears to be considerable scope for research into the weak and semi-strong form of the efficient market hypothesis on the JSE particularly in relation to:-

(a) The reinvestigation of studies conducted which have not considered the volume dependence factor;

(b) Studies conducted in the United States and United Kingdom.

The possibility of research into these areas is facilitated by computer facilities which are now readily available. Research into the abovementioned areas will contribute to a better understanding of the efficient markets theory and provide future evidence for, or against, the efficiency of the JSE.

APPENDIX A

COMPANIES SELECTED IN SAMPLE

	Acquired	Acquiror
1.	Imperial Cold Storage	Barlow Rand
2.	Kohler	Gencor
3.	Fintec	Allied Electronics
4.	Gallo Africa	Premier Group
5.	Bonuskor	Volkskas
6.	Group Five	Darling & Hodgson
7.	Asea	Anglo American Industrial Corporation (AMIC)
8.	Metalbox	Nampak
9.	Southern Sun	South African Breweries
10.	Tedelex	Gencor
11.	Tiger Oats	C.G. Smith
12.	Union Wine	Picardi Finance
13.	Unisec	Sage
14.	Clydesdale	GFSA
15.	Premier Group	JCI/Liberty Life/AAC
16.	Minorco	AAC/De Beers
17.	Powertech	Allied Electronics

APPENDIX B

ALPHA AND BETA COEFFICIENTS

ACQUIRED COMPANIES

	Alpha Coefficient	Beta Coefficient	R Squared
Imperial Cold Storage	0,05	-0,65	25,93
Kohler	0,69	0,46	17,19
Fintec	-0,5	0,41	9,821
Gallo Africa	1,7	0,42	2,415
Bonuskor	-1,4	0,17	1,134
Group Five	-0,1	0,56	8,41
Asea	-0,1	1,09	13,496
Metalbox	-0,5	0,63	35,586
Southern Sun	1,5	1,06	48,153
Tedelex	1,4	0,90	37,669
Tiger Oats	0,5	0,45	21,572
Union Wine	1,8	0,72	9,419
Unisec	1,2	0,3	6,783
Clydesdale	0,2	0,79	39,968
Premier	1,7	0,59	23,984
Minorco	0,9	0,51	9,419
Powertech	-0,8	0,61	21,443

APPENDIX C

ALPHA AND BETA COEFFICIENTS

ACQUIROR COMPANIES

	Alpha Coefficient	Beta Coefficient	R Squared
Barlow Rand	1,0	0,70	44,509
Gencor (Kohler)	-0,3	1,29	82,010
Allied Electronics	2,9	0,60	27,119
Premier Group	-1,0	0,63	29,724
Volkskas	0	0,34	13,387
Darling and Hodgson	2,4	0,28	8,406
Anglo American Industrial Corporation	1,4	0,47	21,050
Nampak	0,3	0,54	43,984
South African Breweries	2,1	0,74	52,823
Gencor (Tedelex)	-0,2	1,32	82,882
C.G. Smith	2,3	0,70	31,423
Picardi Finance	3,7	0,19	0,432
Sage	1,4	0,35	9,789
GFSA	0,7	1,32	57,492
JCI	0,6	1,18	73,207
Liberty Life	0,9	0,47	24,244
AAC (Premier)	0	1,3	81,831
AAC (Minorco)	0,5	1,03	72,832
De Beers	1,8	0,59	22,691
Allied Electronics	0,2	0,49	15,919

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Author Kana, S. (Suresh Parbhoo)
Name of thesis The Efficiency Of The Stock Exchange With Respect To Takeover Information. 1986

PUBLISHER:
University of the Witwatersrand, Johannesburg
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