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STOCK PRICE REACTIONS TO DIVIDEND CHANGES: EVIDENCE FROM THE JOHANNESBURG STOCK EXCHANGE

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Abstract

This research paper examines stock price reactions to the changes in cash dividend payments for mature companies listed on the Johannesburg Stock Exchange (JSE).

Prior South African research studies have employed the Market Model and Mean-Adjusted Return Model of event study to estimate "normal return" of the companies listed on the JSE. This study has employed the Market-Adjusted Return Model and short event window (-5, +5) to test the effect of dividend changes. The empirical results are based on 48 samples of mature companies with regular half yearly cash dividend records during the 2000- 2004 period.

Using 4741 dividend change observations, it was found that the stock price reactions to increase announcements were greater than those for decrease announcements over the entire event days. It was further found that the stronger positive market reactions were associated with those announcements of larger percentage increases in dividends. These results lead to support the existence of the Dividend Signalling Hypothesis.

The evidence also indicates that the positive price reactions to final increases were greater than for interim increases. Conversely, the market did not bid down prices in the light of unfavourable, less than 50% final decreases, over the days -1, 0, and +1. These results enable us to gain a new insight into stock price behaviour around event date.

With respect to the stock price effects, it was found that lower-priced stocks had a greater reaction to dividend changes than higher-priced stocks during the post-announcement days.

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Lastly, I owe a great deal of appreciation to my parents in China for their wonderful love and invaluable encouragement throughout the course of my degree.

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Declaration

I declare that this work has not been previously submitted in whole, or part, for any purpose to any other Department or University.

Each significant contribution to, and quotation from other people's works has been attributed, and has been cited and referenced in this mini-dissertation.

I have not allowed, and will not allow any individual to copy this study with the intention of plagiarizing.

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Signature Date

Lin Mu

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1 Introduction

1.1 Background

Dividend policy is a company's policy decision regarding the amount of earnings paid to stockholders as opposed to being retained for reinvestment in the company. In determining the portion of earnings to be paid as dividends, factors such as the availability of cash, the current investment opportunities, the financing resources, and taxation are considered. It has been shown that the life cycle stage of the company influences the dividend policy. Growing companies pay smaller dividends while mature companies pay larger dividends (Grullon, Michaely, and Swaminathan (2002)). On the other side, investors with different demands will make different decisions.

The South African study by Henn and Smit (2002) found that depending on the price index investigated, there is only 0.006% and 4% stock price movement explained by South African economic news available to the Johannesburg Stock Exchange (JSE). The market is not a reliable price-setter, as it frequently, and sometimes significantly, misinterprets the economic signals it receives. Therefore it is assumed that it is possible for the investors to outperform the market. The company's news reporting and announcements are conventionally perceived as the provision of information that might help the reasonably well-informed and diligent investor to make buy-hold-sell decisions. Investors traditionally measure the company's performance from published dividend per share (DPS) and earnings per share (EPS) information. EPS is subject to accounting manipulation and therefore does not provide clear performance information that drive value (Miller and Rock (1985) and Dechow, Sloan, and Sweeney (1996)), whereas the companies that can afford to pay out dividends are generating cash, especially those companies with stable and increased records of dividend payments. Therefore the dividend announcement, which embodies the company's dividend policy, has significant implications for the stock market participants.

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Since the pioneering work of John Lintner (1956) and Miller & Modigliani (1961), there has been extensive research on dividend announcements with the majority of the empirical studies focused on the US stock market. Empirical results vary according to the different research methodologies, stock market mechanisms, tax regimes, and history periods.

Several streams of theories have been developed to explain the different phenomena with dominant theories clustered around two major research themes. The first theme includes the **Dividend Signalling Hypothesis** (Lintner (1956), Fama and Babiak (1968), Pettit (1972 and 1976), Charest (1978a and 1978b), Bhattacharya (1979 and 1980), Kalay (1980), Miller and Rock (1985), Aharony, Falk, and Swary (1988), Fama and French (1988, 1992, 1993, and 1996), Impson (1997), Gurgul, Majdosz, and Mestel (2003), Skinner (2003), Wang (2004), and Brav, Graham, Harvey, and Michaely (2004), etc.) and **Dividend Irrelevance Theory** (Miller and Modigliani (1961) and Watts (1973, 1976a, and 1976b), Higgins (1974a), Black and Scholes (1974), Miller and Scholes (1978 and 1982), Gonedes (1978), and Penman (1983), DeAngelo, DeAngelo and Skinner (1992, 1996, 2000, and 2002), Benartzi, Michaely and Thaler (1997)). The second theme includes the **Dividend Clientele Hypothesis** (Litzenberger and Ramaswamy (1979 and 1982), Bajaj and Vijh (1990), Denis, Denis, and Sarin (1994), Kalay and Michaely (2000), Allen, Bernardo, and Welch (2000) Brav, and Graham, Harvey, and Michaely (2004)) and **Tax Preference Theory** (Kato and Loewenstein (1995) and Baker, Powell, and Viet (2002)). Certain research has focused on dividend stability and the determinant of dividend policy (Blume (1980), Keim (1983 and 1985), Gombola and Liu (1993), Gentry and Mayer (2003), etc.).

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It is largely accepted that the change in dividend announcements convey valuable information to the market participants. The proponents of Dividend Signalling Hypothesis and their prior work are summarized in the next chapter.

Event Study Methodology is the most widely employed financial economic method to test market reactions to new information such as dividend change announcements, and Capital

Asset Pricing Model (CAPM) and a variety of Market Models are used to assess expected or normal returns. Earlier studies relied more on using basic CAPM and single factor Market Model (Lintner (1965), Knight and Affleck-Graves (1987), and Ball and Kothari (1989), Impson (1997), etc.) to test this line of financial theories. The basic CAPM and traditional Market Model are later criticized as supplying too simple regressions ((Pettit, 1972) and Fama and French (1992, 1993, and 1996)). Thereafter Christie (1990) applied the CAPM-adjusted Model (Size-based Expected-returns Model); and Fama and French (1993 and 1996) derived the famous Three-factor Model. The DeAngelo, DeAngelo, and Skinner (1995) study applied Growth-adjusted Model. The Gurgul, Majdosz, and Mestel (2003) study conducted the GARCH Non-linear Stochastic Time-series Model. Wang (2004) employed the Propensity score matching method. Some other studies also attempted to use questionnaires (Jong, Dijk, and Veld (2002)) and interviews (Brav, Graham, Harvey, and Michaely (2004)) to gather evidence.

In estimating the information content of dividend change announcements, a significant barrier still exists. It is not possible to isolate the effects of dividend announcements from the effects of other company announcements or from the effects of macroeconomic factors which had given, or were giving the potential effects on the stock prices during the announcement periods studied (Charest (1978 a and 1978 b)).

In order to reduce the influence of other macroeconomic factors, this study has used strict data selection criteria and a short-term (-5, +5) event window to examine if the changes in dividend announcements convey useful information on the JSE, which will be reflected by stock price reaction immediately following a public dividend changes announcement. The five-year period from January 1, 2000 to December 31, 2004 has been used for this study.

This study has followed and attempted to extend the work of South African research by using the Market-Adjusted Return Model of event study which was not used by prior researchers. In earlier research most South African studies: for example, Ooms, Archer and Smit (1987),

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Knight and Affleck-Graves (1987), and Bhana (1991a), applied Market Model in dividend research on the JSE. The subsequent Bhana (1991b) study used Cumulative Sum Analysis Methodology and Random Coefficient Regression Model. Most recently, the Bhana (2002) study employed Mean-Adjusted Return Model.

By using a wider array of methods and different data sources to test financial theory, the validity of prior evidence would be either confirmed or invalidated. As each method and data interval has its advantage and disadvantage, financial theories could be developed.

In addition to the descriptive statistics of the sample companies, this study examines the following four separate tests of the data:

The first test measures different market responses to dividend increases and decreases. The market reactions are positively related to dividend changes, indicating that market participants interpret dividend increases as positive signals, and vice versa.

The second test examines dividend changes' size effects. A stronger positive relationship was found between stock returns and the percentage change of dividend increases. This finding is further confirmed by the evidence of the next test derived from the interim ACAR and final ACAR relative to percentage changes of dividends respectively. These results are also consistent with the finding of the South Africa Bhana (1991) study that the market reacts drastically to the large dividend changes on the JSE.

In South Africa, dividend payments are usually made twice a year. The third test involves the estimation of market reactions to interim and final dividend announcements. Consistent with the Balachandran (2001) study, data indicate that interim dividend reductions have greater impact on market reactions. Moreover, it was found that final announcements of dividend increase triggered greater market response than interim announcements of dividend increase. By using daily data, this research will further compare stock price fluctuations versus the percentage change in interim and final dividend announcements for listed

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companies on the JSE.

The fourth test measures market price size effects, since the different stock price size would have contributed to the impact of dividend announcements. Greater market reactions are found to be associated with lower-priced (less than 1000 cents per share) companies than for higher-priced (greater than 5000 cents per share) and medium-priced companies.

The findings from these four tests provide support to the existing dividend signalling hypothesis.

Average Abnormal Returns (AAR) and Average Cumulative Abnormal Returns (ACAR) from a standard market-adjusted model are used to assess the effects of dividend change announcements. This is evaluated by using the $T-$test to determine the statistical significance of average abnormal returns. The standard deviation (S.D.) is also used to indicate the volatility of abnormal returns.

1.2 Purpose of Present Study

The results in this study may be especially useful to investors because stocks in emerging markets have more upside/downside potential than mature markets (Fama and French (1998)) and this paper may give insight into how stock prices may fluctuate in response to the changes in dividend announcement. The possible explanations for the existence of the abnormal returns triggered by dividend changes could provide helpful information for both shareholders and company managers in South Africa.

This topic is important because it examines the importance of dividend changes in determining short-run stock price around their announcements. The significance of this research is not to confirm previous research in this area, but to present some implications for market participants with respect to dividend announcements.

The study contributes to the dividend related literature by employing Market-Adjusted

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Model of event study to test the dividend change effect on the JSE, which differs from previous South African research which did not apply Market-Adjusted Model.

1.3 Organization of the Dissertation

The remainder of this paper is organized as follows: Chapter Two introduces dominant theory and summarizes the previous studies that have been done around the world on the impact of dividend announcements. Chapter Three provides the methodological details and data description. Chapter Four summarizes the empirical tests to reveal the market reaction to dividend change announcements, different impact of interim and final dividend announcements, and the effect of percentage change and stock price. This chapter also documents the results obtained using selected data. Finally, Chapter Five provides conclusions and discusses further research.

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2 Review of Prior Studies

2.1 Theoretical Background to the Major Theories

2.1.1 Dividend Irrelevance Theory

Miller and Modigliani (1961) argued that investors are indifferent between dividends and capital gains, and therefore Dividend policy is irrelevant in determining value. A company's value is only determined by its basic earning power and its business risk. This initial study made a number of restrictive assumptions including perfect capital markets, rational behaviour, and perfect certainty.

In this study, "perfect capital markets" has the following presumptions:

- No one can be large enough to rule the stock price from his transaction.
- Everyone has the identical and costless access to information regarding the company's future earnings and dividends.
- No taxes, brokerage costs, and other transaction costs.

The precise meaning of "rational behaviour" is that investors always prefer more wealth to less and do not mind the form of their wealth increment from holding stocks.

"Perfect certainty" is defined as the assurance of the future investment and profits.

Under these strict assumptions, once a company pays an amount of dividends less than or more than an investor expected, the investor can convert the company's dividend policy to his own dividend policy by selling or buying the company's stock. Theoretically, from a company's standpoint, dividend payout will reduce the earnings and dividends growth rate, for one dollar of dividends payout will reduce the company's stock price by one dollar.

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This means that dividend policy is irrelevant.

Since taxes, brokerage costs, and transaction costs exist in the real world, dividend irrelevance theory is widely questioned and is subject to numerous studies. It will be mentioned later that a majority of studies support Dividend Signalling Hypothesis. Findings of these earlier studies suggested that a change in the dividend announcement is usually followed by a change in the stock price in the same direction. Conversely, some of the studies showed that Dividend Irrelevance Theory still holds even in the real world. The prior empirical results came to a mixed conclusion.

2.1.2 Dividend Clientele Hypothesis

Miller and Modigliani (1961) also acknowledged that imperfections in the real world, such as the tax differential in favour of capital gains and the existence of brokerage fees, make the "clientele effect" work. Subsequently, Black and Scholes (1974) argued that changes in dividend do not have a permanent effect on stock price. On the contrary, investors do take tax into account in making investment decisions.

Following the above initial finding, a major belief of the Dividend Clientele Hypothesis is that different clientele prefer different dividend payout policies given differential tax rates across the clientele of investors (Black and Scholes (1974), Litzenberger and Ramaswamy (1979 and 1982), Bajaj and Vijh (1990), Denis, Denis, and Sarin (1994), and Allen, Bernardo, and Welch (2000)).

According to the Dividend Clientele Hypothesis, the investors in low tax brackets would invest in the high dividend payout companies' stocks. Conversely, the investors who do not need dividend income and in high tax brackets would like to hold low dividend payout companies' stocks because of income-smoothing or tax considerations. Therefore each company would tend to attract the clientele who desire its particular dividend policy.

Once the company changes its dividend policy, the investors who do not like the new

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dividend policy will sell stocks to the others who like these. Although Miller and Modigliani (1961) argued that one clientele would be entirely as good as another in terms of the value it would imply for the company, considering the existence of transaction fees and then the probability of decline of share price, management might be reluctant to change its dividend policy.

2.1.3 Tax Preference Theory

Taxes are one of the important market imperfections. Based on the differential tax treatment between dividend income and capital gains, the proponents (Kato and Loewenstein (1995)) of Tax Preference Theory argued that because capital gains have historically been taxed more favourably than dividends, investors may prefer a low dividend payout to a high dividend payout. Thus the changes in dividend announcement may have tax implications that are reflected in stock price movements and mean that dividend increases are expected to trigger a negative stock price reaction.

Contrary to most of the developed countries, in South Africa dividend incomes are tax free in the hands of individuals. Clearly this regulation of dividend taxes will benefit individual dividend receivers. From this point, South African individual investors may pursue high dividend payout companies or the increases in dividend may trigger positive stock price reaction. The JSE market reactions to dividend increase announcements will be detailed in this study.

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2.1.4 Dividend Information Content, or Signalling, Hypothesis

Miller and Modigliani (1961) Dividend Irrelevance Theory has been questioned because of the imperfections in the real economy where management is likely to know much more information about the company's future profitability than outside investors would know.

The Dividend Signalling Hypothesis agrees that dividend policy reflects managements'

superior information concerning their interpretation of the companies' recent performance and their expectation of future prospects. So dividend policy has been recognized as an information transmission mechanism, an increase in dividends indicates good news about the future profitability of the company and often is accompanied by an increase in the stock's price. And conversely, a decrease in the dividends indicates that management is forecasting poor profitability of the company and thus is accompanied by a decrease in the stock's price.

2.1.5 Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) has been regarded as the most important asset pricing model in the world for around thirty years. It has been acknowledged as a good average return and risk measurement in finance and thus has been widely adopted to test the effect of new information such as dividend announcements.

CAPM describes the relationship between risk and expected return that is used in the risky securities market. In short, CAPM says that the expected return of a security or a portfolio equals the rate on a risk-free security plus a risk premium. According to CAPM the return expected from any individual risky security is given by the equation:

$$R_j = R_f + \beta_j \left(R_m - R_f \right)$$

Where: R_j = The expected return on security j

R_f = Risk free rate

β_j = Beta of security j

R_m = Expected market return

CAPM is a true theoretical model (Armitage (1995)). It will only be valid within a series of standard assumptions, such as the following:

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1. The investors are all risk averse and have homogeneous expectations.
2. All the investors have the same information resources about the securities' returns at the same time.
3. All the investors are able to borrow and lend unlimited amounts at a constant and same rate, which is a risk free rate.
4. All the securities are priced in a perfect market. There are no taxes, no transaction fees, no restrictions on the short sale of securities etc.
5. The quantities of securities that investors hold are fixed in the certain period.

Since the 1990's, CAPM has been doubted by some researchers as gives a too simplistic view of the securities' market. It is insufficient to explain the effect of other factors. Fama and French (1992, 1993, and 1996) are the central researchers that criticized CAPM in detail. They suggested that expected returns should be impacted by multiple risk factors and so tested some risk factors, such as size, book to market equity, value-growth, price-earning, cash flow-price, and dividend-price risk factor. Fama and French's theory holds up well in both the domestic market and international market.

Actually, evidence against CAPM has been showing up since the 1970s. Challenges to the CAPM have focused on the aspect that the variables may not be stationary over the period studied (Pettit, 1972).

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2.2 Literature Review

Dividend announcements are one of the vital financial resources of information for all analysts, company managers, and investors. Besides making investment and financing decisions, managers need to make dividend related decisions on a regular basis: Whether to pay out earnings to investors? How much of the earnings are paid out in dividends? What kind of dividend is paid out to investors? Different dividend payout mechanisms have been adopted regarding taxation, earnings level, timing, ownership, etc. Over the last several decades, in both the mature capital markets and emerging capital markets, numerous studies

have attempted to assess the impact of dividend announcements on market price. As mentioned previously, various hypotheses have been presented to explain the market responses to dividend announcements. Leading explanation is the Dividend Signalling Hypothesis.

2.2.1 Prior Studies Focused on the US Stock Market

A great majority of studies documented that dividend announcements provide credible information. The most frequently cited research includes Lintner (1956), Fama and Babiak (1968), Pettit (1972 and 1976), Charest (1978a and 1978b), Bhattacharya (1979 and 1980), Kalay (1980), Miller and Rock (1985), Fama and French (1988, 1992, 1993, and 1996), etc.

In the early stage of this line of research, the researchers were interested in finding out whether dividend announcement conveys information or not. Two of the famous prior studies (Lintner (1956), Fama and Babiak (1968)) provided evidence on the hypothesis that dividend announcements convey valuable information to investors and thus result in market reactions.

By examining the companies' dividend behaviour during the interwar period 1918-1941, Lintner (1956) indicated that dividends represent the primary and active decision variable in most situations. Managers believed that a dividend reduction was damaging to the reputation, so are reluctant to change dividend rates that might have to be reversed in a relatively short period. Lintner found managers will increase dividends only when they believe that earnings have permanently increased, and companies tend to decrease dividends when cash flows will be insufficient to support the dividend payout ratio. Lintner (1956) concluded that dividend increases (decreases) implies good (bad) news in distribution of earnings.

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The evidence of the Fama and Babiak (1968) paper supported Lintner's finding on the point that once dividends increased, earnings would be unlikely to fall. In addition, it was found that most companies made an effort to smooth dividend payments.

Once the hypothesis that dividends convey information to the stock market originated, some researchers then emphasized the effects of changes in dividend announcements and the effects of dividend announcements other than cash dividends. Pettit (1972 and 1976), and the two Charest (1978a and 1978b) studies are the most frequently cited seminal works in this field.

Pettit (1972 and 1976) provided a result similar to that of Lintner's study that the announcements of changes in dividend payments are useful to the market in assessing the value of a security. The Pettit (1972) study reported a significant signalling effect of dividend announcements as the market reacted dramatically to the announcements of dividend reduction and the substantial increase in dividend payments. The Market Model was used to test the informational content of such dividend announcements and the Efficient Market's Hypothesis. Monthly and daily data were both collected to calculate the abnormal performance for the period 1964-1969 surrounding approximately 1000 dividend changes. Pettit extended the prior research by making two further important conclusions: Firstly, the implicit information in the announcements could make the financing alternatives broader. Secondly, he suggested that the publication of managerial expectations would be more reliable than the information carried by dividend announcements, as the dividend is an imperfect means of conveying the companies' future prospects after all. Pettit confirmed these findings in his subsequent Pettit (1976) study and criticized Watts (1973) study, which will be detailed later in this chapter, on the information content of dividends.

Charest presented two studies (1978a and 1978b) to measure common stock returns around stock split events and dividend change events during the period of 1947-67. These results also appear to be consistent with the view that dividends convey unique and valuable

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information to investors. In the first Charest (1978a) study, the risk and residual behaviour of NYSE common stocks is estimated around stock split events. 606 split proposals, 435 approvals, and 1252 realizations are sampled in this study. Along with the Market Model, monthly data is used to estimate abnormal residuals. Charest (1978a) found that around split time, average beta risk kept increasing and stock returns were more volatile. No significant abnormal residuals were found in split approval or realization months. But abnormal residuals were found in three months lagged split proposals across all calculation methods and investment strategies used. Charest (1978a) concluded that the market only completed its adjustment around three months after split approval.

In a later paper Charest (1978b) continued research to estimate the effects of the changes in dividend announcements. Using the same methodology as the previous Charest (1978a) study, both monthly and daily residuals are estimated in this subsequent study. The same direction abnormal adjustments were observed before announcement dates, at announcement dates, and after the dividend changing announcements. Even if the effect of other simultaneous announcements can not be isolated, as the author acknowledged, the information content in the large change in dividend announcement is still entertained and the impact of a decrease dividend announcement is much more than that of an increase announcement. Compared with the previous Charest (1978a) study, stock return volatility increased around dividend changes. The results observed on a daily basis corroborated the monthly evidence.

Kalay (1980) emphasized Lintner's (1956) argument that managers are reluctant to cut dividend and thus underpinned the signalling role of dividend changes. Kalay suggested that shareholders who control the company would have incentives to maximize their own wealth rather than the company's market value and would have incentives to avoid those dividend payments that are financed by issuing new debt or reducing profitable investment. Therefore the allowable dividend increase would have implied substantial improved profitability.

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Dielman and Oppenheimer (1984) collected, as Charest (1978b) did, both monthly and daily data to examine the impact of large dividend changes during the years of 1969-1977. Large and significant positive abnormal returns were found for the groups with resumptions and a 25 percent increase on the event day and one day after event day. Conversely, the abnormal returns were negative for the groups with omissions and the 25 percent decrease. Moreover, the authors found another impact which is the stability of prior dividend payments on shareholders wealth.

Using Mean-Adjusted Return Model in event studies, Handjinicolaou and Kalay (1984) investigated both bond and stock price behaviour around dividend changes during the 1975-1976 periods. It was found that gains from dividend increases accrue to shareholders, and bondholders share losses with shareholders from dividend reductions. Their empirical result indicated that dividends signal the company's future profitability.

Miller and Rock (1985) confirm the Handjinicolaou and Kalay (1984) findings. They developed the dividend information model based on the asymmetry of information between shareholders and managers. The temptation to manipulate earnings does exist, which allows managers to know the true state of current earnings better than shareholders. Because of this information asymmetry, shareholders are likely to interpret the unexpected dividend as changes of managerial view of expected earnings.

Most recently the Lee and Yan (2003) study shed new light on market reaction to dividend changes. They provided evidence that the market will only react to forward-looking dividend changes, concluding that dividend changes signal future earnings.

In the United States (US) market the situation of utilities with relative stable dividend history and high dividend yield was investigated for difference with unregulated industrial companies. Aharony, Falk, and Swary (1988) tested the signalling hypothesis for regulated utility industry during 1974-1982. The Mean-Adjusted Return Model was used to measure abnormal returns. The event window was 20 days before and 20 days after dividend

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announcement. The evidence tends to support the signalling hypothesis for dividend increases. Greater abnormal returns were found for regulated utilities than for unregulated industries following quarterly dividend increases. In the Aharony and Swary (1980) study, the Market Model was used to measure abnormal returns for unregulated industrial companies during 1963-1976. Their empirical evidence also lends support to the dividend signalling hypothesis. Even though quarterly dividend and earnings were declared on different days, the magnitude of the dividend announcement effect was almost the same. The stronger effects of dividend decreases were further confirmed in this study. The results of Collins, Saxena, and Wansley's (1996) research suggested that payout ratios of utilities are much higher than those of unregulated companies. Impson (1997) investigated the impact of dividend decreases for both utilities and unregulated industrial companies. His study showed that negative abnormal returns reacted rapidly for both utilities and unregulated companies. And the dividend decreases declared by utilities induced greater stock price reactions than similar announcements made by unregulated companies during the study period 1974-1993 (over the two-day announcement period, utilities experienced about 10 percent equity value loss and unregulated companies lost about 5 percent equity value).

Numerous studies also offered evidence for Dividend Signalling Hypothesis. These studies include, among others, Laub (1976), which applied a quarterly model instead of Watts's (1973) annual model to confirm the signalling role of dividends. Building on the existence of asymmetric information and the higher tax rate on cash dividends than capital gains, Bhattacharya (1979 and 1980) applied a non-dissipative signalling model that assumed outside shareholders have imperfect information about the company's profitability and the cash dividends are taxed at a higher rate than capital gains. It was found that there is a positive relation between changes in dividend and market reactions. He emphasized that dividend can be used as a surrogate for a signal of future cash flows. By adopting the incentive-signalling framework, Bar-Yosef and Huffman (1986) observed a similar relation between dividend changes and the changes in expected cash flows. Divecha and Morse (1983) and Firth (1996) further pointed out that the larger the changes in dividend, the

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stronger the information potentially transferred. After controlling for dividend yield and Tobin's Q, the findings of the Denis, Denis, and Sarin (1994) paper also supported the cash flow signalling hypothesis. The more recent work of Alangar, Bathala, and Rao (1999), provided evidence that dividend announcement conducting as a costly signalling mechanism to convey future profitability. Evidence from this study showed that stock prices reacted positively to the degree of preannouncement information asymmetry for all types of dividend changes except omissions. In the survey applied by Baker, Powell, and Veit (2002), respondents strongly support signalling explanation and stress dividend continuity. Bradley, Capozza, and Seguin (1998), Skinner (2003), and Brav, Graham, Harvey, and Michaely (2004) further substantiated existing information-based explanations of dividend theory.

2.2.2 Previous Works Focussed on Markets outside the US

A number of studies on the topic of dividend change affecting stock price were also done outside of the United States. Balachandran (2001) compared the effect of interim dividend reductions with the effect of final dividend reductions in the United Kingdom (UK) and observed the interim shock effect. The Market Model and the standardized cross-sectional $T-$tests were used to investigate the daily abnormal returns around dividend the announcement dates for the period from January 1986 to December 1993. According to the magnitude of the dividend reductions, sample companies were divided into six groups. Nine different event windows were employed to estimate the abnormal returns. It was found that around announcement date, dividend reductions led to remarkable price declines. The empirical result further indicated that the UK market reacted negatively even if the announcement of dividend reduction went with earnings increases for the companies that had kept stable dividend policy during the previous three-years. In the earlier Balachandran, Cadle, and Theobald (1996) study, authors found market reactions were stronger to those interim reductions once companies have not reduced their dividends in the previous three year period. The subsequent Balachandran, Cadle, and Theobald (1999) study indicated

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that price reactions to interim reductions were found positively related to the size of the reduction.

In testing the signalling role of dividend changes in the developing Egyptian stock market, Ibrahim and Ragab (2004) implemented both long-Horizon Regression and short-Horizon Regression derived from Ohlson's model to investigate the relation between current dividend changes and future earnings during the period from 1997 to 2001. It is emphasized that the dividend decisions signal led a company's future profitability on the Egyptian market.

Romon's (2000) study applied two event study methodology, standard Market Model and Mean-Adjusted Returns model, to estimate abnormal returns. He investigated stock price behaviours at the dividend announcement date and at the ex-dividend day in the French market during the period 1991-1995. French companies listed on the Paris Bourse (Now Euronext, Paris) were divided into three groups (low, medium, and high) according to their dividend policies. A positive abnormal return of 0.5 was observed, significant at a 1% level, when current dividend announcements were higher than the previous level.

Signalling position is also expressed by the Austrian Gurgul, Majdosz, and Mestel (2003) study. As the Austrian stock market is very small compared to other mature stock markets, their sample included 22 companies quoted in the Austrian Traded Index (ATX), which comprises the most liquid stocks (blue chips) in Austria, during the period 1992 to 2002. The GARCH non-linear stochastic time-series model was employed to measure abnormal returns and the variability of returns as the authors believe this model is better than the Market Model that uses simple linear regressions. The samples were divided into three clusters (dividend increases, dividend decreases, and constant dividends). Their evidence for each of the clusters confirmed the results of above studies that dividend increases/decreases are viewed as positive/negative signals by stock markets, and constant dividends are considered as conveying no significant information to the markets. It was further confirmed that dividend decrease announcements have a greater impact on stock

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prices than dividend increase announcements. Several tests were applied to test the level of volatility for each of the clusters, as volatility is the other important indicator of uncertainty. The evidence showed relatively constant variances for the dividend increase cluster and a significant increase in variances for the dividend decrease cluster and constant dividends cluster.

2.2.3 Market Reactions to Dividend Initiations and Omissions

It is worthwhile to point out that initiations/omissions of dividend payment are viewed to be a major change of a company's dividend policy. Many researchers, including Asquith and Mullins (1983), Dielman and Oppenheimer (1984), Ghosh and Woolridege (1988), Sant and Cowan (1994), Michaely, Thaler, and Womack (1995), Dyl and Weigand (1998), and Wang (2004), have investigated dividend changes especially dealing with initiations/omissions. These prior researchers have found similar evidence that the stock market response to good news (initiations) and bad news (omissions) is symmetrical, and the positive/negative abnormal returns are associated with the initiations/omissions.

Asquith and Mullins (1983) analyzed 168 companies that either pay out the first dividend to shareholders or initiate dividends after at least 10 years of not paying dividend. Daily stock return data was used to estimate abnormal return during the 1954 to 1980 period. The authors estimated abnormal returns associated with the unexpected change of dividend initiation and the subsequent changes in dividend announcements. It was demonstrated that dividend initiations increase shareholders' wealth and the effect of dividend announcement can be large enough to offset the difference of tax brackets of shareholders. Moreover, they found that 95% sample companies continued the dividends payment following the initiation, and 75% of the samples increased dividends at least once during the first 3-year period after the initiation. They also found the market reacted more strongly to the subsequent dividends increase than to the dividends initiation. Dyl and Weigand (1998) also focused

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on dividend initiations. They asserted that initiations convey information to investors regarding the reduction both in total risk and systematic risk of sample companies. Propensity score matching is used in Wang (2004) initiation study to test the impact of dividend initiation on stock prices. Wang believes that Propensity score matching is better than event study at measuring the long term post-announcement performance of the stock returns. Considering characteristic set X can only be satisfied if X included all variables that have impact on dividend decision making and the outcomes, and stock returns, five variables were included in the characteristic set X: market beta, size, leverage, market to book ratio, and earning price ratio. Evidence showed significantly positive market reaction to dividend initiation announcements.

The Dielman and Oppenheimer (1984) paper found strong support for the information content of large dividend changes (dividend omissions). Using a regression model to examine the impacts of dividend cut and omissions on stock prices over a 2-day period, Ghosh and Woolridge (1988) substantiated strong valuation impact of dividend cuts and omissions as greater capital loss associated with these larger dividend reductions. The more recent Sant and Cowan (1994) paper's main goal was to find out the implication of dividend omissions during 1963-1986. It was shown that dividend omissions precede increases in return variance, beta, and the dispersion of analyst forecasts of earnings. This evidence, that managers may omit dividends when they will not be able to continue dividends in the future, is consistent with the Dividend Signalling Hypothesis.

Michaely, Thaler, and Womack (1995) investigated both dividend initiations and omissions. They tested 3-day stock price reaction and long term post-announcement stock price performance during the period 1964 to 1988. It was found that a stock price increase of over 3 percent was associated with dividend initiations, and a stock price decrease of about 7 percent with dividend omissions, showing that omissions are more serious events than initiations.

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Hence, Dividend Signalling Hypothesis has been widely extended. The unexpected changes in dividends convey managerial favourable/unfavourable information and thus affect the market value of listed companies. Specifically, unexpected dividend increases/initiations are associated with positive stock price response, and vice versa.

2.2.4 The Comparison and Correlation between the Dividend Announcement and Earnings Announcement

However, from above evidence so far available, the comparison and corroborate relationship between the information content of dividend announcements and earnings announcements remains unclear. A number of researchers (Gordon (1959), Aharony and Swary (1980), Hakansson (1982), Kane, Lee, and Marcus (1984), Ghosh and Woolridge (1988), Wansley, Sirmans, Shilling, and Lee (1991), Eddy and Seifert (1992)) have made efforts to understand dividend signal by testing the correlation between dividend announcements, earnings announcements, and the change in stock prices. This research showed a particular picture on the side of the information content of dividends.

Gordon (1959) in his seminal paper argued that dividend multiplier is greater than retained earnings multiplier and the increase in dividend payout positively affects stock price. As he only derived data from four industries and provided evidence for two years (1951 and 1954), his empirical evidence was weak. However, subsequent papers published in this area supported the above study. Among them, Aharony and Swary (1980) obtained results similar to Gordon's (1959) for the sample group of no change in dividend, increases, and decreases, no matter whether earnings announcements precede or follow dividend announcements. Thus the pioneering notion, that useful information conveyed by dividend announcements over and above that conveyed by earnings, was confirmed. After controlling for managerial forecast of future earnings for the years 1968-1973, the findings of the Ghosh and Woolridge (1988) paper concluded that dividend announcement information conveyed additional information over and above the information conveyed by

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earnings announcements. This position is supported by the Hakansson (1982) study and is consistent with Charest's (1978b) research on the larger effects of dividend decrease announcements. Wansley, Sirmans, Shilling, and Lee (1991) found a significant relationship between the change in quarterly dividend announcements and its impact on the daily stock prices, especially for the dividend decrease observations, meaning that dividend decreases deliver more information to the market than dividend increases. In this study, the Market Model was used to estimate the two-day (0, +1) effects of dividend changes during the 1973-1986 periods. Evidence from this study showed that the effect of dividend changes will be greater when current earnings are absent.

Still, the above studies did not answer whether the joint effect of dividend and earnings helps to advance the signal. Kane, Lee, and Marcus (1984) found both dividend and earnings announcements induced abnormal returns and the interaction effect was significant. Eddy and Seifert (1992) continued this line of research applying the mean-adjusted return technique to test whether dividend and earnings joint announcements are viewed by the market as containing more information than just one signal. They examined five-day stock price reactions to contemporaneous and non-contemporaneous dividend and earnings announcements for a sample of 1111 companies from 1983-1985 and found that the stock price reaction to a joint announcement was approximately twice that to only one announcement, indicating that the information content in a joint announcement was much more than the information content in a single announcement. After controlling for the size of the announcements, they further found that the mean price reaction to contemporaneous consistent announcements is significantly greater than the reaction to either non-contemporaneous first announcements or to non-contemporaneous second announcements.

With reference to the natural link of dividend decision and earnings quality, there are four types of evidence supporting the relation between dividend changes and earnings: first, current dividend changes and changes in future earnings, which is the most common

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explanation of information content of dividends; second, current dividend changes and concurrent earnings changes; third, current dividend changes and changes in past earnings; last, dividend means nothing about earnings quality. The correlation between these four types of evidence showed a clear picture about the information content of dividend research.

2.2.5 Prior Studies Dealing with Share Repurchase

Share repurchase (also known as Share Buy Back, hereafter SBB) is an alternative to a cash dividend payout. This has been becoming a more and more important way of distributing earnings to shareholders as there are lots of motives for SBB: excess cash, undervaluation, tax advantage, a need for eliminating small shareholders, to increase leverage and reported earnings, and so on. SBBs have become increasingly popular during the last decade, by which relevant studies are motivated. Prior researchers wanted to find out the determinants that trigger the adjustment of outstanding shares. They were also interested in the market reaction to such a capital structure change.

Within the previous works related to SBB, there are only a few research studies specifically related to signalling. It is generally accepted that investors appear to view SBB as a positive signal. Following are descriptions of several interesting studies that investigated stock price reactions on the announcements of SBB around the world (Vermaelen (1981), Hertzel (1991), Hausch and Seward (1993), Fenn and Liang (1997), Allen, Bernardo, and Welch (2000), Chen, Chen, and Cheng (2004), DeAngelo, DeAngelo, and Skinner (2002), Jong, Dijk, and Veld (2002), Grullon and Michaely (2002 and 2004), Gentry and Mayer (2003), Gryglewicz (2004), and Brav, Graham, Harvey, and Michaely (2004)).

Keeping the number of shares managerial owned constant, SBBs reduce the number of shares outstanding and thus increase managerial control. As the study by Vermaelen (1981) examined, management are engaged in signalling activities. And their signalling incentives are equal across companies. As significantly positive abnormal returns associated with SBBs were found, this study added strong support for the dividend signalling hypothesis.

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Empirical work by Hertzel (1991) further pointed out that the positive market reaction to SBB is not accompanied with the same reaction of industry rivals. This study suggested that SBBs are events primarily transferring firm-specific information.

Consistent with Free cash flow hypothesis, evidence in the Fenn and Liang (1997) study indicated that SBBs are positive related to net operating cash flow and cash balances.

Gentry and Mayer (2003) applied the Market Model of event study methodology to test SBB effect. A significant positive relationship was found between market response and the size of the repurchase plan. It was also found that analyst coverage reduced the magnitude of signalling effect associated with SBB. A recent Grullon and Michaely (2004) study offered more evidence to support SBB impacts on stock price, systematic risk, and investment.

Research studies on stock markets outside of the US have found similar repurchase effects. Chen, Chen, and Cheng (2004) tested the SBB effects of Taiwan's open market system in its first year operating beginning August 7, 2000. Abnormal returns were investigated using the Market Model of event study. Consistent with the traditional Dividend signalling hypothesis, they observed significantly abnormal return around the 3-day repurchase announcement period. Moreover, in this study, samples were sorted into high-growth and low-growth companies based on the Tobin's q. Tobin's q, calculated by averaging the daily stock price one month prior to a stock repurchase announcement over the equity per common shares. A negative relationship was found between abnormal returns and free cash flow among high q value companies and vice versa. One possible reason is share repurchase may make a high q value company under-invested, meaning share repurchase conveys more positive signals of under-valuation for low free cash flow companies than those companies with high free cash flow among high q value companies.

SBBs occur frequently in Canada where Jong, Dijk, and Veld (2002) tested dividend related theories by using questionnaires which made their study of particular interest. By analyzing 191 usable questionnaires from non-financial Canadian companies listed on the

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Toronto Stock Exchange, they concluded that dividend payments and SBBs are positively related to free cash flow, behavioural preferences, and tax preferences. Conversely, dividends and repurchases are significantly negatively related to executive stock option plans. It was further suggested that outsiders would prefer dividends paying stocks because of the existence of asymmetric information.

As dividends and SBB are two common forms of cash disbursement, the question then arises as to whether one disbursement is indeed the substitute for/better than another.

The Hausch and Seward (1993) study is one of the first that highlighted the relationship between the form of cash distribution (dividends and SBBs) and the magnitude of market effect. It was suggested that as the dividend payout level is certain but the price of SBB is not, (results of different SBB techniques), one can distinguish the high-quality companies by the appropriate disbursement adopted between deterministic dividends and stochastic SBBs.

In line with substitution hypothesis, Grullon and Michaely (2002) asserted that SBB has been used to be a substitute for dividend in the US and it has become the preferred payout method for many companies. Moreover, they pointed out that the majority of companies initiate their cash payout through SBB.

While Fenn and Liang (1997) found evidence that managers do not view dividends and SBBs as close substitutes. Allen, Bernardo, and Welch (2000) presented that dividends and SBBs are not substitutes as institutional shareholders prefer to receive dividends. DeAngelo, DeAngelo, and Skinner (2002) found no support for SBBs replacing the special dividend. The most recent evidence from Warsaw in the Gryglewicz (2004) paper emphasized that dividends and SBBs are alternatives but not perfect substitutes. Over the period 1997 - 2000, higher positive abnormal returns were found for the announcements of SBBs (6.23%) than for dividend initiations (2.25%) in this study. Practically, many managers interviewed by Brav, Graham, Harvey, and Michaely (2004) stated that SBBs are more flexible than dividends.

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Overall, a significant stream of prior studies has widely presented the following consensus on the so called dividend signalling hypothesis: Dividend announcement is generally viewed to be an information transmission mechanism of listed companies. Further implications are that dividend changes, e.g. increases (reductions) and initiations (omissions), and share repurchases usually lead to upward (downward) stock price reactions (abnormal returns) to investors. Furthermore, markets reaction appeared to be greater to dividend reductions (omissions) than to dividend increases (initiations).

2.2.6 Minority Works Supporting Dividend Irrelevance Theory

On the other hand, minority evidence supported dividend irrelevance theory. Besides the initial Miller and Modigliani (1961) study, some earlier researchers (Watts (1973, 1976a, and 1976b), Higgins (1974a), Black and Scholes (1974), Miller and Scholes (1978), Gonedes (1978), and Penman (1983)) and more recent researchers (DeAngelo, DeAngelo and Skinner (1992, 1996, and 2000), Benartzi, Michaely and Thaler (1997)) emphasized that the Miller and Modigliani (1961) dividend irrelevancy theory holds true (shareholders' wealth is unaffected by the dividend announcements or dividend announcement are a very limited way for signalling) even given the true economic environment.

Watts (1973, 1976a, and 1976b) suggested that unexpected current and past dividend announcements communicate little potential information beyond that conveyed by current and past earnings announcements. Gonedes (1978) found very similar evidence. Higgins (1974a), Black and Scholes (1974), and subsequent Miller and Scholes (1978) papers stressed that dividend policy has no impact on investors' wealth.

Using data from 1946-1967, Watts (1973) found little evidence of information content of changes in dividend by using an annual model for the randomly selected companies. Another two well-known researchers, Pettit (1976) and Laub (1976), later criticized this paper. In his subsequent study, Watts (1976 a) paper mainly disagreed with Laub's (1976)

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quarterly model because of the extrapolation of the previous year's earnings and the seasonal component in quarterly earnings, and thus insisted on the conclusion of a previous Watts (1973) paper, that the information content of dividends is trivial. Watts (1976 b) rebutted Pettit's (1976) challenges to the misspecification of earnings variables and maintained his original standpoint that dividends have little information content.

By testing the finite-growth model for valuation of electric utility, the evidence of Higgins' (1974a) study determined that dividend increases do not increase stock price. Conversely, there should be an inverse relationship between the dividend policy and the stock price, which reinforced Miller and Modigliani's (1961) dividend irrelevance theory.

Using developed cross-sectional regression tests, Black and Scholes (1974) also asserted that changes in dividends only cause temporary impacts on stock prices as investors may interpret the changes as signalling future profitability. Once it is cleared that company facing no financial difficulties, dividend changes will have no permanent effects on stock prices.

Subsequently, Miller and Scholes (1978) demonstrated that dividend policy has no effect on shareholders' wealth even if dividends and capital gains are taxed in different tax brackets.

Penman (1983) viewed dividends as a crude way to transfer information. His findings showed that even though both earnings announcements and dividend announcements possess information, not all information related to earnings are conveyed by dividend announcements. He suggested that there is more information conveyed by earnings announcements themselves than the information conveyed by dividend changes.

Interestingly, the more recent DeAngelo, DeAngelo, and Skinner (1992, 1996, and 2000) study further challenged classical Dividend Signalling Theory. The authors suggested that dividends signalling might be useful in very limited circumstances. The DeAngelo, DeAngelo and Skinner's (1992) paper, examined companies with poor earnings performance

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from 1980 to 1985. It found loss is a necessary but clearly not sufficient condition for dividend reduction. Dividend reduction is only helpful to improve the predicting ability to future earnings. In the subsequent DeAngelo, DeAngelo, and Skinner (1996) study, they found little evidence that dividend changes were linked to unexpected forthcoming earnings. The authors concluded that dividend increases are not reliable informative signals as managers can manipulate dividend and thus overestimate future earnings. The most recent study by DeAngelo, DeAngelo, and Skinner (2000) examined the market reaction to special dividend announcements during the 1962-1995 periods. It indicated that although special dividends tend to transfer good news to investors, they do not systematically convey significant information.

Benartzi, Michaely, and Thaler (1997) also challenged the role of dividend changes as information signalling devices. They stressed that changes in dividends just tell us what has happened as only concurrent and past earnings changes are associated with dividend changes. Dividend changes have little to do with the future earning changes.

In line with the above result, George, Hein, Schmidt, and Solberg (2004) collected data on quarterly dividends and daily stock returns for the period January, 01, 1999 to December, 31, 2001, and then estimated the relationship between dividends, earnings, and stock price. Their results for R Square, Adjusted R Square, and t-statistics were quite low and p-value very large, indicating that the test is insignificant. There is no evidence in this study that dividend announcements are the dominant predictors of share price returns. The authors further suggested that investors should pay attention to all the factors that affect the demand of a particular stock in order to gain efficient information necessary to make their best investment decision.

Empirical studies conducted outside of the US provided contrary conclusions to the Dividend Signalling Hypothesis. Ed Vos and Tong (1998) maintained that there is no relationship between dividend changes and either past or future profitability. The authors

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applied a random-walk model to test the relationship between dividend changes and earnings changes, timing of the dividend changes and earnings changes, stability of dividend and earnings changes. After studying all 137 publicly listed New Zealand companies, they authors concluded that dividend changes can only convey information of concurrent earnings; they have little to do with the stability of dividends and earnings changes.

By using the Market-Adjusted Return Model to examine the daily market-adjusted abnormal return (MAAR) and daily cumulative abnormal return between October 2001 and September 2002, over a 61-day (-30, +30) event window period, Uddin (2003) found that the effect of dividend announcements is not significant on the Dhaka Stock Exchange. Investors in Bangladesh do not benefit from dividend announcements, but lose about 20 percent in 30 days after the dividend announcement.

2.2.7 Another Aspect of Research Related to the Tax Effect

Another focus of dividend research has been on impact of taxation. It has been mentioned in the previous chapter that different tax procedures and tax rates on dividend incomes, retained earnings, and capital gains may also influence the choice of dividend policy. As the tax system are different from one country to another, the effect of dividend policy on investors' wealth could differ. Hence, a large number of studies have been triggered around the world: Miller and Scholes (1978 and 1982), Litzenberger and Ramaswamy (1979 and 1982), Denis, Denis, and Sarin (1994), Kato and Loewenstein (1995), Kalay and Michaely (2000), Allen, Bernardo, and Welch (2000), Romon (2000), Baker, Powell, and Viet (2002), and Brav, Graham, Harvey, and Michaely (2004). Results of these empirical studies are discrepant. Dividend Clientele Hypothesis and Tax Preference Theory are the two most popular explanations concerning tax effect on dividend policy.

In line with the dividend clientele hypothesis, Litzenberger and Ramaswamy (1979 and 1982) obtained statistically significant tax effect. Authors derived a version of after-tax capital asset pricing model and found strong negative relationship between shareholders' tax

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brackets and dividend yields. More recently, Bajaj and Vijh (1990) and Denis, Denis, and Sarin's (1994) finding further supported Dividend Clientele Hypothesis.

Allen, Bernardo, and Welch (2000) asserted the existance of a dividend clientele effect. They explained that because of the tax advantage of institutional shareholders, managers prefer to pay dividends rather than make share repurchases. In order to please institutional shareholders, managers also made efforts to smooth dividends.

By using both the Market Model and the Mean-Adjusted Return Model, Kato and Loewenstein (1995) examined the tax effect, the end-of-the-fiscal-year effect, and trading volume around ex-dividend days in Japan. This evidences from Japan appeared to support both Dividend Clientele Hypothesis and Tax Preference Theory.

Conversely, the Miller and Scholes (1978) paper tends to support tax irrelevance. They argued that relative tax rules, such as tax-exempt insurance and tax-deductible interest expenses policies, may protect shareholders from dividend taxation. Thus the dividend has no impact on stock value. In their subsequent study, Miller and Scholes (1982) tested yield-related tax effects under the US tax system during the period 1940-1978. They asserted that institutional shareholders have an incentive to receive dividends other than capital gains as institutional investors have tax exemptions for a great portion of dividend income. The short-run yield-related effects are due to some information effects and not tax differential.

The results of the Romon (2000) study also doubt the dividend clientele hypothesis. The impacts of dividend announcement vary with the different dividend policy level around the dividend announcement date, but once the investors already know the company's dividend level, around the ex-dividend date, dividend clientele effect is limited. Kalay and Michaely (2000) failed to find strong support for tax effects as well.

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The Baker, Powell, and Viet (2002) study differs from the others by using a survey to explain dividend policy. They found little evidence to support Tax Preference Theory. Brav, Graham, Harvey, and Michaely (2004) gathered evidence through both interview and survey to enhance their previous empirical results. From managers' perspectives, taxes are not a dominant factor affecting dividend decision. And there is no evidence in support of the clientele effect.

2.2.8 Dividend Stability and the Determinants of Dividend Policy

Among practitioners and academics, dividend stability is of predominant importance for testing dividend influence. The tests of dividend stability provide insight into the effect of dividend announcements and become another explanation for market reaction to dividend changes. In the literature reviewed, measures of dividend stability are not standard. Cash dividends, dividend yield, and dividend payout ratio are the three measurements that are usually used. In the same line of research, there have also been numerous empirical studies that can be attributed to information impacts regarding the effects of dividend yield. Conflicting evidence centres on whether or not there is a positive association between common stock returns and dividend yields. Despite some opposing views, it is generally accepted that dividend yield acts as a strong stability measurement to support a company's market value. The notion that dividend yields forecast stock returns has a long tradition.

By applying short-run estimates of expected dividend yield, Litzenberger and Ramaswamy (1979) found that the before-tax expected stock return is positive related to its dividend yield. A 1% increase in dividends requires an additional 0.23% in before-tax stock return. Litzenberger and Ramaswamy (1982) later affirmed this positive but non-linear relation between dividend yields and stock returns. Blume (1980) extended the research on dividend yield. He investigated dividend-paying and non-dividend-paying stocks separately and found a significant positive relationship between long-run quarterly stock

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returns and both beta coefficients and quarterly expected dividend yields for dividend-paying stocks, despite the puzzling finding that on average, total returns of zero-dividend stocks exceed dividend-paying stocks over the World War II period of 1937-1946. Keim (1985) also applied a long-run measurement to test yield effect. In this study, small/big companies were generally found in the high/low yield groups. It was stressed that abnormal returns were related to both size and yield. The findings of Asquith and Mullins' (1983) paper also supported this part of Dividend Signalling Hypothesis in that the market reactions were highly related to the change in dividend yield. The Fama and French (1988) study statistically confirmed the strong forecast power of dividend yields on expected stock returns across different time periods and return horizons. Bajaj and Vijh (1990) suggested that beside dividend changes surprises, dividend yield surprises can be the other explanation of the market reactions around changes of dividend announcement. The evidence of the Wansley, Sirmans, Shilling, and Lee (1991) and Denis, Denis, and Sarin (1994) studies indicated that significant positive relationships exist between the announcement effect and changes in the dividend yield.

In a study of Japanese stock prices, Kato and Loewenstein (1995) found that next to the end-of-the-fiscal-year effect, dividend yield is the secondary determinant that is positively related to abnormal returns. The Romon (2000) paper considered the stability (dividend yield) of dividend policy on the French market. It found that according to the different level of dividend policy, the impacts of dividend announcement appeared different. An increase in cumulative abnormal returns was observed with the dividend yield level over event days -1, +1. Based on a cross-sectional regression analysis, Nishat and Irfan (2003) tested the data of 160 companies listed on the Karachi Stock Exchange during pre-reform and reform periods from 1981 to 2000. They estimated how dividend policy (dividend yield and payout ratio) affects stock price volatility in Pakistan. During the reform period, the impact of dividend yield on stock price volatility increased. A significant negative correlation was found between dividend yield and earning volatility, implying that companies with volatile earnings hesitated to pay higher dividends to investors and thus considered to be more risky.

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At this stage, the importance of dividend yield is well documented. However, most of the prior studies focused on dividend size and did not pay attention to the combination of dividend yield and dividend stability. Gombola and Liu (1993) measured dividend yield in addition to their absolute stability measure, which is the resistance to cuts in the dollar amount of dividend, during 1969-1984 period. Evidence indicated that even after controlling for January and size effects, the intercept term of portfolio with high dividend yield and high stability was significantly positive at the 0.05 level.

By using different methods which are called "sensitivity measures", Adams and Booth (1994) concluded that high dividend yield stocks actually give higher gross returns than low dividend yield stocks and thus should be more attractive, especially for those investors in lower tax brackets.

The Michel (1979) paper concluded that a positive relationship existed between dividend yield and payout ratio, which is consistent with Black and Scholes' (1974) observation. However, the pioneering empirical study of Black and Scholes (1974) failed to demonstrate that the level of dividend yield and payout ratio have any effect on stock prices.

The controversy centred on yield effect has been presented in a variety of research. Miller and Scholes (1982) did not find a significant relation between expected returns and dividend yields. The Australian Allen and Rachim (1996) study found no evidence that dividend yield affects stock price volatility. The most recent evidences also from Australia supplied by Powell, Shi, and Smith (2004) doubted the return predictability of dividend yield. Their results implied that changes in the aggregate level of dividends are only explained by lagged share price innovations as well as lagged dividend innovations.

Some researchers made efforts to find the determinants of dividend policy, including explanation of agency theory and investment theory. Theoretically, cash dividend payment means cash paid to the investors reduces cash available to managers and restricts investment opportunity. These extensions help us gain new insight into the signalling role of dividend.

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Rozeff (1982) found that the beta, insider stock holding, investment, and sales growth of companies studied were negatively related to their level of dividend payout. In his paper, Rozeff argued that the optimal dividend payout is just the trade-off between agency cost and transaction cost.

Collins, Saxena, and Wansley (1996) presented evidence that both insider holdings and the regulatory status of utilities influence company payout ratios.

Holder, Langrehr, and Hexter (1998) found that dividend policy was negatively related to the investment decisions, the degree of insider ownership, and the sales-growth of the company. Conversely, it was positively related to the sizes of the company, free cash flow, and the stability of returns. They further suggested that managers may consider the claim of stakeholder more than the debt and equity holder for deciding on dividend policy.

Using dynamic panel data, Thomsen (2004) examined how ownership affected dividend policy of European companies and thus affected stock prices. The data showed that concentrated ownership prefers to retain earnings rather than payout as dividends. Results of this study also suggested a negative relationship between the level of ownership and stock prices.

Travlos, Trigeorgis, and Vafeas (1999) made an attempt to understand the impact of dividend announcement changes on the developing stock market of Cyprus. They found a positive relationship between the changes in return on equity and dividend increases and further suggested that different market microstructures, tax regimes, and control environments are very important for studying the corporate dividend policy in emerging markets. This study also found that the less the growth opportunities of the companies, the higher the market reactions to dividend increases.

Some researchers (Miller and Scholes (1982), Keim (1983 and 1985), Ghosh and Woolridge (1988), Bajaj and Vijh (1990 and 1995), Gombola and Liu (1993), Allen and Rachim (1996),

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Dyl and Weigand (1998), and Nishat and Irfan (2003), etc.) developed the dividend study by finding out whether the changes in dividend announcements convey information like size, beta, leverage, seasonality, etc., other than the company's future profitability.

As indicated by Miller and Scholes (1982) and Keim (1985), companies with higher betas usually pay out lower dividend. Keim (1983) presented that size-related effect is concentrated during the first week of January, especially on the first trading day. That is, investors yield higher abnormal stock returns on small companies particularly in January. January and size effect was further stressed by Keim (1985) and Gombola and Liu (1993). In addition, Gombola and Liu (1993) suggested that the relation between yield and systematic risk is reinforced by dividend stability. By using a market-adjusted returns approach of event study methodology, Ghosh and Woolridge (1988) found greater impact of dividend cuts and omissions on stock prices for smaller companies during 1962-1984. Their evidence indicated that the substitution of stock dividends may reduce capital loss. It is also found that daily beta has the predicted sign of abnormal return during the announcements period. In Pakistan, the empirical results of the Nishat and Irfan (2003) paper showed that size and leverage effect is positive related to stock price volatility.

Gaver and Gaver (1993) found that growth companies provide much lower dividend yields than non-growth companies. Bajaj and Vijh's (1990 and 1995) finding indicated that market reactions are greater for lower priced and small company's stocks. In a subsequent Australian study, Allen and Rachim (1996) indicated that payout ratio, size, leverage, and earnings volatility are the dominant determinants that affect stock prices. More recently, Bradley, Capozza, and Seguin (1998) provided strong evidence that both systematic and non-systematic risk impact dividend policy. Authors applied four measures of effects of cash flow volatility: size, leverage, product type, and diversification. Also, cash flow volatility was found to have an impact on dividend policy. Dyl and Weigand (1998) found that 70 percent of the companies who initiated dividends had a lower daily return volatility

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during the following year. Beta of the samples also decreased in the post dividend period. Simultaneously, smaller companies showed greater and more significant changes.

In studies related to share repurchase, Fenn and Liang (1997) found evidence that investment opportunities and leverage are negatively related to SBBs. Stock options induce managers to substitute SBBs for dividends. Recent evidence in the Gentry and Mayer (2003) paper suggested that analyst information is the important determinant of SBB. The size of SBB plan was also positively related to market reaction.

Grullon, Michaely, and Swaminathan (2003) found positive market response to dividend increases is strongly related to the subsequent decline in companies' systematic risk, even in the long run. Similar empirical results were documented by Chen, Shevlin, and Tong (2004). Using Fama-French three-factor models which identify three common risk factors of stock returns: overall market factor, size, book to market ratio, they tested companies listed on NYSE, AMEX, and NASDAQ paying dividends between 1974 and 1999. It was indicated that the dividend-decrease companies' information risk beta, analyst forecast dispersion, and stock return volatility became larger in the three years after decrease announcement. Conversely, analyst forecast dispersion and stock return volatility became smaller after dividend increases. This paper extended the traditional dividend signalling hypothesis on the information content of dividends by finding dividend change of the samples did not necessarily predict the same direction of the companies' future profitability but more about changes in companies' information risks and the uncertainty of companies' future profitability.

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2.2.9 Prior South African Studies

The above theories created mixed evidence. No matter how many hypotheses have been proposed to explain the market response to the changes in dividend, there are only a few studies focused on this topic on the JSE, which typically include Ooms, Archer, and Smit (1987), Knight and Affleck-Graves (1987), and Bhana (1991a, 1991b, and 2002). These

research studies either provided strong theoretical justification for the Dividend Signalling Hypothesis (Bhana (1991a, 1991b, and 2002)) or tentatively rejected the signalling role of dividend announcement (Ooms, Archer, and Smit (1987) and Knight and Affleck-Graves (1987)).

By testing stock price reaction to yearly dividend announcements declared by companies listed in the industrial section of the JSE over the period 1973-1984, Ooms, Archer, and Smit (1987) suggested that compared with dividend announcements, earnings announcements are likely to be the stronger impact on the stock price on the JSE. In quite a few cases, the JSE market was not sophisticated enough to distinguish between the good dividend declarations and bad dividend declarations as investors were better off by holding a bad declaration portfolio. Evidence was obtained from the Cumulative Abnormal Return approach based on the Market Model.

Knight and Affleck-Graves (1987) confirmed the results obtained by Ooms, Archer, and Smit (1987) in the context of the JSE. It was concluded that dividend announcements convey little or even no information on the further earnings of companies listed on the JSE. The signalling effect of dividends was tentatively rejected. This study was done by using weekly stock price data for the nine-year period 1973-1980.

A series of empirical studies taken by Bhana (1991a, 1991b, and 2002) document the impacts of substantial changes in dividend policy and the special (extra) dividend announcements on stock prices and the abnormal returns earned by investors. Bhana (1991a) developed this kind of research by using a Market Model to calculate daily return data over 41 days surrounding the dividend announcement date, and found dividend announcements make a strong impact on the stockholders' wealth on the JSE. Also, it was shown that the effect of unfavourable announcements is much greater than that of favourable announcements. In reacting to the major change in dividend announcement, the JSE seems to be inefficient during the 1970-1988 periods. Bhana (1991b) investigated the impact of

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substantial changes in dividend policies –omissions and resumptions on the JSE during the same period of previous study. The results provide strong evidence for the Dividend information content hypothesis. It was found that insiders earned significant abnormal returns during the six month period prior to the relevant announcements.

Bhana (2002) estimated the impact of special (extra) dividend announcements on stock prices on the JSE by using the Mean-Adjusted Return Model during the period 1975-1994, and getting the daily average excess returns for various equally weighted portfolios of shares for the three-day event window around the announcements. The results suggested that special dividend announcements tend to trigger positive stock price reactions on the JSE. It was further indicated that the impact of the first special dividend announcement was larger than that of any subsequent announcements; the stock price tended to react negatively once the special dividend was declared frequently. This implied that the frequent declarations of special dividend convey less information than those infrequent declarations as the infrequent announcements of special dividend would be more likely to surprise the market.

A review of the dividend behaviour literature provides insights into how the theoretical and empirical research related to this topic has been presented around the world. However, there is a lack of previous empirical studies applying different research methods and presenting various evidences in this area based on emerging market such as the JSE. Based on current South African macroeconomic conditions, this paper will make an effort to investigate market responses to the changes in cash dividend announcement on the JSE.

This study could make useful contributions to the dividend related literature for companies listed on the JSE because it has used the Market-Adjusted Return Model which none of the previous South African studies used. This will be discussed in detail in the next chapter.

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3 Research Methodology

3.1 Methodology Employed

In the reviewed literature relating to dividend announcements the event study methodology is most frequently used to examine the impact of dividend announcements. In using this methodology researchers have adopted different sample selection methods and have used different study intervals.

3.1.1 Event Study Methodology

Event study is a statistical methodology employed to measure the stock price reactions to a specific event at certain intervals over a period. The magnitude of abnormal return is a measure of the impact of that event on the shareholders' wealth at and around the time that the unanticipated event occurs. Event study methodology can be used to study the company's special event announcements such as: earnings announcements (Eddy and Seifert (1992)), share repurchase announcements (Chen, Chen, Cheng (2004)), stock splits (Charest (1978a)), and dividend change announcements (Ryan, Besley, and Lee (2000)), etc.

The event study methodology involves four steps: identifying the special event to study; choosing a model to estimate abnormal returns; measuring the abnormal returns; and analyzing the abnormal returns.

There are three dominant models for measuring abnormal returns: Mean-Adjusted Return Model, Market-Adjusted Return Model, and Market Model. The details of these models will be discussed in the next section.

In these prior studies there is no consensus about the interval and study period used. Some of the previous studies focused on the long term impact (monthly interval) of dividend changes, e.g. Bolster and Janjigian (1991), Holder, Langrehr, and Hexter (1998). On the

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other hand, most of more recent researchers, e.g. Aharony and Swary (1980), Woolridge (1982), Handjinicolaou and Kalay (1984), Seiler and Rom (1997), Ryan, Besley and Lee (2000), Balachandran (2001), and Bhana (2002), focused on the short term impact (daily interval). Both monthly and daily data were collected in two of the most frequently cited studies, Pettit (1972) and Charest (1978b). And the South African study by Knight and Affleck-Graves (1987) used weekly data.

In respect of the period used, approximately half of the prior studies tested the impact of dividend changes over a very long period, e.g. J. Powell, J. Shi, and T. Smith (2004) from 1927 to 1996; R. Sant and A. Cowan (1994) from 1962 to 1987; S. Chen, T. Shevlin, and Y. Tong (2004) from 1974 to 1999. In contrast, approximately half of earlier studies tested this issue over a relative short period, e.g. Woolridge (1982) from 1971-1977, George, Hein, Schmidt, and Solberg (2004) from 1999 to 2000, Ibrahim and Ragab (2004) from 1997 to 2001, Uddin (2003) from 2001 to 2003.

In using event study methodology to measure dividend changes effects, there are two major difficulties. On the one side, it is impossible to exactly separate the impact of dividend announcement from those events which might happened during the event window (Charest (1978 a and 1978 b)), thus we cannot make sure that the observed stock price reactions were solely caused by the event. On the other side, the features of each company are unique, thus the advantages and disadvantages derived from event study method can not be simply applied to the companies in general.

Note there is a trade-off with respect to the width of event window: the longer the event window, the higher the likelihood to capture event impact especially in case of uncertain event date and information leakage. On the contrary, the longer the event window, the higher the effect of other concurrent events and the lower the power of the test statistic will be. Brown and Warner (1980) suggested that all other things equal, a more powerful test is preferred to a less powerful test, as the power of a test is just the ability of a test to measure

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abnormal return. Moreover, it has been found that the lower power of the test statistic can lead to false explanation about the significance of a dividend changes event (Brown and Warner (1985)). Therefore our study focuses on the impact of dividend change events on daily data intervals.

This study has chosen a relatively short (-5, +5) event window to obtain better control for confounding impacts of other events and also to ensure the stronger power of test statistic.

3.1.2 Dominant Models for Estimating Abnormal Returns

To interpret the stock price reactions to the specific event, we firstly need to specify a model generating the normal or expected return, which is the stock return if no event occurred; second we need to calculate the abnormal return, which is the difference between actual return and normal return.

Comparing the major models, Mean-Adjusted Return Model, Market Model, and Market-Adjusted Return Model, that have been used in event studies, Brown and Warner (1980) presented that beyond a simple, one-factor Market Model, the more complicated methodologies make the researcher worse off. Dyckman, Philbrick, and Stephan (1984) found that the model used will not have much influence on the empirical results, especially if daily data is used.

The Mean-Adjusted Return Model assumed the expected return to be the mean returns of company j over the past estimation period:

$$R_{jt} = \bar{R}_j$$

Where $\bar{R}_j$ denotes the mean returns during the estimation period. It is a simple model.

The Market Model is a generalized model and frequently used in studies and is based on the standard asset-pricing model. The Market Model posits a linear relationship between the

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return on the individual security and the return on the whole market:

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

Where α_j and β_j denote regression coefficients:

α_j = the intercept of the linear relation for the return on stock j and the market return

β_j = the slope of the linear relation between the return on stock j and the market return

R_{mt} = the market return over time t

ε_{jt} = the stochastic error

The assumption of the Market Model based on the standard CAPM is that the slope and intercept term are constant over time.

Figure 3-1, which states that the expected return from a security is an increasing function of its systematic risk called the Security Market Line.

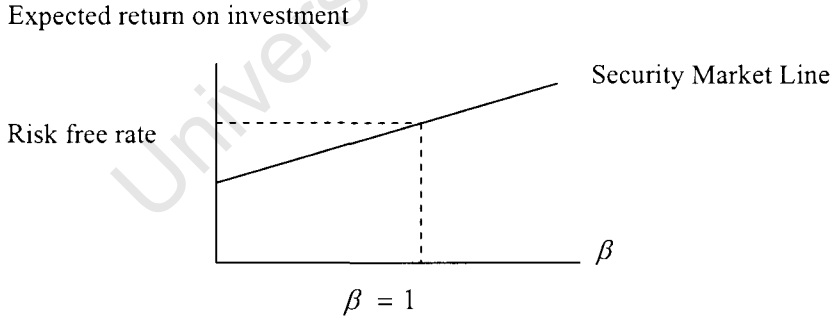

Figure 3-1 The capital asset pricing model

In practise when calculating β, different return intervals will result in different β values. This bias may arise with the application of Market Model.

In addition when using the Market Model, the coefficients, such as expected return, need to

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be estimated from observations at least 12 months prior to the change in dividend announcement and then the real stock return may not be the same as the expected return estimated during the period studied.

What should be noted is that Pettit was already aware of the limitation of the Market Model from two aspects in his (1972 and 1976) study. From one aspect, the coefficients of the Market Model must be estimated during the periods that are different from those periods in which the impact of the unique factor is being estimated. From the other aspect, the parameters may not be stationary over the period studied.

As we have mentioned in the previous chapter related to the shortcomings of CAPM, the single factor Market Model offered a too simple linear regression. The regression line may be biased.

Woolridge (1982) criticized the daily market return specified by the Market Model as giving the lowest and at most times insignificant explanatory power of beta. He applied Market-Adjusted Return Model, in which stocks are assumed to have the same beta of 1.0.

Given a stochastic return-generating progress, Market-Adjusted Return Model specifies stock j return R_{jt} over time t as:

$$R_{jt} = \mu_{jt} + \varepsilon_{jt}$$

Where μ_{jt} is the expected return of stock j and ε_{jt} is the stochastic error term. In using Market-Adjusted Return Model, the normal or expected return is assumed to be the return of market portfolio. A broad market index, such as S&P 500, is usually used (Ghosh and Woolridge (1988), Fama and French (1988), and Skinner (2003), etc.) as a proxy of the return on the market portfolio:

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$$\mu_{jt} = R_{mt}$$

As the true extent of abnormal return is unknown in an Event Study, Armitage (1995) concluded that it is impossible to discern which model is performing best. Recognising the criticisms of the Market Model mentioned in Woolridge's (1982) research, this study will use the Market-Adjusted Return Model. In comparison to other models, the Market-Adjusted Return Model does not need an estimation period; and omits statistical tests. The disadvantage of this model is that an additional data, i.e. the market index is needed.

In applying Market-Adjusted Return Model, we define the event date as the declaration date of dividends of the listed companies obtained in the McGregor's Database. FTSE/JSE Africa All Share Index (ALSI) is employed as the proxy of market return. Two difference measures: (1) average abnormal return (AAR) for each day of the event period and (2) cumulative abnormal return (CAR) are calculated to test the impact of dividend changes on stock price. All the related returns are calculated with daily closing prices of the companies listed on the JSE market.

Relevant terminology is defined as follows:

- **Event date** is the date which the change in dividend policy is publicly announced, and t denotes the event time, i.e. $t = -5, \cdots, +5$; $t = 0$ denotes the event date.

- **Event window** is defined to be 5 trading days before and 5 trading days after the dividend announcement date. This study used 5 days before the event as the changes in dividend might leaks out before the public announcements. The possibility of information leakage has been considered in many prior studies (Charest (1978), Bolster and Janjigian (1991), Dewenter and Warther (1998), and Balachandran (2001), etc.). This study used 5 days after the event because it often takes some days for the market to fully impound the effects of dividend announcement into stock prices.

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- **Normal return** is the return expected on the stock during the event window if no event occurred. R_{mt} denotes market return on date t; R_{jt} stands for Actual return of company j on date t.

- **Abnormal return** (AR_{jt}) is calculated as the difference between actual stock return R_{jt} and the predicted normal return R_{mt}.

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

where,

AR_{jt} is the market-adjusted abnormal return for stock j over time t.

R_{jt} is the return of stock i on time t, calculated as $\left(R_{jt} - R_{j(t-1)}\right) / R_{j(t-1)}$.

R_{mt} is the market return on time t calculated as $(R_t - R_{t-1}) / R_{t-1}$. Where, R_t is the FTSE/JSE Africa All Share Index on day t. R_{t-1} is the FTSE/JSE Africa All Share Index on day $t-1$.

Let $j = 1, \cdots, N$ identify the companies in this sample. A portfolio's AR at each time is $AR_t = \text{sum}$ from $j=1$ to N of each AR_{jt} / N. Here AR_{jt} is the abnormal return at time t of security j. Used in the context of Market-Adjusted Return Model, abnormal return means the return to a portfolio in excess of the return to a market portfolio. The abnormal returns can be negative. In this study, Average Abnormal Return (AAR) is primarily used to assess the dividend change effects.

Cumulative abnormal return (CAR), the second measure of this study, is defined as: Sum of the difference between the expected return on a stock and the actual return that comes from the release of dividend announcement changes to the JSE. Over a window from $t=1$ to T, CAR is the sum of all the AR's:

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$$CAR_{jT} = \sum_{t=1}^{T} AR_{jt}$$

The plot of CAR_{jt} against t will show a clearer picture about how the changes in dividend announcement were incorporated into stock prices (refer to Figure 4-2 and Figure 4-3). This approach was approved in the Brown and Warner (1980) paper. Average cumulative abnormal return (ACAR) is employed to test the effects of dividend changes in this study.

3.1.3 *T*-test

Finally, we used a parametric test to determine the statistical significance of market-adjusted average abnormal return of dividend changes stocks over the event window. The $t-$statistics were calculated cross-sectionally by using the standard deviation of abnormal returns of the portfolio of 48 companies.

For any portfolio at time *t*, the average abnormal return AAR_t is

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

where N is the number of securities in that portfolio, AR_{jt} is the abnormal return of the j^{th} security at time t. Let S_t be the cross-sectional standard deviation, then

$$S_t = \sqrt{\frac{1}{N-1}\sum_{j=1}^{N}\left(AR_{jt} - AAR_t\right)^2}$$

Hence the $t-$statistic with degree of freedom of $N-1$ is calculated using

$$Tstat = \frac{AAR_t}{\frac{S_t}{\sqrt{N}}} = \frac{AAR_t\sqrt{N}}{S_t}$$

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The null hypothesis is

$$H_0 : AAR_t = 0$$

and the alternative is

$$H_1 : AAR_t \neq 0$$

It is a dual side $T-$test. We compare the $Tstat$ calculated with the key $T-$value of $N-1$ freedom at a specific significant level α, expressed as $t_{\left(N-1,\ \frac{1}{2}\alpha\right)}$. If

$$Tstat > t_{\left(N-1,\ \frac{1}{2}\alpha\right)}$$

then the null hypothesis will be rejected, i.e., there is abnormal return. Otherwise, we accept the null hypothesis and there's no abnormal return.

3.2 Data Source

3.2.1 Data Base, Sample Selection Criteria and Time Period

Considered some of the historical events coinciding with the South African economic and political circumstance might have affected investors, and made their expectations go through peaks and troughs. This study used a five-year period (from 1 January 2000 to 31 December 2004) of relative stability in risk levels, tax laws, and inflation rate compared with the isolation period and the beginning of democracy in South Africa.

As significant changes were made to the structure of the JSE in 1999 with the consolidation of some sectors and the unbundling and creation of new sectors, this study chose the source data period from 1 January 2000 to 31 December 2004.

In South Africa, cash dividends are typically declared twice yearly, depending on each

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company's fiscal year. The first dividend declaration being made after the first half year and referred to as an interim declaration, and the second and final declaration is made at the beginning of the next fiscal year. If the Dividend Signalling Hypothesis is relevant to the JSE, an examination of stock price behaviour around announcements of dividend changes is particularly important. The following five criteria were used for the selection of companies to be included in the sample:

1. The change in dividend announcement is limited to cash dividend changes;
2. Companies must pay regular interim and final cash dividends from January 2000 to December 2004;
3. Special dividends or extraordinary dividends, stock split, stock dividends, rights or more than one interim or final dividend were not issued during 2000-2004 period;
4. There are no other events, e.g. take over, mergers, acquisitions, in the 11 days surrounding dividend announcement day so as to avoid the confounding effect of other events;
5. Daily closing prices of each company must have been available for 11 trading days surrounding the announcement date (5 trading days before and 6 trading days on and after the announcement date).

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The above restrictions ensure that the samples observed are seasoned and stable thereby making the sample characteristics estimated comparable and reliable. The original sample contained 48 companies.

This sample selection process yielded 480 cash dividend changes events over five years from January 2000 to December 2004 made by 48 unique companies. Of these, 356 were dividend increase events, 75 dividend decrease events, and 49 dividend no change events.

The interim and final dividend announcements for the sample companies were obtained from the McGregor's Database at the University of Cape Town. Dividend announcement changes are defined relative to the previous year's value, that is, there is an

increase/reduction if the interim/final dividend per share this year is more/less than the interim/final dividend per share paid last year.

The descriptive statistics relating to the characteristics of dividend policy of sample companies is presented in section 4.1 in the next chapter.

The following steps were used to measure the dividend change impact on stock prices: The first step was the calculation of dividend changes and the percentage change for each semi-year of sample companies. In section 4.2, samples were then divided into two groups relating to increases and decreases in dividend announcements.

In order to analyse the percentage change effects, set out in section 4.3, companies experiencing dividend increases and decreases were further allocated into five and four subgroups respectively according to the magnitude of the dividend changes. The first subgroup were the companies which increased/decreased their dividends less than or equal to 10%; the second subgroup were the companies which increased/decreased their dividends greater than 10% but less than or equal to 20%; the third subgroup were the companies which increased/decreased their dividends greater than 20% but less than or equal to 50%; the fourth subgroup were the companies which increased/decreased their dividends greater than 50% but less than or equal to 100%; and the last subgroup were the companies which only increased their dividends greater than 100%.

In section 4.4, two new portfolios were constructed based on the sample companies' fiscal year relating to interim dividends and final dividends. These two portfolios were further allocated into four subgroups (less than and equal to 50% dividend decrease, greater than 50% dividend decrease, less than and equal to 50% dividend increase, and greater than 50% dividend increase) based on the magnitude of interim and final dividend changes, respectively. The result derived from this part of the test confirms the result of percentage change effects derived from the last section.

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Finally, in section 4.5, this analysis is extended by testing size effects of stock price around dividend changes. The samples were broken down by stock price (less than or equal to 1000 cents per share, less than or equal to 5000 cents per share, and greater than 5000 cents per share) the day before the dividend change events in order to examine the impact of price-specific different market reactions to dividend changes, which enables us to gain insight into the stock price behaviour in the context of the JSE.

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4 Empirical Results

Section 4.1 presents the descriptive statistics. The results are detailed in Table 4-1, Table 4-2, Table 4-3, Table 4-4, and Figure 4-1. Section 4.2 measures the impacts of unexpected dividend changes on the market value of sampled companies. The results are reported in Table 4-5, Table 4-6, and Figure 4-2. Section 4.3 explores the impacts of dividend announcements relative to different percentage changes. The data are tabulated in Figure 4-3 and Figure 4-4. The market reactions to interim and final dividend changes are tested and the results are reported in section 4.4. We see the results in Table 4-7, Table 4-8, Figure 4-5, and Figure 4-6. The further test relative to the percentage changes of interim and final dividends are reported in Table 4-9, Figure 4-7, and Figure 4-8, respectively. Finally, the results of stock price effect are included in section 4.5. The findings are tabulated in Figure 4-9 and Figure 4-10.

All the above tests are performed by using Microsoft Excel. The empirical results are generated from some VBA programmes. The VBA codes are attached in the Appendix.

4.1 Descriptive Statistics on Sample Companies

This study begins by presenting the descriptive statistics on characteristics of dividend policy changed companies and comparing the different characteristics between dividend increase companies and dividend decrease companies.

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Table 4-1 Distribution of Dividend Changes by year 2000-2004

Year	Increase events	Increases Percentage of Sample	No change events	No changes Percentage of Sample	Decrease events	Decreases Percentage of Sample
2000	68	19.10%	14	28.57%	14	18.67%
2001	69	19.38%	12	24.49%	15	20.00%
2002	79	22.19%	2	4.08%	15	20.00%
2003	68	19.10%	8	16.33%	20	26.67%
2004	72	20.22%	13	26.53%	11	14.67%
Total	**356**	**100%**	**49**	**100%**	**75**	**100%**

Table 4-2 Stock Price Per-Share of Increasing and Decreasing Observations (Day before the Event)

Price (c)	Increases		Decreases	
<= 1000	148	41.57%	26	34.67%
<=5000	149	41.85%	16	21.33%
>5000	59	16.57%	33	44.00%
Total	**356**	**100%**	**75**	**100%**

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Table 4-3 Distribution of observations by Industry classification

Industry groups	Industry	No. of increases		No. of decreases	
Resource	Mining	33	9.27%	30	40%
	Oil and gas	7	1.97%	1	1.33%
Basic industries	Chemical	16	4.49%	2	2.66%
	Construction & building material	26	7.3%	1	1.33%
General industrials	Diversified industrials	8	2.25%	1	1.33%
	Electronic & electrical equipment	14	3.93%	3	4%
	Engineering and machinery	8	2.25%	0	0
Cyclical consumer goods	Automobiles and parts	10	2.81%	0	0
Non cyclical consumer	Beverages	10	2.81%	6	8%
goods	Food producers and processors	8	2.25%	0	0
Cyclical services	General retailers	41	11.52%	6	8%
	Leisure and hotels	8	2.25%	0	0
	Support services	18	5.06%	0	0
Non cyclical services	Food and drug retailers	30	8.43%	0	0
Financials	Banks	38	10.67%	1	1.33%
	Insurance	15	4.21%	3	4%
	Life assurance	10	2.81%	4	5.33%
	Real estate	56	15.73%	17	22.67%
TOTAL		**356**	**100%**	**75**	**100%**

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Table 4-4 Magnitude of Dividend Changes

Absolute Percentage Change	Dividend Increase		Dividend Decrease	
	No. of Observations	Percentage	No. of Observations	Percentage
<= 10%	627	16.01%	132	16.00%
<= 20%	979	25.00%	176	21.33%
<=50%	1617	41.29%	341	41.33%
<=100%	363	9.27%	176	21.33%
> 100%	330	8.43%		
Total	**3916**	**100%**	**825**	**100%**

From Table 4-1 and Figure 4-1 we can see, the number of dividend events such as increases in dividends, no changes in dividends, and decreases in dividends are widely spread over the five years. Sample companies declared the most increase announcements in 2002, and the least number of decrease announcements were declared in 2004. The decrease announcements (75 events) captured 15.63% of the total announcements ($356 + 49 + 75 = 480$ events) over the five year study period. This is consistent with the view that managers are reluctant to cut dividends once they start paying dividends to shareholders (Lintner (1956), Kalay (1980), DeAngelo, DeAngelo, and Skinner (1995), Allen, Bernardo, and Welch (2000), Balachandran (2001), Brav, Graham, Harvey, and Michaely (2004), etc.). Such a low rate that the decreases involved reflects the truth that dividend decreases are still seen as negative signals and companies do not want to transfer unfavourable news to investors, especially when the perspective of company might not be really negative. This result is also consistent with Fama and Babiak's (1968) finding that most managers made an effort to smooth dividend payments.

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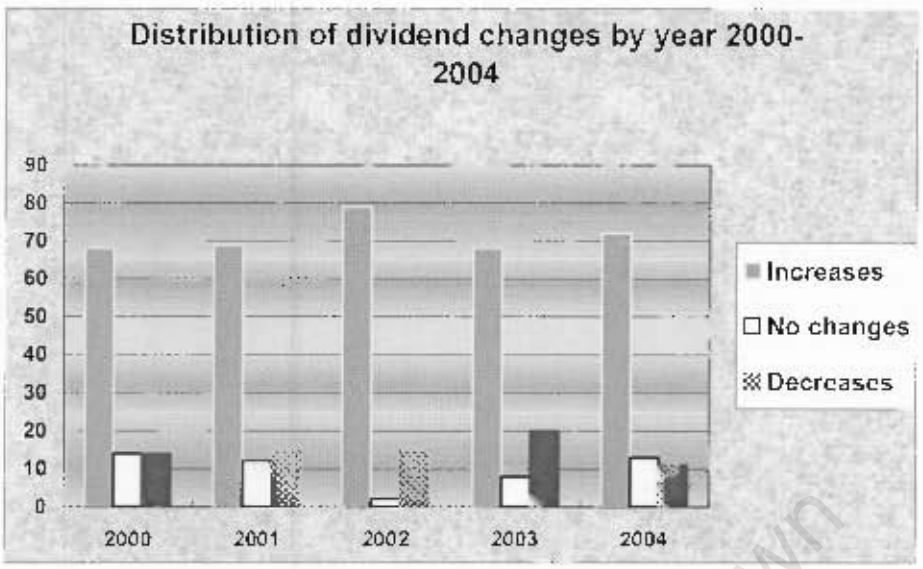

Figure 4-1 The frequency of dividend changes by year 2000-2004

High-priced sample companies declared the least dividend increases (16.57%) and the most dividend decreases (44%) over the five years studied. This evidence is shown in Table 4-2.

Table 4-3 reports the industry distribution of observations by the sign of dividend change. Observations in the mining industry dominate the dividend decreases (40%). The most (15.73%) dividend increases were declared in real estate industry. Among the sample companies, there is no dividend decrease declared in Engineering and Machinery, Automobiles and Parts, Food Producers and Processors, Leisure and Hotels, Support Services, and Food and Drug Retailers industry.

Table 4-4 tabulates the magnitude of dividend changes: the majority samples for both dividend increase and dividend decrease (41.29%, and 41.33%, respectively) fall between 20% to 50% absolute percentage dividend change. This information is important for our investigation as we will see in section 4.3: market reacts negatively to this percentage (20%-50%) of dividend decrease.

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4.2 Analysis of Market Reactions Surrounding Dividend Change Announcements

All 431 dividend change events (4741 observations) are dividend into two clusters (dividend increases and dividend decreases). Among the 431 events, 356 events are dividend increase announcements, 75 events are dividend decrease announcements, and the remaining 49 events are no change dividend announcements (see Table 4-1).

Table 4-5 provides the average abnormal return (AAR), the standard deviation of AAR, the $t-$value, and the cumulative average abnormal return (ACAR) for dividend increase clusters on each day surrounding the declaration date (day 0). And Table 4-6 reports the AAR, the S.D. of AAR, the t-value, and the ACAR for dividend decrease clusters over the eleven event days. Figure 4-2 shows ACAR of all the observations relative to dividend changes.

Table 4-5 AAR and ACAR 5 Days before and 5 Days after Dividend Increase

Day	AAR	S.D	t-value	ACAR
-5	0.00135	0.01996	1.27308	0.00135
-4	-0.00022	0.01969	0.20823	0.00113
-3	0.00146	0.02399	1.14437	0.00258
-2	0.00272	0.02133	2.40923**	0.00531
-1	0.00432	0.02823	2.88920***	0.00963
0	0.00727	0.03265	4.21616***	0.01690
1	0.00716	0.03971	3.45676***	0.02407
2	0.00518	0.02995	3.26396***	0.02925
3	0.00213	0.02259	1.77697*	0.03138
4	0.00074	0.02486	0.56232	0.03212
5	0.00076	0.02590	0.55301	0.03288

Notes: AAR is the average abnormal returns. S.D is the standard deviation. ACAR is the average cumulative abnormal returns. *, **, and *** are significant at the 10%, 5%, and 1% level respectively.

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Table 4-6 AAR and ACAR 5 Days before and 5 Days after Dividend Decrease

[illegible]	AAR	S.D	[illegible]	[illegible]
-5	-0.00118	0.02277	-0.44484	-0.00118
-4	0.00425	0.02602	1.41501	0.00307
-3	-0.00444	0.02467	-1.56027	-0.00137
-2	0.00178	0.02105	0.73114	0.00040
-1	0.00199	0.02140	0.80623	0.00240
0	0.00269	0.02081	1.12034	0.00509
+1	0.00054	0.02416	0.19462	0.00563
+2	-0.00420	0.03154	-1.15199	0.00144
+3	-0.00248	0.02630	0.81563	0.00104
+4	0.00048	0.01844	0.21821	0.00056
+5	-0.00071	0.01842	-0.33445	0.00129

Notes: AAR is the average daily abnormal returns. S.D is the standard deviation. ACAR is the cumulative average daily abnormal returns.

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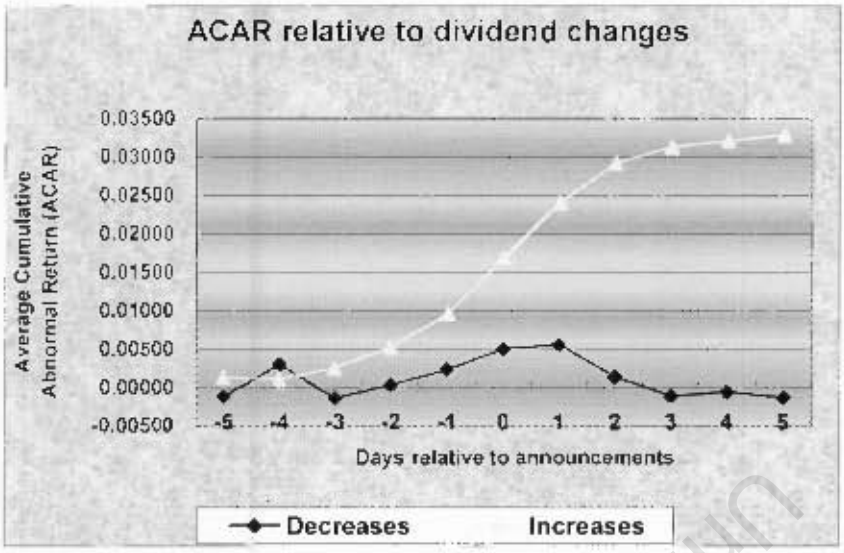

Figure 4-2 ACAR of 4741 observations over period from day -5 to day 5 relative to dividend changes

Result indicates that the market reacts rapidly to dividend increases (see Figure 4-2). The market reactions to increase announcements from the first day (day -5) of the event window may be attributed to leakage of information (Charest (1978a and 1978b), Bolster and Janjigian (1991), Dewenter and Warther (1998), and Balachandran (2001), etc.).

Except for day -4, the AARs of dividend increase on other ten event days are all positive. Around announcement days (day -2 to day +3), the cross-sectional $t-$test also reveals a positive and significant association, on the average, between daily stock returns and the dividend increases. On day -2, AAR is significant at the 5% level ($t-$value = 2.40923). From day -1 to day +2, the AARs are significant at the 1% level ($t-$value = 2.88920, 4.21616, 3.45676, and 3.26396, respectively). On day +3, AAR is significant at the 10% level ($t-$value = 1.77697). The price reaction to dividend increase announcements suggests that investors interpret these changes as positive signals.

For decreases, in contrast to the finding reported by Charest (1978b), Aharony and Swary (1980), Ghosh and Woolridge (1988), Wansley, Sirmans, Shilling, and Lee (1991), Michaely,

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Thaler, and Womack (1995), and the Gurgul, Majdosz, and Mestel (2003) study that dividend reductions have a greater impact on the stock prices than dividend increase announcements, JSE participants did not seem to interpret dividend reductions as bad news around event date (day -2, 0, and +1) and even gained positive abnormal returns (see Figure 4-2). One of the possible explanations may be the timely market reactions to dividend decrease announcements reported in Eades, Hess, and Kim (1985) paper. The small sample size of decrease announcements in this study (see Table 4-4, 825 decrease observations) might also be an explanation for this somewhat insensitive market response. Even though the AARs are not negatively significant during an 11-day event window, the sign of ACAR of decrease announcements changes to negative from positive on day -3 and does not change again over the following event days. The following section will identify subgroups of the sample companies whose stock prices appeared to be insensitive to decrease announcements.

The evidence derived from this section appears consistent with traditional Dividend Signalling Hypothesis, which predicts a positive relationship between stock price reactions and dividend changes.

In the next section we will further examine whether the dividend change announcements convey different information among groups with different percentages of dividend changes.

4.3 Analysis of Percentage Change Effects Surrounding Dividend Change Announcements

The dividend increase and dividend decrease cluster were further divided into subgroups based on the absolute percentage change (less than or equal to 10%, less than or equal to 20%, less than or equal to 50%, less than or equal to 100%, and greater than 100%) in dividends (see Table 4-4).

ACAR for these increase and decrease subgroups are shown in Figure 4-3 and Figure 4-4 respectively.

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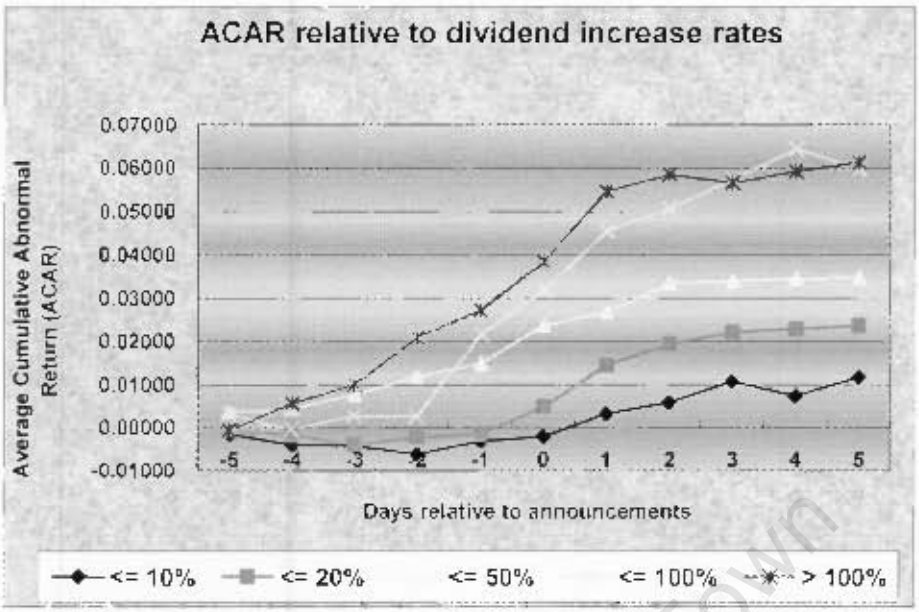

Figure 4-3 ACAR of 3916 observations over period from day -5 to day 5 relative to dividend increase rates

Evidence presented in Figure 4-3 indicates that all the information contained in dividend increases is rapidly incorporated into stock prices. Figure 4-3 clearly shows that there is a strong positive relationship between stock returns and percentage change of dividend. Moreover, the larger the dividends change rates, the earlier and firmer the market reactions are.

This finding has strong implications for the existing Dividend Signalling Hypothesis, which is consistent with prior studies (Divecha and Morse (1983) and Firth (1996)).

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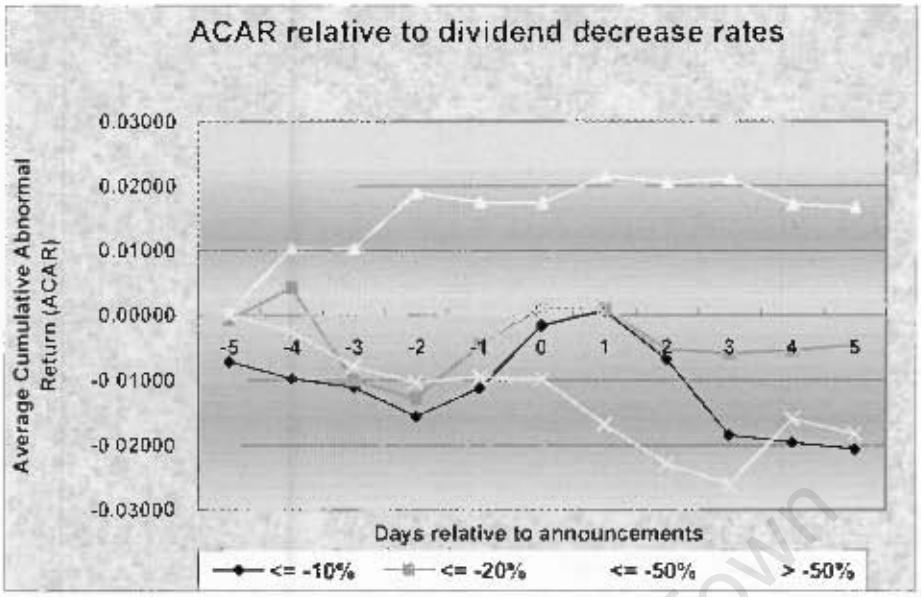

Figure 4-4 ACAR of 825 observations over period from day -5 to day 5 relative to dividend decrease rates

Figure 4-4 indicates that the strongest market reaction is to the largest dividend decrease subgroup (dividends decrease greater than 50%) on event date and the following three days. Interestingly, market interprets the decrease announcements of 20% to 50% percentage as good news, as investors earned positive ACAR during the 11-day period studied. Table 4-4 shows us this part of events capture 41.33% of total decrease observations. Possible explanation may be that unfavourable announcements are anticipated and hence are not fully reflected during the short event window (Fenn and Liang (2000), Romon (2000), and Graham, Koski, and Loewenstein (2003)). An alternative explanation might be the relative small number of decrease observations. The results of the South African Ooms, Archer, and Smit (1987) study also suggest that in many cases, JSE investors were better off holding a bad dividend declaration portfolio over the 1973-1984 periods.

Still, evidence derived from decreases indicates that on average, investors recognized dividend reductions as bad news. It is confirmed by the results in Table 4-6 (negative ACAR on day +5) and the data are tabulated in Figure 4-2.

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4.4 Analysis of Interim versus Final Effects Surrounding Dividend Change Announcements

This section examines the increase and decrease clusters further allocated into two sub-groups based on interim and final declaration of cash dividend.

Interim dividends are announced at the half year. Final dividends are announced right after the declaration of annual accounting results. If the market participants recognize the relationship between dividend changes and the changes of managerial prospect of risk and profitability, then this should be reflected simultaneously in the market reaction around event date.

Table 4-7 and Table 4-8 display the differences in AARs and ACARs between interim and final announcements over eleven-day window relative to dividend changes.

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Table 4-7 Interim versus Final AAR and ACAR relative to dividend increases

Day	Interim			Final		
	AAR	t-value	ACAR	AAR	t-value	ACAR
-5	0.00103	0.71081	0.00103	0.00167	1.07688	0.00167
-4	-0.00111	-0.80586	-0.00008	0.00068	0.42683	0.00235
-3	-0.00021	-0.15789	-0.00030	0.00314	1.45378	0.00550
-2	0.00088	0.60481	0.00059	0.00458	2.66238***	0.01008
-1	0.00272	2.02573**	0.00330	0.00595	2.21401**	0.01603
0	0.01138	5.03480***	0.01469	0.00312	1.20932	0.01915
1	0.00848	3.53885***	0.02316	0.00584	1.71805*	0.02498
2	0.00213	1.16179	0.02530	0.00826	3.19917***	0.03325
3	0.00055	0.33634	0.02584	0.00373	2.12180**	0.03697
4	0.00210	1.16139	0.02794	-0.00063	-0.33101	0.03634
5	-0.00070	-0.41480	0.02725	0.00223	1.02487	0.03857
Mean	0.00103			0.00314		
Median	0.00248			0.00351		
Events	179			177		

Notes: AAR is the average abnormal returns. ACAR is the cumulative average abnormal returns. *, **, and *** are significant at the 10%, 5%, and 1% level respectively.

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Table 4-7 presents the average abnormal returns (AAR), t-value, and cumulative average abnormal returns (ACAR) for 179 increase events of interim dividend and 177 increase events of final dividend over the eleven event days. The stocks of announcing increases companies have a significant abnormal performance for interim and final increases. For interim dividend increases: on day -1, AAR is significant at the 5% level ($t-\text{value}=2.02573$); from day 0 to day +1, the AARs are significant at the 1% level ($t-\text{value}=5.03480$ and 3.53885, respectively). For final dividend increases: on day -2 and

day +2, the AARs are significant at the 1% level ($t-$value = 2.66238 and 3.19917, respectively); on day-1 and day +3, the AARs are significant at the 5% level ($t-$value = 2.21401 and 2.12180, respectively); on day + 1, the AAR is significant at the 10% level ($t-$value = 1.71805).

Table 4-8 Interim versus Final AAR and ACAR relative to dividend decreases

Day	Interim			Final		
	AAR	t-value	ACAR	AAR	t-value	ACAR
-5	-0.00656	-1.36816	-0.00656	0.00305	1.30161	0.00305
-4	0.00327	0.87446	-0.00329	0.00502	1.12811	0.00807
-3	-0.00662	-1.32394	-0.00991	-0.00273	-0.91747	0.00534
-2	0.00754	1.68854	-0.00237	-0.00275	-1.30256	0.00258
-1	0.00082	0.17582	-0.00154	0.00291	1.32072	0.00549
0	-0.00025	-0.07624	-0.00180	0.00501	1.55617	0.01050
1	-0.00473	-0.98889	-0.00653	0.00468	1.56264	0.01518
2	-0.00412	-0.56660	-0.01065	-0.00425	-1.35865	0.01093
3	-0.00155	-0.31753	-0.01220	-0.00320	-1.18778	0.00773
4	-0.00309	-0.98741	-0.01529	0.00326	1.18837	0.01099
5	-0.00148	-0.45992	-0.01677	-0.00011	-0.03844	0.01088
Mean	-0.00155			0.00291		
Median	-0.00152			0.00099		
Events	33			42		

Notes: AAR is the average abnormal returns. ACAR is the cumulative average abnormal returns. *, **, and *** are significant at the 10%, 5%, and 1% level respectively.

The sample companies announcing interim reductions experienced poor performance subsequent to the announcements (reflected in Table 4-8, negative AAR since event date and negative ACAR over the entire study period). In contrast, the market seems to have reacted

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insensitively to final dividend decreases as shareholders of these companies have gained positive ACAR over the entire study period.

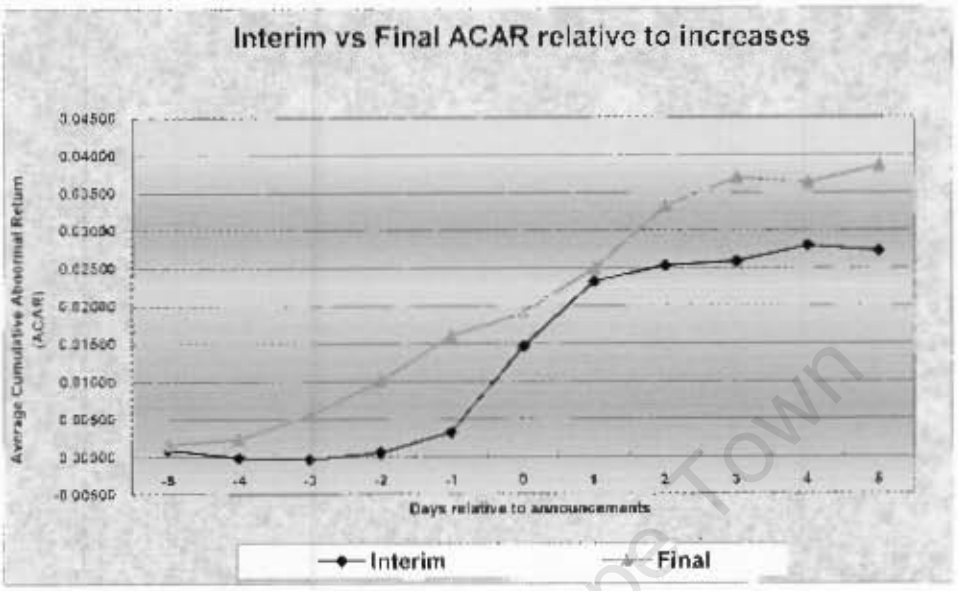

Figure 4-5 Interim versus final ACAR relative to increase announcements

Figure 4-5 shows us that both interim and final ACAR stably go upwards, reacting to dividend increase announcements, but final ACAR continue standing above interim ACAR during the whole event window.

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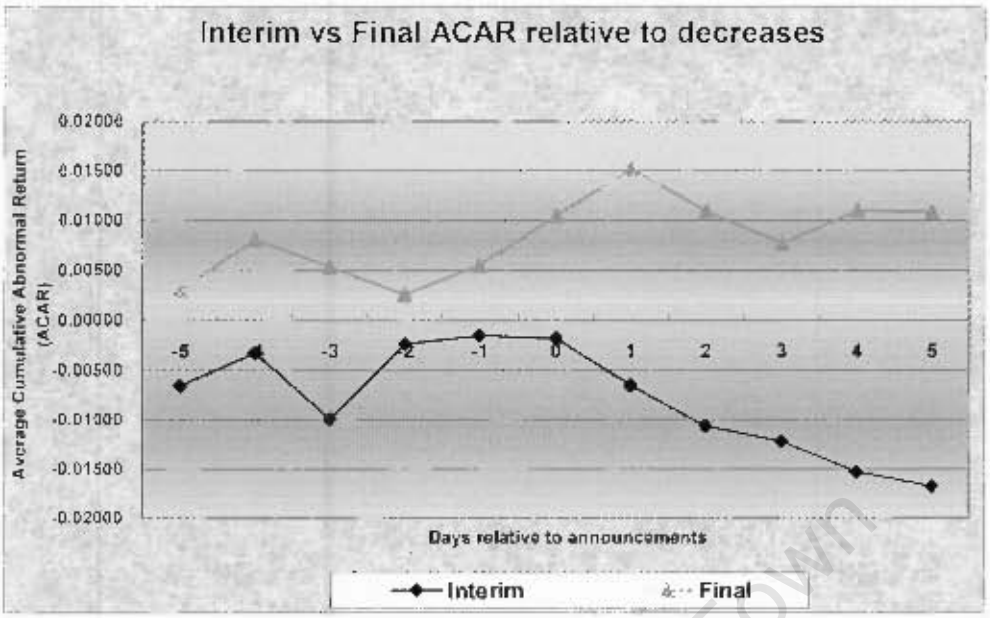

Figure 4-6 Interim versus final ACAR relative to decrease announcements

Figure 4-6 displays that stock returns are more volatile to both interim and final decrease announcements preceding the announcement, which is different from the stable and earlier positive market reactions to interim and final increases. After the event date, the interim ACAR decreases day by day over the post-announcement days while the final ACAR remained volatile and positive. This greater market reaction to interim dividend reductions observed in this study is consistent with the Balachandran (2001) study.

The evidence of the Balachandran (2001) paper indicated that except for the event window from day 2 to day 20, the stock price reactions were greater for the interim dividend reductions than final dividend reductions at the 2% level for all the event windows. Moreover, except for the group with less than 20% dividend reduction, the stock price reaction was statistically significantly greater for interim dividend reductions than for final dividend reductions for all the dividend reduction groups, indicating that the effect of interim dividend reductions was much stronger than that of final dividend reductions.

Kato and Loewenstein (1995) indicated that the impacts of fiscal year end ex-dividend days

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are greater than those of interim ex-dividend days, which is contrary to the Balachandran (2001) interim shock finding.

There are four alternative explanations for the somewhat insensitive market reaction to final dividend decreases: First, as the potential manipulation of final accounting data, interim dividend is announced prior to the annual financial report, it is thus considered to be more reliable. Second, the probability to suffer a loss has been anticipated in the company's interim report. Third, there has already been an interim dividend reduction prior to the final one, so the impact of final reduction is weakened. Last, it might be due to the small sample size of dividend decreases.

Figure 4-6 displays that on average, investors do not lose value from final decreases over the entire event window. Subdividing decrease announcements is however important to further interpret the partially positive market reactions to the final dividend reductions.

Data from the last section of this study has shown that there is a strong positive relation between the percentage dividend increases and market reactions. In order to find out if this relation still exists after the total observations were broken into interim and final, an additional investigation was conducted to examine the robustness of the results reported in Figure 4-3 and Figure 4-4 of the last section. Based on the size of dividend changes, the interim and final events of dividend changes were further divided into four subgroups: greater than 50% increases, less than or equal to 50% increases, greater than 50% decreases, and less than or equal to 50% decreases, respectively. The results are calculated and tabulated in Table 4-9.

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Table 4-9 Interim versus final AAR and ACAR relative to percentage changes

Dividend Changes		Interim AAR	Final AAR	Interim ACAR	Final ACAR
>50% Increases	Mean	0.00694	0.00428	0.06531	0.05366
	Median	0.00362	0.00269		
≤ 50% Increases	Mean	0.00186	0.00319	0.02040	0.03511
	Median	0.00097	0.00332		
≤50% Decreases	Mean	-0.00087	0.00116	-0.00952	0.01276
	Median	-0.00046	-0.00029		
>50% Decreases	Mean	-0.00358	0.00026	-0.03942	0.00287
	Median	-0.00381	-0.00135		

This is consistent with the earlier finding in this study. The larger the change in dividend increases, the stronger the association between dividend increases and market responses. It was further confirmed that dividend increase announcements have a greater impact on the stock prices than dividend decrease announcements.

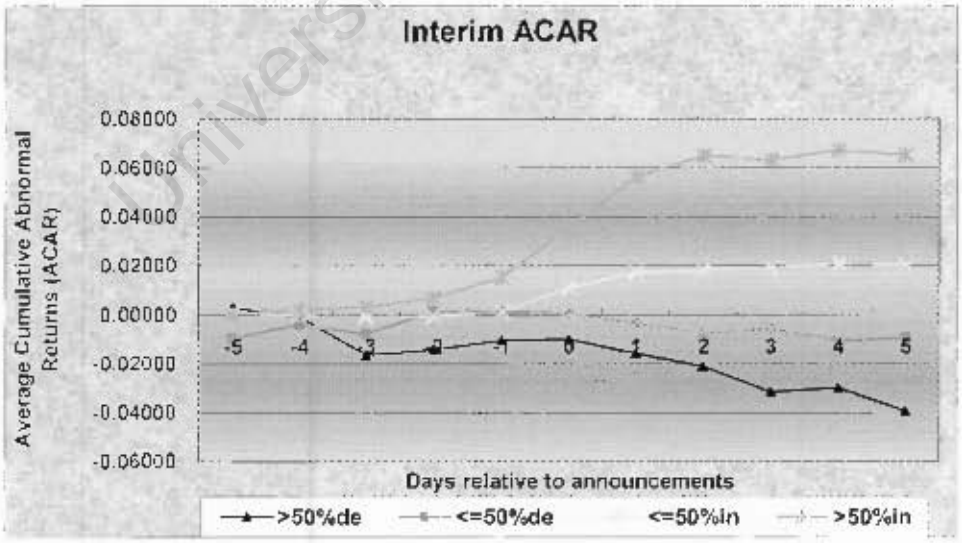

Figure 4-7 Interim ACAR relative to percentage changes

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Apparently, in Figure 4-7, the evidences derived from interim dividend changes confirm the results of prior studies that dividend increases/decreases are viewed as positive/negative signal by stock markets. This evidence is also consistent with Bhana's (1991) finding that the market reacts drastically to the large dividend changes on the JSE.

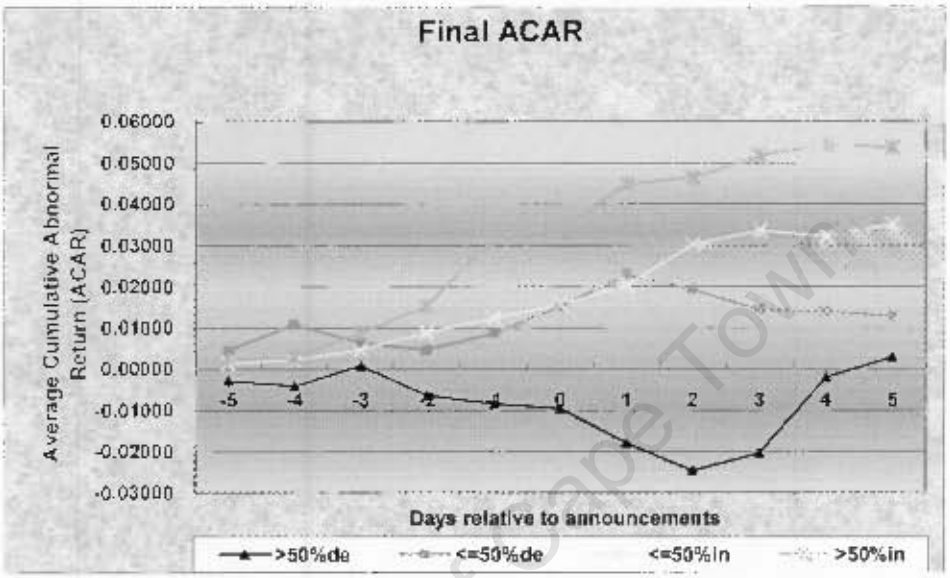

Figure 4-8 Final ACAR relative to percentage changes

Comparing Figure 4-8 with Figure 4-7, we see substantially negative common share price reactions to both subgroups of interim dividend decreases. This evidence confirms the findings of the Balachandran, Cadle, and Theobald (1999) study that the magnitude of stock price reactions to interim dividend decreases is statistically significantly related to the size of the dividend decreases. Unlike increase observations, the market responds to less than 50% final dividend decreases is surprising. The market did not bid down prices in the light of unfavourable, less than 50% final decreases, over the days -1, 0, and +1. In interpreting the implications of these results for dividend decreases, among the explanations we supplied in this section, one point should be noted again, that the positive market response may be associated with investors' correct anticipation of dividend reductions. Hence dividend reductions have not been linked to stock price on event date. Since day +1, reductions are

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associated with stock price gradually.

The evidence derived from this section further confirms the findings of the last section that the larger the percentage of dividend change, the greater the market reactions are.

4.5 Size Effects of Stock Price Surrounding Dividend Change Announcements

Finally, size effects of stock price on shareholder's wealth around event date were considered. It was also possible to break down the samples by stock price in order to examine the impact of price-specific different market reactions to dividend changes. Dividend increase and decrease observations were reallocated into three sub-groups, lower-priced (stock price less than and equal to 1000 cents per share), medium-priced (stock price less than and equal to 5000 cents per share), and higher-priced (stock price greater than 5000 cents per share), respectively.

Among the 431 dividend change events (431×11= 4741 observations), the resulting sample contains 148 dividend increase events declared by lower-priced companies, 149 dividend increase events declared by medium-priced sample companies, and the remaining 59 dividend increase events declared by higher-priced companies. The decrease sample contains 26, 16, and 33 dividend decrease events declared by lower-priced companies, medium-priced companies, and higher-priced companies, respectively (see Table 4-2).

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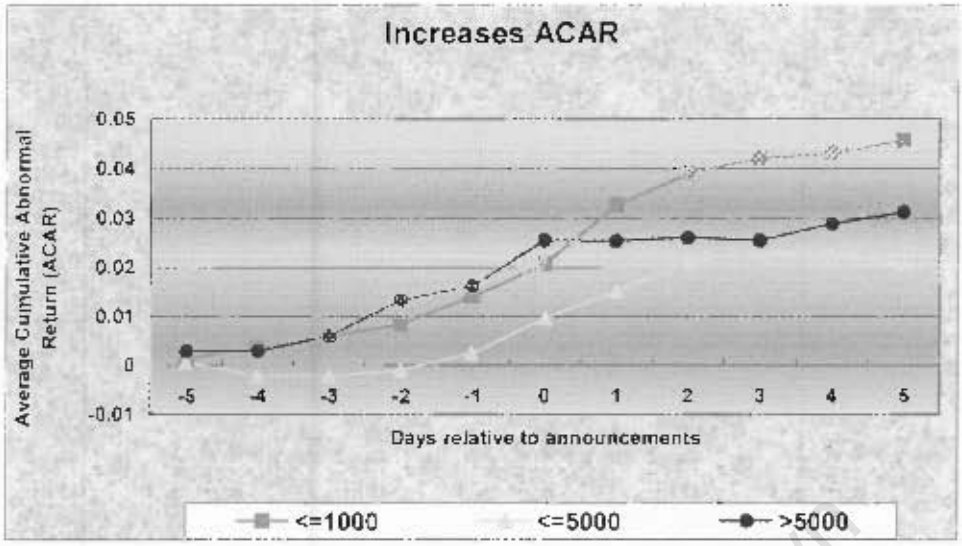

Figure 4-9 ACAR of dividend increases relative to different stock price (Rand in cents) category

Of particular interest is the finding that a more positive price reaction to dividend increases is associated with lower-priced companies during post-announcement days. In Figure 4-9, comparing with higher-priced and lower-priced companies, the investors of medium-priced companies respond later to dividend increases and earn the least ACAR during the entire event window.

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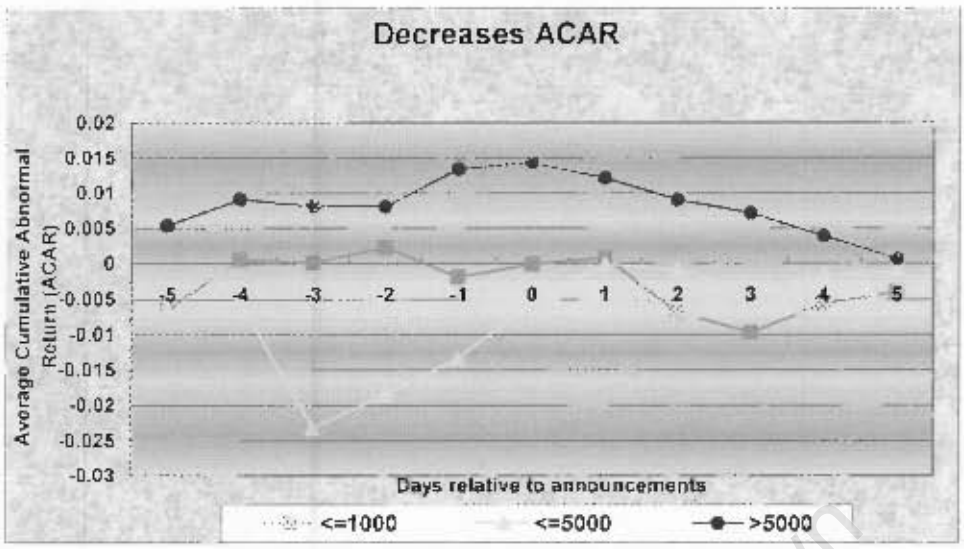

Figure 4-10 ACAR of dividend decreases relative to different stock price (Rand in cents) category

The result from dividend decrease observations also indicated that the market reactions of lower-priced companies are subject to have more drastic decreases in stock price during the post-announcement days. Figure 4-10 shows that for higher-priced companies, declaring dividend reductions, stock price reduction occurs evenly during the post-announcement days but their ACAR is positive on event date. The abnormal returns for medium-priced and lower-priced companies keep fluctuating during the entire event window. Dividend decrease observations indicated that lower-priced companies reacted most drastically during the post-announcement days. This finding is consistent with Bajaj and Vijh's (1990 and 1995) argument that market reactions are greater for a lower-priced company's stocks.

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5 Conclusions and Future Research

5.1 Conclusions

This study has examined the market reactions to increases and decreases in dividend announcements. The empirical results indicate the following:

(1) South African managers are aware of the signalling potentials of dividend changes and are reluctant to reduce dividend payments once these have been initiated. Over the five-year study period, the dividend decrease events only captured 15.63% of the total dividend announcements.

(2) The result drawn from the total 3916 dividend increase observations indicates that an increase in dividends signals favourable news. From event day -1 to day +2, the AARs are all significant at the 1% level. On event day -2, the AAR is significant at the 5% level. On event day +3, the AAR is significant at the 10% level.

(3) Average Abnormal Returns (AARs) are generally positively related with absolute dividend change rate (with exception of market reactions to reductions in the range 20% to 50%). The larger the percentage change of dividends, the greater the market reactions were found to be.

(4) Observed market reactions to dividend increases are greater than observed market reactions to dividend decreases. Around event date, there is a significant positive relationship between market response and dividend increases. However, it cannot be concluded that market reaction is also significantly positively related to decrease announcements. With the exception of market reaction to 20% to 50% decreases, all other decrease observations are explained by the negative abnormal returns.

There are five possible explanations for the somewhat insensitive market response to

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dividend decreases: timely market reactions to the dividend decreases, small sample size of dividend decreases, the possible anticipation of an unfavourable dividend announcement, the potential manipulation of accounting data, and the weakened impact of the final reduction because of an earlier decrease in interim dividends.

It appears that there is informational content about company value in dividend change announcements on the JSE.

This paper has further examined investor behaviour around the date of interim and final dividend announcements, and the following conclusions can be made:

(1) In the case of the percentage change effects of interim and final dividends, except market reaction to less than 50% final decreases, the larger the dividend change, the greater is the same direction of market response.
(2) Market reactions to both categories (less than and equal to 50% and greater than 50%) of interim increases are about double the reactions to both categories (less than and equal to 50% and greater than 50%) of interim decrease, respectively (Figure 4-7). This finding suggests that the impacts of interim dividend increase are much stronger than the impacts of interim dividend decrease on the JSE. It is consistent with the previous finding of this study that observed market reactions to increase announcements are greater than observed market reactions to decrease announcements.
(3) The final dividend increases triggered greater market reactions than interim increases. On the contrary, market reactions are stronger to the interim dividend reductions than final dividend reductions.

These results further support the information content of dividends hypothesis. And the strongest support for the information content of the dividends hypothesis comes from both interim and final increases.

Finally, this study has examined the size effects of stock prices on market reactions to

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dividend changes. The results indicate that more positive abnormal returns are associated with increase announcements declared by lower-priced companies and more negative abnormal returns are associated with decrease announcements declared by lower-priced companies. The conclusion drawn from these findings is that compared with medium-priced and higher-priced stocks, the market reactions of lower-priced stocks are subject to more drastically reacting during the post-announcement days on the JSE. These results are consistent with prior study (Bajaj and Vijh (1990 and 1995)) and enable us to gain a new insight into stock price behaviour during post-announcement event days in the context of the JSE.

However, this mini thesis focused on the effects of dividend announcements, as some other factors, e.g. earnings changes, tax regimes, growth opportunities, dividend stability, end-of-fiscal year, etc. could also have potential impacts on the market reactions. We cannot draw the conclusions that observed market reactions were exclusively caused by the event of dividend announcements.

5.2 Future Research

This research focused on the relationship between the company specific events, e.g. the role of dividend changes in determining stock market activity, e.g. the stock price movements following dividend change announcement. The stock market activity can be defined in different aspects, e.g. stock price movements or volume traded, etc. Further research may serve to emphasize the correlation between the company specific events and volume traded.

It has been well established by prior researchers (Asquith and Mullins (1983), Dielman and Oppenheimer (1984), Ghosh and Woolridege (1988), Sant and Cowan (1994), Michaely, Thaler, and Womack (1995), Dyl and Weigand (1998), and Wang (2004)) that positive/negative market reactions are associated with the major changes of a company's dividend policy: dividend initiations and omissions.

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This research has shown positively relationship between short run market reactions and the increases/decreases of dividends on the JSE. Further research efforts should focus on testing short run market reactions to dividend initiations and omissions. The result may provide new insights about the effect of dividend changes on the JSE.

Future investigation may also reveal those companies with irregular cash dividend declarations. Comparing the market response to dividend change announcements made by companies with different dividend policies or pattern could reinforce or question the evidence found in the current study.

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Appendix

1 Stock data

Data source: McGregor's Database, University of Cape Town;

Data period: 01, January, 2000- 31, December, 2004

Stock labels:

1. ANGGOLD
2. ANGLOPLAT
3. IMPLATS
4. TRNSHEX
5. ANGLO
6. ASSMANG
7. ASSORE
8. SASOL
9. AFROX
10. AECI
11. ITLTILE
12. CERAMIC
13. GROUP-5
14. BARWORLD
15. DELTA
16. GRINTEK
17. INVICTA
18. CMH
19. DISTELL
20. KWV BEL
21. OCEANA
22. JDGROUP
23. EDCON
24. FOSCHNI
25. TRUWTHS
26. NUCLICKS
27. CITYLDG
28. BOWCALF
29. NAMPAK
30. PICKNPAY
31. PIKWIK
32. SHOPRIT
33. ABSA
34. FIRSTRAND
35. RMBH
36. STANBANK
37. GLENMIB
38. SANTAM
39. AFLIFE
40. LIB-HOLD
41. ATLAS
42. CAPITAL
43. GRAYPROP
44. HYPROP
45. OCTODEC
46. PANPROP
47. PREMIUM
48. PUTPROP

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2 VBA Codes

2.1 Distribution of Dividend Changes

```
Option Base 1
Sub test_6()
    Dim i, j, k, m, Num, jthDivDateSeek As Integer
    Dim S, Stock(), DDate(), Event_Date, IntOrFnl As String, S_Num, N As Integer, AR(), CAR() As Double, CAR_Sum As Double
    S_Num = 48
    N = 10
    ReDim Stock(S_Num), DDate(S_Num, N), AR(1 To S_Num, 1 To N, -5 To 5), CAR(1 To S_Num, 1 To N, -5 To 5)

    Dim DivChgRate, AAR(), ACAR() As Double, DOF(), Inc_DOF(), P_Num, P_Seq As Integer
    P_Num = 3
    ReDim AAR(1 To P_Num, -5 To 5), ACAR(1 To P_Num, -5 To 5), DOF(1 To P_Num, -5 To 5), Inc_DOF(1 To P_Num, -5 To 5)

    Dim Inc_AAR(), Inc_ACAR() As Double, Price As Long
```

```
    ReDim Inc_AAR(1 To P_Num, -5 To 5), Inc_ACAR(1 To P_Num, -5 To 5)

    Dim Smpl(), Inc_Smpl(), STD(), Inc_STD(), Tstat(), Inc_Tstat() As Double
    ReDim STD(1 To P_Num, -5 To 5), Inc_STD(1 To P_Num, -5 To 5), Tstat(1 To P_Num, -5 To 5), Inc_Tstat(1 To P_Num, -5 To 5)

    ReDim Smpl(P_Num, 5)

    For i = 1 To P_Num
        For m = 1 To 5
            Smpl(i, m) = 0
        Next m
    Next i

    For i = 1 To 620
        S = Trim(Sheets("Dividend").Range("B" & i + 4))
        If S <> "" Then
            For j = 1 To N
                DivChgRate = Sheets("Dividend").Range("G" & j + i + 3)
                m = (12 - j) \ 2
                P_Seq = 2 - Sgn(DivChgRate)
                Smpl(P_Seq, m) = Smpl(P_Seq, m) + 1
            Next j
        End If
    Next i

    For i = 1 To P_Num
        For m = 1 To 5
            Smpl(i, m) = 11 * Smpl(i, m)
            Sheets("stats6").Cells(m + 4, 2 * i) = Smpl(i, m)
        Next m
    Next i
End Sub
```

2.2 T-test of Dividend Increases and Decreases

```
Option Base 1
Sub Test_2()
    Dim i, j, k, m, Num, jthDivDateSeek As Integer
    Dim S, Stock(), DDate(), Event_Date, IntOrFnl As String, S_Num, N As Integer, AR(), CAR() As Double, CAR_Sum As Double
    S_Num = 48
    N = 10
    ReDim Stock(S_Num), DDate(S_Num, N), AR(1 To S_Num, 1 To N, -5 To 5), CAR(1 To S_Num, 1 To N, -5 To 5)

    Dim DivChgRate, AAR(), ACAR() As Double, DOF(), Fnl_DOF(), P_Num, P_Seq As Integer
    P_Num = 3
    ReDim AAR(1 To P_Num, -5 To 5), ACAR(1 To P_Num, -5 To 5), DOF(1 To P_Num, -5 To 5), Fnl_DOF(1 To P_Num, -5 To 5)

    Dim Fnl_AAR(), Fnl_ACAR() As Double
    ReDim Fnl_AAR(1 To P_Num, -5 To 5), Fnl_ACAR(1 To P_Num, -5 To 5)

    Dim Smpl(), Fnl_Smpl(), STD(), Fnl_STD(), Tstat(), Fnl_Tstat() As Double
    ReDim STD(1 To P_Num, -5 To 5), Fnl_STD(1 To P_Num, -5 To 5), Tstat(1 To P_Num, -5 To 5), Fnl_Tstat(1 To P_Num, -5 To 5), _
            Smpl(1 To P_Num, -5 To 5, 1 To 400), Fnl_Smpl(1 To P_Num, -5 To 5, 1 To 400)

    For i = 1 To P_Num
        For m = -5 To 5
            AAR(i, m) = 0
            ACAR(i, m) = 0
            DOF(i, m) = 0
            STD(i, m) = 0
        Next m
    Next i

    Num = 0
    For i = 1 To 620
        S = Trim(Sheets("Dividend").Range("B" & i + 4))
        If S <> "" Then
            Num = Num + 1
            Stock(Num) = S
            jthDivDateSeek = 1400
            For j = 1 To N
                DDate(Num, j) = Sheets("Dividend").Range("D" & j + i + 3)
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```
                DivChgRate = Sheets("Dividend").Range("G" & j + i + 3)
                For k = jthDivDateSeek To 1 Step -1
                    Event_Date = Sheets(Stock(Num)).Range("A" & k + 4)
                    If Event_Date = DDate(Num, j) Then
                        CAR_Sum = 0
                        For m = -5 To 5
                            AR(Num, j, m) = Sheets(Stock(Num)).Range("C" & k + 4 + m) - Sheets("All Share").Range("C" & k + 4 + m)
                            CAR_Sum = CAR_Sum + AR(Num, j, m)
                            CAR(Num, j, m) = CAR_Sum
                                If DivChgRate < -0 Then
                                    P_Seq = 1
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate = 0 Then
                                    P_Seq = 2
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                Else
                                    P_Seq = 3
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                End If
                        Next m
                    jthDivDateSeek = k
                    k = 1
                    End If
                Next k
            Next j
        End If
    Next i

    For i = 1 To P_Num
        For m = -5 To 5
            If DOF(i, m) <> 0 Then
                AAR(i, m) = AAR(i, m) / DOF(i, m)
                ACAR(i, m) = ACAR(i, m) / DOF(i, m)
            End If

            For j = 1 To DOF(i, m)
                STD(i, m) = STD(i, m) + (Smpl(i, m, j) - AAR(i, m)) ^ 2
            Next j

            STD(i, m) = Sqr(STD(i, m) / (DOF(i, m) - 1))
            Tstat(i, m) = AAR(i, m) * Sqr(DOF(i, m)) / STD(i, m)

            Sheets("stats2").Cells(m + 10, 2) = AAR(1, m)
            Sheets("stats2").Cells(m + 10, 3) = STD(1, m)
            Sheets("stats2").Cells(m + 10, 4) = Tstat(1, m)
            Sheets("stats2").Cells(m + 10, 5) = ACAR(1, m)
            Sheets("stats2").Cells(m + 25, 2) = AAR(3, m)
            Sheets("stats2").Cells(m + 25, 3) = STD(3, m)
            Sheets("stats2").Cells(m + 25, 4) = Tstat(3, m)
            Sheets("stats2").Cells(m + 25, 5) = ACAR(3, m)
        Next m
        Sheets("stats2").Cells(20, i + 5) = DOF(i, 0) - 1
    Next i
End Sub
```

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2.3 Percentage Change Effects surrounding Dividend Change Announcements

```
Option Base 1
Sub Test_4()
    Dim i, j, k, m, Num, jthDivDateSeek As Integer
    Dim S, Stock(), DDate(), Event_Date, IntOrFnl As String, S_Num, N As Integer, AR(), CAR() As Double, CAR_Sum As Double
    S_Num = 48
    N = 10
    ReDim Stock(S_Num), DDate(S_Num, N), AR(1 To S_Num, 1 To N, -5 To 5), CAR(1 To S_Num, 1 To N, -5 To 5)

    Dim DivChgRate, AAR(), ACAR() As Double, DOF(), Fnl_DOF(), P_Num, P_Seq As Integer
    P_Num = 10
    ReDim AAR(1 To P_Num, -5 To 5), ACAR(1 To P_Num, -5 To 5), DOF(1 To P_Num, -5 To 5), Fnl_DOF(1 To P_Num, -5 To 5)

    Dim Fnl_AAR(), Fnl_ACAR() As Double
    ReDim Fnl_AAR(1 To P_Num, -5 To 5), Fnl_ACAR(1 To P_Num, -5 To 5)

    Dim Smpl(), Fnl_Smpl(), STD(), Fnl_STD(), Tstat(), Fnl_Tstat() As Double
    ReDim STD(1 To P_Num, -5 To 5), Fnl_STD(1 To P_Num, -5 To 5), Tstat(1 To P_Num, -5 To 5), Fnl_Tstat(1 To P_Num, -5 To 5), _
          Smpl(1 To P_Num, -5 To 5, 1 To 300), Fnl_Smpl(1 To P_Num, -5 To 5, 1 To 300)

    For i = 1 To P_Num
        For m = -5 To 5
            AAR(i, m) = 0
            ACAR(i, m) = 0
            'Fnl_AAR(i, m) = 0
            'Fnl_ACAR(i, m) = 0
            DOF(i, m) = 0
            'Fnl_DOF(i, m) = 0
            STD(i, m) = 0
            'Fnl_STD(i, m) = 0
        Next m
    Next i

    Num = 0
    For i = 1 To 620
        S = Trim(Sheets("Dividend").Range("B" & i + 4))
        If S <> "" Then
            Num = Num + 1
            Stock(Num) = S
            jthDivDateSeek = 1400
            'Sheets(Stock(num)).Range("D5:E1300").ClearContents
            For j = 1 To N
                DDate(Num, j) = Sheets("Dividend").Range("D" & j + i + 3)
                DivChgRate = Sheets("Dividend").Range("G" & j + i + 3)
                'IntOrFnl = Trim(Sheets("Dividend").Range("C" & j + i + 3))
                For k = jthDivDateSeek To 1 Step -1
                    Event_Date = Sheets(Stock(Num)).Range("A" & k + 4)
                    If Event_Date = DDate(Num, j) Then
                        CAR_Sum = 0
                        For m = -5 To 5
                            AR(Num, j, m) = Sheets(Stock(Num)).Range("C" & k + 4 + m) - Sheets("All Share").Range("C" & k + 4 + m)
                            CAR_Sum = CAR_Sum + AR(Num, j, m)
                            CAR(Num, j, m) = CAR_Sum
                            'Sheets(Stock(Num)).Range("D" & k + 4 + m) = AR(Num, j, m)
                            'Sheets(Stock(Num)).Range("E" & k + 4 + m) = CAR(Num, j, m)

                                If DivChgRate < -0.5 Then
                                    P_Seq = 1
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate < -0.2 Then
                                    P_Seq = 2
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
```

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```
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate < -0.1 Then
                    P_Seq = 3
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate < -0 Then
                    P_Seq = 4
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate = 0 Then
                    P_Seq = 5
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate < 0.1 Then
                    P_Seq = 6
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate < 0.2 Then
                    P_Seq = 7
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate < 0.5 Then
                    P_Seq = 8
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                ElseIf DivChgRate < 1 Then
                    P_Seq = 9
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                Else
                    P_Seq = 10
                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                End If
            Next m
            jthDivDateSeek = k
            k = 1
            End If
        Next k
    Next j
End If
Next i

For i = 1 To P_Num
    For m = -5 To 5
        If DOF(i, m) <> 0 Then
            AAR(i, m) = AAR(i, m) / DOF(i, m)
            ACAR(i, m) = ACAR(i, m) / DOF(i, m)
        End If

        For j = 1 To DOF(i, m)
            STD(i, m) = STD(i, m) + (Smpl(i, m, j) - AAR(i, m)) ^ 2
        Next j

        STD(i, m) = Sqr(STD(i, m) / (DOF(i, m) - 1))
        'Fnl_STD(i, m) = Sqr(Fnl_STD(i, m) / (Fnl_DOF(i, m) - 1))
        Tstat(i, m) = AAR(i, m) * Sqr(DOF(i, m)) / STD(i, m)
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```
            'Fnl_Tstat(i, m) = Fnl_AAR(i, m) * Sqr(Fnl_DOF(i, m)) / Fnl_STD(i, m)

            Sheets("stats4").Cells(m + 10, i + 1) = AAR(i, m)
            Sheets("stats4").Cells(m + 25, i + 1) = ACAR(i, m)
            'Sheets("stats2").Cells(m + 10, i + 7) = Fnl_AAR(i, m)
            'Sheets("stats2").Cells(m + 25, i + 7) = Fnl_ACAR(i, m)
            Sheets("stats4").Cells(m + 10, i + 12) = Tstat(i, m)
            'Sheets("stats4").Cells(m + 10, i + 19) = Fnl_Tstat(i, m)
        Next m

        Sheets("stats4").Cells(20, i + 12) = DOF(i, 0) - 1
        'Sheets("stats2").Cells(20, i + 19) = Fnl_DOF(i, 0) - 1
    Next i

End Sub
```

2.4 T-test of Interim and Final Dividend Effects Comparison

```
Option Base 1
Sub Test_3()
    Dim i, j, k, m, Num, jthDivDateSeek As Integer
    Dim S, Stock(), DDate(), Event_Date, IntOrFnl As String, S_Num, N As Integer, AR(), CAR() As Double, CAR_Sum As Double
    S_Num = 48
    N = 10
    ReDim Stock(S_Num), DDate(S_Num, N), AR(1 To S_Num, 1 To N, -5 To 5), CAR(1 To S_Num, 1 To N, -5 To 5)

    Dim DivChgRate, AAR(), ACAR() As Double, DOF(), Fnl_DOF(), P_Num, P_Seq As Integer
    P_Num = 3
    ReDim AAR(1 To P_Num, -5 To 5), ACAR(1 To P_Num, -5 To 5), DOF(1 To P_Num, -5 To 5), Fnl_DOF(1 To P_Num, -5 To 5)

    Dim Fnl_AAR(), Fnl_ACAR() As Double
    ReDim Fnl_AAR(1 To P_Num, -5 To 5), Fnl_ACAR(1 To P_Num, -5 To 5)

    Dim Smpl(), Fnl_Smpl(), STD(), Fnl_STD(), Tstat(), Fnl_Tstat() As Double
    ReDim STD(1 To P_Num, -5 To 5), Fnl_STD(1 To P_Num, -5 To 5), Tstat(1 To P_Num, -5 To 5), Fnl_Tstat(1 To P_Num, -5 To 5), _
          Smpl(1 To P_Num, -5 To 5, 1 To 300), Fnl_Smpl(1 To P_Num, -5 To 5, 1 To 300)

    For i = 1 To P_Num
        For m = -5 To 5
            AAR(i, m) = 0
            ACAR(i, m) = 0
            Fnl_AAR(i, m) = 0
            Fnl_ACAR(i, m) = 0
            DOF(i, m) = 0
            Fnl_DOF(i, m) = 0
            STD(i, m) = 0
            Fnl_STD(i, m) = 0
        Next m
    Next i

    Num = 0
    For i = 1 To 620
        S = Trim(Sheets("Dividend").Range("B" & i + 4))
        If S <> "" Then
            Num = Num + 1
            Stock(Num) = S
            jthDivDateSeek = 1400
            For j = 1 To N
                DDate(Num, j) = Sheets("Dividend").Range("D" & j + i + 3)
                DivChgRate = Sheets("Dividend").Range("G" & j + i + 3)
                IntOrFnl = Trim(Sheets("Dividend").Range("C" & j + i + 3))
                For k = jthDivDateSeek To 1 Step -1
                    Event_Date = Sheets(Stock(Num)).Range("A" & k + 4)
                    If Event_Date = DDate(Num, j) Then
                        CAR_Sum = 0
                        For m = -5 To 5
                            AR(Num, j, m) = Sheets(Stock(Num)).Range("C" & k + 4 + m) - Sheets("All Share").Range("C" & k + 4 + m)
                            CAR_Sum = CAR_Sum + AR(Num, j, m)
                            CAR(Num, j, m) = CAR_Sum

                                If DivChgRate < -0 Then
                                    If IntOrFnl = "INTERM" Then
```

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```
                                P_Seq = 1
                                AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                            Else
                                P_Seq = 1
                                Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                            End If
                        ElseIf DivChgRate = 0 Then
                            If IntOrFnl = "INTERM" Then
                                P_Seq = 2
                                AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                            Else
                                P_Seq = 2
                                Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                            End If
                        Else
                            If IntOrFnl = "INTERM" Then
                                P_Seq = 3
                                AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                            Else
                                P_Seq = 3
                                Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                            End If
                        End If
                    Next m
                jthDivDateSeek = k
                k = 1
                End If
            Next k
        Next j
    End If
Next i

For i = 1 To P_Num
    For m = -5 To 5
        If DOF(i, m) <> 0 Then
            AAR(i, m) = AAR(i, m) / DOF(i, m)
            ACAR(i, m) = ACAR(i, m) / DOF(i, m)
        End If
        If Fnl_DOF(i, m) <> 0 Then
            Fnl_AAR(i, m) = Fnl_AAR(i, m) / Fnl_DOF(i, m)
            Fnl_ACAR(i, m) = Fnl_ACAR(i, m) / Fnl_DOF(i, m)
        End If

        For j = 1 To DOF(i, m)
            STD(i, m) = STD(i, m) + (Smpl(i, m, j) - AAR(i, m)) ^ 2
        Next j
        For j = 1 To DOF(i, m)
            Fnl_STD(i, m) = Fnl_STD(i, m) + (Fnl_Smpl(i, m, j) - Fnl_AAR(i, m)) ^ 2
        Next j

        STD(i, m) = Sqr(STD(i, m) / (DOF(i, m) - 1))
        Fnl_STD(i, m) = Sqr(Fnl_STD(i, m) / (Fnl_DOF(i, m) - 1))
        Tstat(i, m) = AAR(i, m) * Sqr(DOF(i, m)) / STD(i, m)
        Fnl_Tstat(i, m) = Fnl_AAR(i, m) * Sqr(Fnl_DOF(i, m)) / Fnl_STD(i, m)
        Sheets("stats3").Cells(m + 10, i * 2) = AAR(i, m)
        Sheets("stats3").Cells(m + 25, i * 2) = ACAR(i, m)
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```
            Sheets("stats3").Cells(m + 10, i * 2 + 1) = Fnl_AAR(i, m)
            Sheets("stats3").Cells(m + 25, i * 2 + 1) = Fnl_ACAR(i, m)
            Sheets("stats3").Cells(m + 10, i * 2 + 7) = Tstat(i, m)
            Sheets("stats3").Cells(m + 10, i * 2 + 8) = Fnl_Tstat(i, m)
        Next m

        Sheets("stats3").Cells(20, i * 2 + 7) = DOF(i, 0) - 1
        Sheets("stats3").Cells(20, i * 2 + 8) = Fnl_DOF(i, 0) - 1
    Next i
End Sub
```

2.5 Percentage Change Effects of Interim and Final Dividend Announcements

```
Option Base 1
Sub Test_1()
'define variables
    Dim i, j, k, m, Num, jthDivDateSeek As Integer
    Dim S, Stock(), DDate(), Event_Date, IntOrFnl As String, S_Num, N As Integer, AR(), CAR() As Double, CAR_Sum As Double

'S_Num is the number the stocks
'N is the number of the dividends paying
    S_Num = 48
    N = 10

    ReDim Stock(S_Num), DDate(S_Num, N), AR(1 To S_Num, 1 To N, -5 To 5), CAR(1 To S_Num, 1 To N, -5 To 5)

'while "Fnl_*" is a variable for the final term, "*" for interim
    Dim DivChgRate, AAR(), ACAR() As Double, DOF(), Fnl_DOF(), P_Num, P_Seq As Integer

'P_Num is the number of ranges of the dividend change
    P_Num = 5
    ReDim AAR(1 To P_Num, -5 To 5), ACAR(1 To P_Num, -5 To 5), DOF(1 To P_Num, -5 To 5), Fnl_DOF(1 To P_Num, -5 To 5)

    Dim Fnl_AAR(), Fnl_ACAR() As Double
    ReDim Fnl_AAR(1 To P_Num, -5 To 5), Fnl_ACAR(1 To P_Num, -5 To 5)

    Dim Smpl(), Fnl_Smpl(), STD(), Fnl_STD(), Tstat(), Fnl_Tstat() As Double
    ReDim STD(1 To P_Num, -5 To 5), Fnl_STD(1 To P_Num, -5 To 5), Tstat(1 To P_Num, -5 To 5), Fnl_Tstat(1 To P_Num, -5 To 5), _
          Smpl(1 To P_Num, -5 To 5, 1 To 300), Fnl_Smpl(1 To P_Num, -5 To 5, 1 To 300)

'set the initial values to zero
    For i = 1 To P_Num
        For m = -5 To 5
            AAR(i, m) = 0
            ACAR(i, m) = 0
            Fnl_AAR(i, m) = 0
            Fnl_ACAR(i, m) = 0
            DOF(i, m) = 0
            Fnl_DOF(i, m) = 0
            STD(i, m) = 0
            Fnl_STD(i, m) = 0
        Next m
    Next i

'start the loop
    Num = 0
    For i = 1 To 620
'the data is put in the sheet named "Dividend"
'read the stock name from column "B"
        S = Trim(Sheets("Dividend").Range("B" & i + 4))
        If S <> "" Then
'vector variable Stock() is for the stock's name
            Num = Num + 1
            Stock(Num) = S
            jthDivDateSeek = 1400

            For j = 1 To N
'matrix DDate() is for the dividend date, and DivChgRate for dividend change rate
                DDate(Num, j) = Sheets("Dividend").Range("D" & j + i + 3)
                DivChgRate = Sheets("Dividend").Range("G" & j + i + 3)
'IntOrFnl means the internal or final dividend
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                IntOrFnl = Trim(Sheets("Dividend").Range("C" & j + i + 3))
                CAR_Sum = 0
'the loop goes from bottom to top
                For k = jthDivDateSeek To 1 Step -1
'seek event date which is in the sheet names with the stock's name
                    Event_Date = Sheets(Stock(Num)).Range("A" & k + 4)
                    If Event_Date = DDate(Num, j) Then
                        CAR_Sum = 0
                        For m = -5 To 5
'each Num for a stock, j for the ordial number of dividend, m for the day in the period
'AR() is the abnormal return, CAR cumulative abnormal return
                            AR(Num, j, m) = Sheets(Stock(Num)).Range("C" & k + 4 + m) - Sheets("All Share").Range("C" & k + 4 + m)
                            CAR_Sum = CAR_Sum + AR(Num, j, m)
                            CAR(Num, j, m) = CAR_Sum
                            Sheets(Stock(Num)).Range("D" & k + 4 + m) = AR(Num, j, m)
                            Sheets(Stock(Num)).Range("E" & k + 4 + m) = CAR(Num, j, m)

'investigate different situations
'for interim dividend
'AAR() is average abnormal return
'DOF() is the numbers of sample falling into the range
'ACAR() is average cumulative abnormal return
                            If IntOrFnl = "INTERM" Then
                                If DivChgRate < -0.5 Then
                                    P_Seq = 1
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate < 0 Then
                                    P_Seq = 2
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate = 0 Then
                                    P_Seq = 3
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate <= 0.5 Then
                                    P_Seq = 4
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                Else
                                    P_Seq = 5
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                End If
'for final dividend
                            Else
                                If DivChgRate < -0.5 Then
                                    P_Seq = 1
                                    Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                    Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                    Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate < 0 Then
                                    P_Seq = 2
                                    Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                    Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                    Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf DivChgRate = 0 Then
                                    P_Seq = 3
                                    Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                    Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                    Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
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```
                                ElseIf DivChgRate <= 0.5 Then
                                    P_Seq = 4
                                    Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                    Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                    Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                                Else
                                    P_Seq = 5
                                    Fnl_AAR(P_Seq, m) = Fnl_AAR(P_Seq, m) + AR(Num, j, m)
                                    Fnl_DOF(P_Seq, m) = Fnl_DOF(P_Seq, m) + 1
                                    Fnl_ACAR(P_Seq, m) = Fnl_ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Fnl_Smpl(P_Seq, m, Fnl_DOF(P_Seq, m)) = AR(Num, j, m)
                                End If
                            End If
                        Next m
'reset the value of jthDivDateSeek shorten next loop
'set k=1 to end this loop
                            jthDivDateSeek = k
                            k = 1
                            End If
                        Next k

                If CAR_Sum = 0 Then
                    Sheets("stats1").Range("Z1") = i
                    Sheets("stats1").Range("Z2") = j
                    Exit Sub
                End If

                Next j
            End If
        Next i

        For i = 1 To P_Num
            For m = -5 To 5
'calculate each day's average abnormal return and average cumulative abnormal return for interim
                If DOF(i, m) <> 0 Then
                    AAR(i, m) = AAR(i, m) / DOF(i, m)
                    ACAR(i, m) = ACAR(i, m) / DOF(i, m)
                End If
'calculate each day's average abnormal return and average cumulative abnormal return for final
                If Fnl_DOF(i, m) <> 0 Then
                    Fnl_AAR(i, m) = Fnl_AAR(i, m) / Fnl_DOF(i, m)
                    Fnl_ACAR(i, m) = Fnl_ACAR(i, m) / Fnl_DOF(i, m)
                End If

'calculate each day's standard deviation of average abnormal return for interim and final
                For j = 1 To DOF(i, m)
                    STD(i, m) = STD(i, m) + (Smpl(i, m, j) - AAR(i, m)) ^ 2
                Next j
                For j = 1 To Fnl_DOF(i, m)
                    Fnl_STD(i, m) = Fnl_STD(i, m) + (Fnl_Smpl(i, m, j) - Fnl_AAR(i, m)) ^ 2
                Next j

'calculate each day's t-statistic for interim and final
'note the degree for s-stat is "DOF-1"
                STD(i, m) = Sqr(STD(i, m) / (DOF(i, m) - 1))
                Fnl_STD(i, m) = Sqr(Fnl_STD(i, m) / (Fnl_DOF(i, m) - 1))
                Tstat(i, m) = AAR(i, m) * Sqr(DOF(i, m)) / STD(i, m)
                Fnl_Tstat(i, m) = Fnl_AAR(i, m) * Sqr(Fnl_DOF(i, m)) / Fnl_STD(i, m)

                Sheets("Stats1").Cells(m + 10, i + 1) = AAR(i, m)
                Sheets("Stats1").Cells(m + 25, i + 1) = ACAR(i, m)
                Sheets("Stats1").Cells(m + 10, i + 7) = Fnl_AAR(i, m)
                Sheets("Stats1").Cells(m + 25, i + 7) = Fnl_ACAR(i, m)
                Sheets("Stats1").Cells(m + 10, i + 13) = Tstat(i, m)
                Sheets("Stats1").Cells(m + 10, i + 19) = Fnl_Tstat(i, m)
            Next m

            Sheets("Stats1").Cells(20, i + 13) = DOF(i, 0) - 1
            Sheets("Stats1").Cells(20, i + 19) = Fnl_DOF(i, 0) - 1
        Next i

End Sub
```

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2.6 Size Effects of Stock Prices

```
Option Base 1
Sub Test_5()
    Dim i, j, k, m, Num, jthDivDateSeek As Integer
    Dim S, Stock(), DDate(), Event_Date, IntOrFnl As String, S_Num, N As Integer, AR(), CAR() As Double, CAR_Sum As Double
    S_Num = 48
    N = 10
    ReDim Stock(S_Num), DDate(S_Num, N), AR(1 To S_Num, 1 To N, -5 To 5), CAR(1 To S_Num, 1 To N, -5 To 5)

    Dim DivChgRate, AAR(), ACAR() As Double, DOF(), Inc_DOF(), P_Num, P_Seq As Integer
    P_Num = 3
    ReDim AAR(1 To P_Num, -5 To 5), ACAR(1 To P_Num, -5 To 5), DOF(1 To P_Num, -5 To 5), Inc_DOF(1 To P_Num, -5 To 5)

    Dim Inc_AAR(), Inc_ACAR() As Double, Price As Long
    ReDim Inc_AAR(1 To P_Num, -5 To 5), Inc_ACAR(1 To P_Num, -5 To 5)

    Dim Smpl(), Inc_Smpl(), STD(), Inc_STD(), Tstat(), Inc_Tstat() As Double
    ReDim STD(1 To P_Num, -5 To 5), Inc_STD(1 To P_Num, -5 To 5), Tstat(1 To P_Num, -5 To 5), Inc_Tstat(1 To P_Num, -5 To 5), _
          Smpl(1 To P_Num, -5 To 5, 1 To 300), Inc_Smpl(1 To P_Num, -5 To 5, 1 To 300)

    For i = 1 To P_Num
        For m = -5 To 5
            AAR(i, m) = 0
            ACAR(i, m) = 0
            Inc_AAR(i, m) = 0
            Inc_ACAR(i, m) = 0
            DOF(i, m) = 0
            Inc_DOF(i, m) = 0
            STD(i, m) = 0
            Inc_STD(i, m) = 0
        Next m
    Next i

    Num = 0
    For i = 1 To 620
        S = Trim(Sheets("Dividend").Range("B" & i + 4))
        If S <> "" Then
            Num = Num + 1
            Stock(Num) = S
            jthDivDateSeek = 1400
            For j = 1 To N
                DDate(Num, j) = Sheets("Dividend").Range("D" & j + i + 3)
                DivChgRate = Sheets("Dividend").Range("G" & j + i + 3)
                For k = jthDivDateSeek To 1 Step -1
                    Event_Date = Sheets(Stock(Num)).Range("A" & k + 4)
                    If Event_Date = DDate(Num, j) Then
                        Price = Sheets(Stock(Num)).Range("B" & k + 3)
                        CAR_Sum = 0
                        For m = -5 To 5
                            AR(Num, j, m) = Sheets(Stock(Num)).Range("C" & k + 4 + m) - Sheets("All Share").Range("C" & k + 4 + m)
                            CAR_Sum = CAR_Sum + AR(Num, j, m)
                            CAR(Num, j, m) = CAR_Sum
                            If DivChgRate < 0 Then
                                If Price <= 1000 Then
                                    P_Seq = 1
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                ElseIf Price <= 5000 Then
                                    P_Seq = 2
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                Else
                                    P_Seq = 3
                                    AAR(P_Seq, m) = AAR(P_Seq, m) + AR(Num, j, m)
                                    DOF(P_Seq, m) = DOF(P_Seq, m) + 1
                                    ACAR(P_Seq, m) = ACAR(P_Seq, m) + CAR(Num, j, m)
                                    Smpl(P_Seq, m, DOF(P_Seq, m)) = AR(Num, j, m)
                                End If
```

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```
                        ElseIf DivChgRate > 0 Then
                            If Price <= 1000 Then
                                P_Seq = 1
                                Inc_AAR(P_Seq, m) = Inc_AAR(P_Seq, m) + AR(Num, j, m)
                                Inc_DOF(P_Seq, m) = Inc_DOF(P_Seq, m) + 1
                                Inc_ACAR(P_Seq, m) = Inc_ACAR(P_Seq, m) + CAR(Num, j, m)
                                Inc_Smpl(P_Seq, m, Inc_DOF(P_Seq, m)) = AR(Num, j, m)
                            ElseIf Price <= 5000 Then
                                P_Seq = 2
                                Inc_AAR(P_Seq, m) = Inc_AAR(P_Seq, m) + AR(Num, j, m)
                                Inc_DOF(P_Seq, m) = Inc_DOF(P_Seq, m) + 1
                                Inc_ACAR(P_Seq, m) = Inc_ACAR(P_Seq, m) + CAR(Num, j, m)
                                Inc_Smpl(P_Seq, m, Inc_DOF(P_Seq, m)) = AR(Num, j, m)
                            Else
                                P_Seq = 3
                                Inc_AAR(P_Seq, m) = Inc_AAR(P_Seq, m) + AR(Num, j, m)
                                Inc_DOF(P_Seq, m) = Inc_DOF(P_Seq, m) + 1
                                Inc_ACAR(P_Seq, m) = Inc_ACAR(P_Seq, m) + CAR(Num, j, m)
                                Inc_Smpl(P_Seq, m, Inc_DOF(P_Seq, m)) = AR(Num, j, m)
                            End If
                        End If
                    Next m
                jthDivDateSeek = k
                k = 1
                End If
            Next k
        Next j
    End If
Next i

For i = 1 To P_Num
    For m = -5 To 5
        If DOF(i, m) <> 0 Then
            AAR(i, m) = AAR(i, m) / DOF(i, m)
            ACAR(i, m) = ACAR(i, m) / DOF(i, m)
        End If
        If Inc_DOF(i, m) <> 0 Then
            Inc_AAR(i, m) = Inc_AAR(i, m) / Inc_DOF(i, m)
            Inc_ACAR(i, m) = Inc_ACAR(i, m) / Inc_DOF(i, m)
        End If

        For j = 1 To DOF(i, m)
            STD(i, m) = STD(i, m) + (Smpl(i, m, j) - AAR(i, m)) ^ 2
        Next j
        For j = 1 To Inc_DOF(i, m)
            Inc_STD(i, m) = Inc_STD(i, m) + (Inc_Smpl(i, m, j) - Inc_AAR(i, m)) ^ 2
        Next j

        STD(i, m) = Sqr(STD(i, m) / (DOF(i, m) - 1))
        Inc_STD(i, m) = Sqr(Inc_STD(i, m) / (Inc_DOF(i, m) - 1))
        Tstat(i, m) = AAR(i, m) * Sqr(DOF(i, m)) / STD(i, m)
        Inc_Tstat(i, m) = Inc_AAR(i, m) * Sqr(Inc_DOF(i, m)) / Inc_STD(i, m)

        Sheets("stats5").Cells(m + 10, i + 1) = AAR(i, m)
        Sheets("stats5").Cells(m + 25, i + 1) = ACAR(i, m)
        Sheets("stats5").Cells(m + 41, i + 1) = Inc_AAR(i, m)
        Sheets("stats5").Cells(m + 56, i + 1) = Inc_ACAR(i, m)
        Sheets("stats5").Cells(m + 10, i + 5) = Tstat(i, m)
        Sheets("stats5").Cells(m + 25, i + 5) = Inc_Tstat(i, m)
    Next m

    Sheets("stats5").Cells(36, i + 5) = DOF(i, 0) - 1
    Sheets("stats5").Cells(42, i + 5) = Inc_DOF(i, 0) - 1
Next i

End Sub
```

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