# Stock Price Reaction to Dividend Changes

*An Empirical Analysis of the Johannesburg Securities Exchange*

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**A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in Finance and Investment**

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# ABSTRACT

This paper provides an empirical analysis of the stock price behaviour of firms listed on the Johannesburg Securities Exchange (JSE) around corporate events relating to final cash dividend change announcements over the period 2004 to 2009. Declared for the financial year-end, final cash dividend announcements either represent an increase, a reduction or no change relative to the previous year's announcement. In this paper we analyse the stock price behaviour of firms that announced dividend reductions before and during the Global Financial Crisis of 2007 (GFC 2007). The pre-crisis analysis focuses on dividend reduction effects on share price during normal economic times and crisis analysis focuses on effects during economic downturn. We refer to the pre and during crises effects as firm-specific and systemic effects respectively. Studies about the general effect of dividend announcements on shareholder value are well documented; however our study is motivated by the fact that there has not been an abundance of forthcoming research in South Africa pertaining to how share prices have reacted to dividend reductions before and during the GFC 2007. We employ an event study methodology in the context of this emerging market to assess the share price behaviour to dividend reductions. Integral to an event study methodology in the corporate context, is the analysis of abnormal performance around the event date. Abnormal performance is measured by employing three widely used quantitative approaches namely, the market-adjusted, market model and the buy-and-hold abnormal return approaches. Based on daily closing share price information collected from iNet Bridge database, abnormal performance is calculated from 2004 to 2009 while controlling for the contemporaneous effect of earnings announcements (earnings data collected from Bloomberg database) occurring within 10 trading days of dividend announcement. The analysis shows that the market reaction is not statistically significant on the announcement day and that more negative returns occur during the pre-crisis period. Volatility of abnormal returns is higher during the pre-crisis period. The research does not support the Irrelevance Theory but seems to support the signalling hypothesis.

**Keywords:** *Johannesburg Securities Exchange, Final Cash Dividend, Global Financial Crisis, Firm-Specific Effects, Systemic Effects, Abnormal Performance, Market Adjusted Abnormal Return, Market Model Abnormal Return, Buy-and-Hold Abnormal Return*

# DECLARATION

I, **Enos Nkgwalepane Lentsoane**, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Finance and Investment in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

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(Enos Nkgwalepane Lentsoane)

Signed at …………………………………………………

On the …………………………….. day of ………………………… 2011

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# Chapter 1: Introduction

## 1.1 Purpose of the study

The purpose of this research is to analyse the stock price reaction of firms listed on the Johannesburg Securities Exchange (JSE) to dividend reductions or suspensions over the period 2004 to 2009. This period of analysis was chosen such that it consists of the Global Financial Crisis of 2007 (GFC 2007) period. The objective is to assess the market reaction to dividend reductions before and during the GFC 2007. The pre-crisis analysis endeavours to assess stock price reaction to dividend changes that are made or announced during normal economic conditions (firm-specific effects) while the crisis analysis aims to gauge the systemic effects of dividend changes. Literature on share price reactions to dividend announcements is abundant in South Africa, however since GFC 2007, not much literature has been forthcoming assessing the share price reaction to dividend reductions or suspension during the downturn. This event study analysis therefore presents an opportunity to test theories and hypothesis relating to corporate dividend policy e.g. Miller and Modigliani (1961) Dividend Irrelevance Theory and Signalling Hypothesis - Bhattacharya (1979), over the period of study. This paper is amongst the first to gauge the behaviour of firms' stock prices around corporate dividend events before and during GFC 2007 in South Africa.

## 1.2 Context of the study

The topic about corporate dividend policy is an important subject in the field of corporate finance and there has been ongoing research on whether dividend policy matters. At the centre of dividend policy is the question of whether firms would always pay dividend or retain earnings to invest in positive net present value projects for its shareholders (Firer, et al., 2008). Dividends are by definition, the portion of a company's earnings, decided by the board of directors, distributed to the shareholders. There are various forms of corporate actions pertaining to dividend announcements made by firms listed on the JSE exchange and these are classified into three broad categories namely, final, interim and preliminary. To illustrate the magnitude of the cash outlay associated with dividend payout, in 2006, JSE companies paid around R110 billion in dividends to their shareholders (Firer, et al., 2008). However, there are other schools of research that have developed and proven theories suggesting that dividend policy does not matter e.g. dividend irrelevance theory (Miller and Modigliani, 1961). Most of these studies conclude that their empirical analyses support the dividend irrelevance theory. In the context of the South African market i.e. the JSE, it has also been shown that dividend irrelevance theory holds. However, research on what was the effect of cut in dividends on the share price or the market as a whole during the crisis is limited. Most of the research that has been done for emerging (including South Africa) and developed markets, focussed primarily at analysing the declaration effects on shareholder value. The JSE exchange is ranked as one of the top 20 exchanges in the world by market capitalisation. The majority of this market capitalisation is attributable to the companies listed on the Main Board which also consists of the listings of the top 40 stocks. There are approximately 340 shares listed on the JSE Main Board which houses the same sectors grouped according to the London Stock Exchange (www.jse.co.za).

## 1.3 Problem statement

### *1.3.1 Main Problem*

To analyse and interpret results of the firm's stock price behaviour around corporate dividend relating to dividend reductions over the period 2004 to 2009. The analysis is conducted on the JSE listed firms.

### *1.3.2 Sub-problems*

- To compare the severity of market reaction to dividend cuts before and during the Global Financial Crisis of 2007.

- To test for the abnormal return significance using event study metrics of average and cumulative abnormal returns

- To deduce whether the South African market (emerging market) supports the informational content of dividend hypothesis and whether the study is in line with other emerging market or international studies

- To recommend future areas of study on this topical issue relating to corporate dividend policy in South Africa

## 1.4 Research questions

The financial market impact of the subprime mortgage crisis of 2007 was catastrophic. A large number of "too large to fail" financial institutions either failed or were rescued by governments during the crisis. In order to circumvent the likelihood of failure, some institutions took decisions relating to distribution of earnings in the form of dividends. Instead, they cut back or suspended dividends. Below are some of the questions that the report will address:

- There has not been a lot of research conducted on the JSE exchange since the subprime mortgage crisis, pertaining to how the market reacted during the crisis to announcements of dividend cuts or suspensions. How has the market responded to such decisions and what happened to the share prices of companies that announced dividend cuts or suspended dividends?

- For comparative purposes, does the market react more to dividend cuts or suspensions if such decisions are made during a crisis period or during normal economic periods?

- Does the dividend payment or announcement impact on share price support any of the hypotheses such as irrelevance theory? Did the announcement of dividend cuts or suspension have a signalling effect about the underlying firm's future earnings' prospects during the crisis?

- Since dividend policy differs from company to company and the majority of JSE-listed companies follow a constant dividend payout policy, will the effect dividend payment have a significant effect on share price?

## 1.5 Significance of the study

- The study fills a gap in that literature on the *"South African market reaction to dividend reductions or suspensions pre and during financial crisis"* is not abundant

- The study establishes, in the context of JSE, whether markets react more to dividend cuts or suspensions if made during a financial crisis or normal economic phase

- The study provides an opportunity to test some of the theories developed in academia on the domestic market e.g. does evidence from the JSE support the Miller and Modigliani (1961) hypothesis of dividend irrelevancy

## 1.6 Delimitations of the study

The research only covers the sample of shares listed on the JSE Main Board that announced dividends cuts over the chosen period of study. Furthermore, since there are various basic types of dividends announced by JSE listed firms e.g. extra dividends, special dividends and liquidating dividends (Firer *et al* 2008), the report only focuses on regular cash dividend. We also control for confounding earnings effect resulting from the joint announcement of earnings and dividends. Selection criteria is discussed later in the research.

# Chapter 2: Literature review

## 2.1 Introduction

This chapter provides literature review pertaining to dividends and is structured as follows. Discussion of dividend policy theory is provided in section 2.2. This is followed in section 2.3 by a discussion of literature on dividend payment effect on shareholder wealth, and provides an overview of some of the international studies conducted. Section 2.4 provides a detailed overview of studies conducted in emerging markets including South Africa. The last section articulates the main issue relating to dividend cuts or suspension.

## 2.2 Dividend policy

At the heart of dividend policy is the question of whether the firm would always pay dividend or retain earnings to invest in positive net present value projects. There are however, schools of research that have developed and proven theories suggesting that dividend policy does not matter e.g. dividend irrelevance theory (Miller and Modigliani, 1961). Several studies conducted on the effect of dividend policy on share prices have supported the dividend irrelevance theory. There is an abundance of literature pertaining to the topic of dividend policy effects on the share price. Miller and Modigliani (1961) concluded that dividend payments should have no impact on shareholder value in the absence of taxes and market imperfections. This algebraically derived theory is well-known in academia as the Dividend Irrelevance Theory. The implication of this is that firms should instead be focussing on investing earnings in value-adding i.e. positive net present value projects, instead of paying them out to shareholders in the form of dividends. There are also theories around tax preferences of shareholders. The Gordon Growth Model (1959) postulates that the value of the share price is the present value of future expected dividends. Some hypotheses in academic literature suggest that firms pay dividends to signal future earnings prospects of the companies. This signal is called the information content effect of dividend (Firer et al., 2008).

## 2.3 Dividend payment effect on share price

Despite literature pertaining to dividend policies, stock market data shows that firms do pay dividends. In a recent international study of why firms pay dividends, it was found that there is little evidence of a positive systematic relationship between dividend payments and prices for countries outside the US (Denis and Osobov 2007). The findings of the report cast doubt on signalling, clientele effect, catering explanations for dividends and supported agency cost-based lifecycle theories. Dividends as mentioned are paid out of earnings and while on the contention of information content of dividends i.e. whether dividends signal more earnings or future firm's earnings prospects, (Araujo *et al* 2004) took a mathematical approach involving equilibrium models to illustrate that dividends have an informational content about a firms future earnings prospects. However, their dividend signalling model indicated that firms with low earnings may pay high dividends to be considered as high-earning firms. Fuller and Goldstein (2003) showed that dividend paying firms have higher returns than non-dividend paying firms especially during recessions. This was tested on the S&P 500 stocks. It is in the light of this that this report reviews literature pertaining to various studies that have been conducted on this topic and more specifically to assess the impact on the share price if companies cut back or suspended dividends in the face of financial crisis.

## 2.4 Emerging market studies

### *2.4.1 South Africa*

Sealy and Knight (1987) documented two empirical studies on the JSE aimed at assessing the systematic effect of a firm's dividend policy on its share price. They used methods entailing dividend groupings based on payout ratios and dividend yields and the market model. Their tests revealed that firms' dividend policies do not appear to affect the price of the securities. Another recent study performed on the JSE assessed whether the dividend payments can be explained using Lintner's model derived in the 1950s (Wolmarans 2003). The findings of this research illustrate that the model does not explain the payments in the South African context largely due to data issues. Some entities on the JSE had not been listed for a sufficient period of time while other companies followed a constant payout dividend policy. Ravi and Sirikiat (2007) mention that dividend signal is complete or effective when it is measured in terms of surprise from financial analysts' forecast rather than a surprise from an already paid dividend. Consequently they conclude based on their empirical analysis that stock prices react to dividend surprises. Another research done in the context of the South African market, is by Bhana (1998) where the share price reaction to special (extra) dividend announcement is investigated. The research shows that share prices on the JSE react positively to the announcement of special dividends. It is not expected that most companies make special dividends hence the report focuses largely on final cash dividend payments.

### *2.4.2 Other markets*

Studies in other markets have also been performed in this field; Uddin (2003) study on the Dhaka Stock Exchange (DSE) focussed on the analysis of announcement effects of dividends on the shareholder value. The paper chose this approach after having reviewed other alternatives with the hope that announcement of dividend payments may carry some information for the market and share prices may adjust to this accordingly. However, having applied what appears to be commonly used methodologies (to be discussed later) on 137 shares listed on the DSE, the paper concluded that evidence from DSE tends to support the dividend irrelevance theory.

Moving on to the Indian market, Azhagaiah and Sabari (2008) analysed the impact of dividend policy on shareholder wealth in specific industries. Their research approach entailed multiple and stepwise regression methodologies taking dividend per share, retained earnings per share, lagged dividend/market price per share as explanatory variables and market price per share as the response variable. In a nutshell, their methodology tested whether any of the explanatory variables explained the variability in the share price but with more focus on the dividend per share impact on the share price. Their study showed that there is a significant impact of dividend policy on shareholder value and thus nullified the dividend irrelevance theory.

Travlos *et al* (2001) tested the announcement effect in the case of Cyprus. The empirical results of their research were in favour of the information signalling contention. The studies conducted in this market should be of interest to the JSE since the Cyprus market is also an emerging stock market. Various tests have been conducted on developed market. However the approach used in the analysis is similar to the approach discussed in the research methodology for the JSE listed entities. The paper asserts that due to market microstructure and different information, tax and control environments, the impact of dividend changes is likely to vary across economic environments in different countries.

Thirumalvalavan and Sunitha (2006) studied the developments in the Indian market; Pradhan (2003) studied the effect of dividends and retained earnings on common stock prices in the context of Nepalese companies. The study revealed that dividends were important in Nepal than retained earnings as they increased the market price of a share in Nepal.

The case for the Greek stock market as discussed by Dasilas (2004) focused on the stock price and trading volume sensitivity to dividend distribution announcements. The study documents that there is a significant market reaction to announcements which effectively supports the information content of dividends hypothesis. This paper also uses the abnormal return methods which examines the market-adjusted abnormal returns.

## 2.5 Conclusion

Firer *et al* (2008) highlight the De Beers' share price reaction to dividend reductions in different periods. The study postulates that share price may or may not react to dividend changes. Below is an extract that explains this phenomenon:

*"When De Beers, the world's major diamond producer, announced in 1982 that it had for the first time in 50 years cut its final dividend (by 50 per cent), its share price fell by 13 per cent in week after the announcement. However a decade later, when it cut its final dividend for 1992 by nearly 30 per cent, the share price traded unchanged over the week that followed."*

The primary focus of the report is to assess what happened to the share price of those companies that cut back dividends as a result of the financial crisis. Clearly from the above, share price could react or not react on the news of a cut. Based on the share valuation theory, share price is equal to the net present value of future dividends (the Gordon Growth Model). On that view, one can immediately suspect that dividend cut is likely to hurt the share price unless the company can compellingly persuade shareholders that there will be an offsetting, larger dividend increase in the future. However, this model of pricing equities has its shortcomings as evidenced from the technology sector. This sector has shown that companies can grow in share price and size more or less indefinitely without paying any dividends at all. One of the cited reasons for dividend cuts is a change in economic environment in which the company is incorporated whereby the companies' cash flows are diminishing (the cash flow hypothesis). This is one of the warning signals associated with the financial crisis. Kalay (1980) examined the empirical evidence on dividend cuts and found it to be inconclusive. The study also investigates the informational content of dividend cuts and finds that dividend cuts do have informational content. While some investors may look at a dividend cut and decide that the company management is simply responding appropriately to changing business conditions, the historical evidence indicates that the stock price is likely to suffer upon news of a dividend cut.

# Chapter 3: Research methodology

## 3.1 Introduction

This chapter provides an overview of the methodology employed to address the research problem and questions in this study and is structured as follows: section 3.2 discusses data and sources thereof. Section 3.3 presents an overview of the different types of dividend announcements made in South Africa and discusses briefly the type of dividend that the research focuses on. The final sample selection criterion is provided in section 3.4, followed by an in-depth technical description of the research design in section 3.5.

## 3.2 Data and sources

For this event study research, daily closing share price and dividend announcements data were collected from *iNet datastream* over the time period 1 January 2004 to 31 December 2009. The use of daily rather than monthly share price data permits more precise measurement of abnormal returns and more informative studies of announcement effect (Khotari and Warner, 2006). The dividend announcement data provides information about the very first official date, the executive of a firm declared the dividend. The corporate practice in South Africa regarding dividend and earnings announcements is suspected to be such that both events are announced jointly. If this joint effect of earnings and dividend announcement is not controlled for, there will be a potential for abnormal return distortion. It was as a result of this relation that information on earnings announcement date, a separate event from dividend announcement date, was collected from *Bloomberg database* over the period 2004 to 2009. Dasilas (2004) posits that the effect of joint dividend and earnings announcement should be controlled for i.e. earnings announcement is one of the confounding factors that must be controlled for when analysing dividend effect on share prices. Kane, Lee and Marcus (1985) showed that there is a corroborative relationship between dividend and earnings announcement.

Therefore, abnormal return performance may be distorted if the two announcements are not separated. To circumvent this contagion effect, Dasilas (2004) mention that only dividend announcements that have no corporate events that can distort results 10 days prior and post the announcement should be considered. The following section describes different types of dividend announcements made by companies listed on the JSE.

## 3.3 Dividend types

The dividend announcement data as described in the section 3.2 is drawn for companies listed on the JSE exchange over the period 2004 to 2009. Each data point has the following fields: (a) announcement date (event date); (b) announcement type (various forms described in this section); (c) financial year end; (d) last date of record (LDR); (e) payment date, and (f) dividend per share, expressed in South African cents (ZAC). Table 1 exhibits different types of JSE corporate actions pertaining to dividends. A corporate action is any event which has a material effect on the share price or a shareholder's right (JSE). The abbreviations are in line with iNet dividend database. A brief description of each event type is provided in the last column.

**Table 1: JSE corporate actions definition**

| **Overview of Announcement Types** | | |
|---|---|---|
| Dividend type | Abbreviation | Description |
| Final Capital Issue | FA | Free issue of shares to all existing shareholders for the financial year-end. Also called bonus issue (company feels free to convert part of its reserves into new shares) |
| Final Cash | FC | **Dividend declared for the financial year-end** where an issuer distributes reserves in cash only to the registered owners (and where applicable for the benefit of beneficial owners). |
| Interim Capital Issue | IA | Free issue of shares to all existing shareholders for the financial year-end. Also called bonus issue (company feels free to convert part of its reserves into new shares) |
| Interim Cash | IC | **Dividend paid after a reporting period** where an issuer distributes reserves in cash only to the registered owners (and where applicable for the benefit of beneficial owners). |
| Special Cash | SC | Dividend declared for the interim or financial year-end, over and above the normal dividend |
| Special Script | SS | A process of creating new shares which are given free of charge to existing shareholders normally done in lieu of cash dividend. Scrip dividends generally signal that a firm is short of cash. |

| | | |
|---|---|---|
| Other Types | FO | Final Option |
| | FP | Final Proforma |
| | IO | Interim Dollar |
| | IP | Interim Option |
| | IQ | Interim Proforma |
| | SO | Special Option |

The research focuses on final cash dividend (FC) announcements only. Section 3.4 summarises the sample selection criteria.

## 3.4 Sample selection criteria

To be included in the final sample, JSE listed companies should meet the following criteria which is commonly used in other event studies such as Asquith and Mullins (1983), Vieira and Raposo (2000); Dasilas (2004): (a) company earnings announcements or other factors that may distort the analysis e.g. stock splits, stock dividends, share repurchases etc, did not occur within 10 trading days before and after the dividend announcement; (b) the company has dividend payment history which entails the ordinary final cash dividend payment in the current and previous year. This criterion is important for the calculation of dividend changes from year to year; (c) the firm is listed on the JSE exchange the year before and two years after the dividend events. This criterion controls for de-listings from one year to the next and thus minimizes the survivorship bias; (d) interim and stock dividends are not announced during the event window. This is defined in the next section as 20 days before and after the dividend announcement date, i.e. 41-day event window, and (e) the firm should have price data over the 100 day estimation window.

To control for confounding effects of earnings announcements within 10 trading days of dividend announcements, earnings data was collected from Bloomberg database. The total number of firms that announced final cash dividends over the period of study is 307 (1701 announcements). For each firm, earnings announcement date associated with each dividend event was collected. However, Bloomberg data was available for only 207 of the 307 companies. This resulted in 1163 total number of dividend events after adjusting for the missing earnings data. Table 2 reports the number of dividend events (after adjusting for missing Bloomberg data) classified by sample selection criteria and number of dividend events over the period of study.

**Table 2: Sample selection criteria**

| **Selection criteria** | No. of events (no. of firms) |
|---|---|
| Total number of final cash dividend announcements | 1701 (307) |
| Total number of dividend events after adjusting for missing earnings data | 1163 (207) |
| Dividend events which earnings announcements occurs within 10 trading days of dividend change announcement | 216 |
| Dividend events which earnings announcements are made on the same day as dividend announcements | 698 |
| Total excluded dividend events | 914 |
| Total number of dividend events for analysis | **249 (128)** |

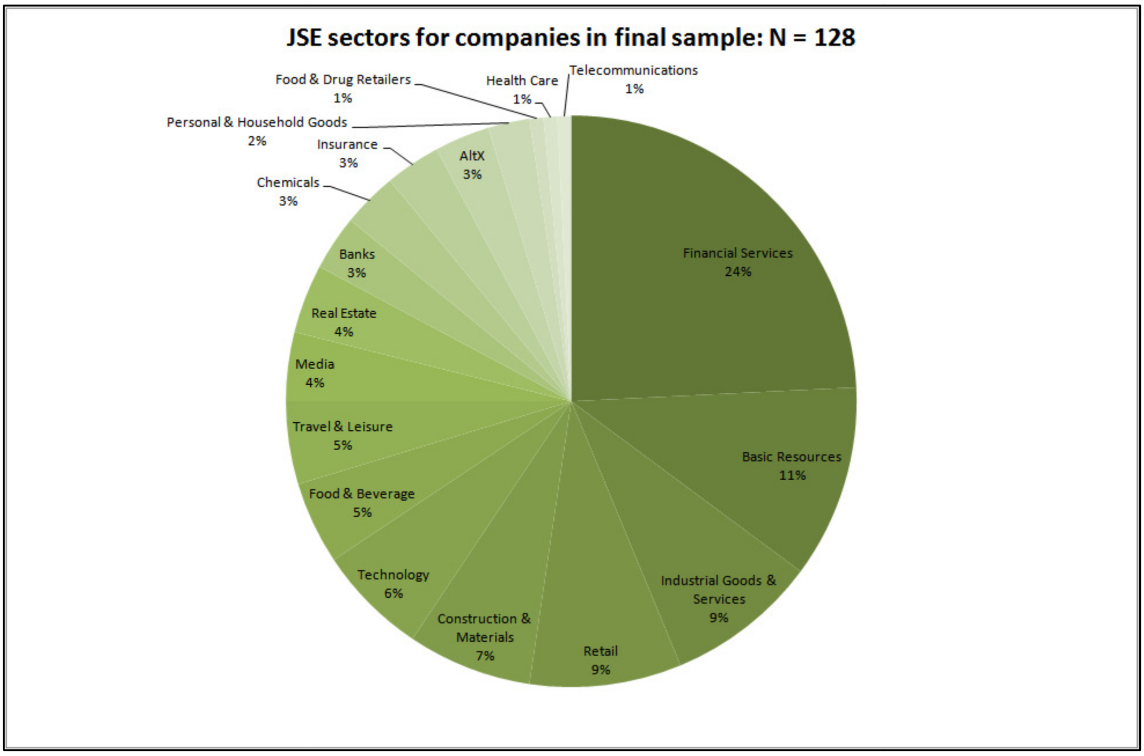
Figures in parentheses show number of firms

For this analysis, all cases that had earnings announcements made within 10 trading days of dividend announcement were excluded. Approximately 19% of dividend events, with the exclusion of joint announcements, occur within 10 trading days of dividend announcements. Furthermore, Table 2 shows that 60% of earnings and dividends events are announced jointly for the JSE listed companies. This resulted in 79% of events being excluded from the analysis. Applying the above sample selection criteria resulted in an unbalanced panel data of 249 events across 128 companies. Table 3 reports the JSE sectors for the companies in the final sample. Overall, it can be seen that the final sample is made up of companies from all sectors on the JSE which are classified according to the Industry Classification Benchmark (ICB). Figure 1 shows the distribution per sector with the majority of companies belonging to the financial services category.

**Table 3: Final sample company sector allocation**

| JSE ICB Sector Allocation | | |
|---|---|---|
| Sector | No of companies | % of companies |
| All dividends (N=249) | | |
| Financial Services | 31 | 24.22% |
| Basic Resources | 14 | 10.94% |
| Industrial Goods & Services | 11 | 8.59% |
| Retail | 11 | 8.59% |
| Construction & Materials | 9 | 7.03% |
| Technology | 8 | 6.25% |
| Food & Beverage | 6 | 4.69% |
| Travel & Leisure | 6 | 4.69% |
| Media | 5 | 3.91% |
| Real Estate | 5 | 3.91% |
| Banks | 4 | 3.13% |
| Chemicals | 4 | 3.13% |
| Insurance | 4 | 3.13% |
| AltX | 4 | 3.13% |
| Personal & Household Goods | 3 | 2.34% |
| Food & Drug Retailers | 1 | 0.78% |
| Health Care | 1 | 0.78% |
| Telecommunications | 1 | 0.78% |
| | 128 | 100% |

**Figure 1: Sector allocation distribution**



## 3.5 Research design

### 3.5.1 Event study overview

This section describes methods used to calculate abnormal performance around an event date with a special focus on the design and statistical properties of event study methods. By definition, event studies assess the stock price reaction or behaviour around corporate events. In the context of this research, the corporate event of interest is dividend reduction. Of particular interest is the assessment abnormal performance magnitude around the event date. The following commonly used abnormal return measurement approaches are employed in this research:

- Market Adjusted Abnormal Return (MAAR)
- Market Model Abnormal Return (MMAR)
- Buy-and-hold abnormal return (BHAR)

Before describing the above measures, it is important to define stages of an event study as documented by Khotari and Warner (2006), Hirvonen (2009) and Thiagarajan and McDonald (2001). Stages of an event study entail the following steps:

- Define event to be tested
- Define period to be studied in terms of estimation window, event window and event date
- Define what is meant by abnormal performance
- Collect event data which meets data selection criteria already defined
- Calculate pre-event abnormal returns
- Calculate abnormal returns over the event window

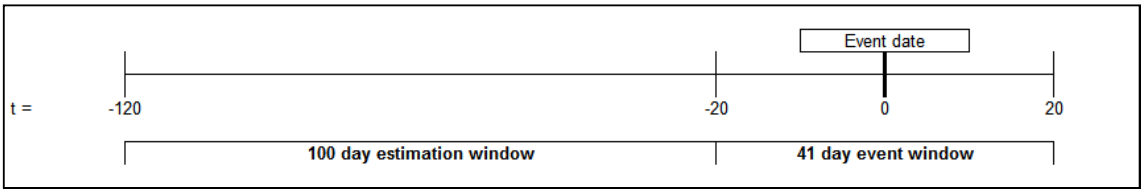
- Calculate the average abnormal return (AAR) and cumulative abnormal return (CAR) for the test statistic

- Determine the critical values (statistical significance) of the AAR and CAR

- Analyse and interpret the results

Figure 2 shows the timeline for abnormal performance measurement. Key aspects of the performance timeline are the estimation window, event window and event date.

**Figure 2: Abnormal performance timeline**




The estimation window consists of 100 trading days. This period is used for the calculation of unbiased estimate of firm's performance in the absence of the event. Expressed differently, the estimation period is important for establishing how the stock returns behave in the absence of the event (Hirvonen 2009). For the MMAR approach, we use ordinary least squares (OLS) approach to quantify regression parameters to be used to estimate abnormal performance in the event window. The event window period defines the number of trading days before and after event. In this study, we study firm's share price behaviour 20 days before and after the event date (day 0). Event window period is important as it shows how long the market takes to adjust to new information; in this case market's reaction to corporate events relating to final cash dividend change announcement. Section 3.5.2 presents the dividend change model.

### *3.5.2 Dividend change model*

The general focus of this research is on firm's stock price reaction to dividend changes. This section presents a simple model for decomposing dividend events into decreases, increases or no change announcements. The dividend change model is therefore described by three formulaic expressions outlined below:

A dividend change is considered constant if the following holds:

$$D_{i,t} = D_{i,t-1} \tag{1}$$

where

$D_{i,t}$ is the firm $i$ current final cash dividend and $D_{i,t-1}$ is the previous year's final cash dividend.

A dividend increase is recorded if the following holds:

$$D_{i,t} > D_{i,t-1} \tag{2}$$

A dividend reduction is recorded if the following holds:

$$D_{i,t} < D_{i,t-1} \tag{3}$$

Application of the dividend change model is illustrated in Section 4.3 where the final unbalanced panel data of 249 events described in Section 3.4 (Table 2) is decomposed into dividend changes.

The next section provides a mathematical description of each abnormal performance measurement approach introduced in Section 3.5.1. Market adjusted abnormal return (MAAR) approach is described first, followed by market model abnormal return (MMAR) approach and lastly, market adjusted buy-and-hold abnormal return (BHAR) approach is described.

### *3.5.3 Abnormal return calculation approaches*

Abnormal returns are calculated as the difference between actual returns and expected returns. Therefore, the generalized form of abnormal return formula for all expected return models is:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \qquad (4)$$

where,

$AR_{i,t}$ *is the abnormal return of firm i on day t, where t* $\in (-20; +20)$

$R_{i,t}$ *is the actual return of firm i on day t, where t* $\in (-20; +20)$

$E(R_{i,t})$ *is the expected return on firm i on day t, where t* $\in (-20; +20)$

**Market Adjusted Abnormal Return**

The first model of abnormal returns we discuss is the Market-Adjusted Abnormal Return (MAAR). In functional form, this is the simplest model. Equation 5 below shows how MAAR is calculated:

$$MAAR_{i,t} = R_{i,t} - R_{m,t} \qquad (5)$$

where

$MAAR_{i,t}$ *is the market adjusted abnormal return of firm i on day t in event window*

$R_{m,t}$ *is the JSE ALSI*[1] *return on day t within the event window*

Equation 5 posits that the expected return on a firm's stock price over the event window can be predicted by the return of the market (JSE ALSI) over the same period (Thiagarajan and McDonald 2001). From modern portfolio theory, Equation 5 is the Jensen's alpha, a measure of active return or outperformance.

[1] All Share Index

### Market Model Abnormal Return

The market model abnormal return (MMAR) entails applying the single-index market model to calculate expected returns as shown by Equation 6 below:

$$E(R_{i,t}) = \propto_i + \beta_i R_{m,t} \qquad (6)$$

Regression coefficients are calculated over the 100-day estimation window (-120, 21) by regressing share price return against the market index return as follows:

$$R_{i,t} = \propto_i + \beta_i R_{m,t} + \varepsilon_t \qquad (7)$$

where

$$\beta_i = \frac{Cov(R_{m,t}, R_{i,t})}{\sigma^2(R_{m,t})} \qquad (8)$$

Therefore the market model abnormal return (MMAR) is computed as follows:

$$MMAR_{i,t} = R_{i,t} - (\widehat{\propto_i} + \widehat{\beta}_i R_{m,t}) \qquad (9)$$

### Buy-and-hold Abnormal Return

Market-adjusted buy-and-hold returns for the dividend events are calculated for different periods as follows:

$$BHAR_{\ i(a\ to\ b)} = \prod_{t=a}^{t=b} (1 + R_{i,t}) - \prod_{t=a}^{t=b} (1 + R_{m,t}) \qquad (10)$$

where

$BHAR_{\ i(a\ to\ b)}$ is the buy and hold abnormal return for share $i$ from time a to b.

### Stock price return calculation

For all the aforementioned models, returns are calculated by employing natural logarithm of the stock market prices as follows:

$$R_{i,t} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right);\ R_{m,t} = \ln\left(\frac{P_{m,t}}{P_{m,t-1}}\right) \qquad (11)$$

where,

$P_{i/m,t} = \text{stock price/market price on day t}$

$P_{i/m,t-1} = \text{stock or market price on day t} - 1,$

$R_{i/m,t} = logarithmic\ return\ of\ the\ stock\ price\ or\ market\ price\ on\ day\ t$

## 3.6 Metrics used to test abnormal returns

The metrics used to measure and test the abnormal return significance are, average abnormal return (AAR) and cumulative abnormal return (CAR). These are applied to the three approaches for calculating abnormal returns within the event window, MAAR, MMAR and BHAR. We now describe AAR and CAR measurements.

### *3.6.1 Average Abnormal Return*

The average abnormal returns for a 41 day-event window (-20, +20) is calculated as follows:

$$\overline{\gamma_t} = \frac{\sum_{i=1}^{N_t} \gamma_{i,t}}{N_t} \qquad (12)$$

where,

$\overline{\gamma_t} = average\ abnormal\ returns\ on\ day\ t, where\ t \in (-20,20)\ and\ \gamma \in (MAAR, MMAR, BHAR)$

$\gamma_{i,t} = abnormal\ returns\ of\ firm\ i\ on\ day\ t\ where\ t \in (-20,20)\ and\ \gamma \in (MAAR, MMAR, BHAR)$

$N_t\ is\ the\ number\ of\ dividend\ events\ on\ day\ t, where\ t \in (-20,20)$

For example, to calculate average abnormal returns for MMAR, formulaic expression of equation 12 becomes:

$$\overline{MMAR_t} = \frac{\sum_{i=1}^{N_t} MMAR_{i,t}}{N_t}$$

### 3.6.2 Cumulative Abnormal Return

Cumulative abnormal returns for all abnormal return types for various event windows around the announcement date as follows:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} \varphi_t \qquad (13)$$

where

$$\varphi_t \in (\overline{MAAR_t}, \overline{MMAR_t}, \overline{BHAR_t})$$

### 3.6.3 Event study tests

To test the significance of the abnormal returns around the event date, the following hypothesis test (for dividend increases, decreases and no change) is performed:

$$H_0 : \overline{\gamma_t} = \mu \;\; where\, \gamma \in (MAAR, MMAR, BHAR)$$

$$H_1 : \overline{\gamma_t} \neq \mu$$

To test the null hypothesis ($H_0$), t-test statistic which is the ratio of cross-sectional mean abnormal returns and their standard deviation (σ) is calculated :

$$t(\overline{\gamma_t}) = \frac{\overline{\gamma_t} - \mu}{\sigma(\overline{\gamma_t})} \qquad (14)$$

To test the null hypothesis that the mean abnormal return as calculated under the three discussed approaches is equal to zero over the event window, the hypothesis test is now stated as follows:

$$H_0 : \overline{\gamma_t} = 0$$

$$H_1 : \overline{\gamma_t} \neq 0$$

The test statistic is therefore,

$$t(\overline{\gamma_t}) = \frac{\overline{\gamma_t}}{\sigma(\overline{\gamma_t})} \qquad (15)$$

If we assume normality assumptions that the mean abnormal returns are independent and identically distributed i.e. $\overline{\gamma_t} \sim iidN(0, \sigma^2(\overline{\gamma_t}))$, then $t(\overline{\gamma_t})$ follows a *t-distribution* with $n-1$ degrees of freedom. The numerator in Equation 15 refers to the average abnormal returns around the event date and the denominator is the variance of the abnormal returns over the same period. There are various ways of calculating this variance and presented below are the approaches used by Thiagarajan and McDonald (2001). These approaches can be summarised into parametric and non-parametric approaches.

**Parametric variance calculation approach**

From the normality assumption of independent and identically distributed mean abnormal returns, the Central Limit Theorem states that there will be convergence to normality as the number of observations increase i.e. $\overline{\gamma_t} \sim N(0, \sigma^2(\overline{\gamma_t}))$. The parametric variance is therefore calculated as follows:

$$\sigma^2(\overline{\gamma_t}) = \frac{\sum_{t=-120}^{-21} (\overline{\gamma_t} - Avg(\overline{\gamma_t}))^2}{100-1} \qquad (16)$$

where

$$Avg(\overline{\gamma_t}) = \frac{\sum_{t=-120}^{-21} (\overline{\gamma_t})}{100} \qquad (17)$$

Thiagarajan and McDonald (2001) explain that the above variance cannot be used when calculating BHARs, as the variance of BHARs is heteroskedastic i.e. time-variant. It must be noted that the above estimates variance over an extended estimation window up to the day before the event. The average abnormal returns used however, are those estimated over the event window, namely 20 days before and after the event.

**Non-parametric variance calculation approach**

Under this method, the variance of abnormal returns is calculated as follows:

$$\sigma^2(\overline{\gamma}_t) = \frac{1}{{N_t}^2}\sum_{i=1}^{N_t}(\gamma_{i,t} - \overline{\gamma}_t)^2 \qquad (18)$$

The test statistics is the same as one stated in Equation 15 but based on the variances represented by Equation 16 (parametric test) and Equation 18 (non-parametric test). The above calculations are based on the average abnormal returns as calculated in Equation 12. In order to calculate based on the cumulative return approach as portrayed in Equation 13, the t-statistics is revised as follows for the parametric test using CARs:

$$t(\overline{CAR}) = \frac{\overline{CAR(t_1, t_2)_t}}{\sigma(\overline{\gamma.AR_t})} * \sqrt{T} \qquad (19)$$

where

$$T = (t_2 - t_1) + 1 \qquad (20)$$

Equation 20 represents the total number of event observations used to calculate the cumulative abnormal return. The non-parametric approach is similar to that presented in Equation 18. Table 4 presents a summary of the tests that will be used to test the null hypothesis.

**Table 4: Summary of event study tests**

| | **Metric used to test abnormal return and test type** | | | |
|---|---|---|---|---|
| | Average Abnormal Return (AAR) | | Cumulative Abnormal Return (CAR) | |
| Return Type | Parametric | Non-parametric | Parametric | Non-parametric |
| Market Adjusted | √ | √ | √ | √ |
| Market Model | √ | √ | √ | √ |
| Buy and Hold | N/A | √ | N/A | √ |

# Chapter4: Presentation of results

## 4.1 Introduction

This chapter presents results of the event study research and is structured as follows. Section 4.2 reports findings on the dividend trend analysis focusing on different dividend announcements, no of firms and the nominal size of dividend per share. The dividend change model application on the final dividend sample consisting of 249 events across 128 companies is presented in Section 4.3 together with year-on-year frequency of dividend changes. Section 4.4 reports final sample's descriptive statistics of dividend per share (DPS), dividend change and dividend yield (DY). Section 4.5 presents results of the event study tests conducted based on the abnormal return performance measures.

## 4.2 Dividend analysis and interpretation

JSE listed companies announce different types of dividends. This is illustrated in Table 5 which provides information on the original data sample on dividends. Panel A reports the number of dividend events per dividend type and the number of firms that made those announcements over the period 2004 to 2009. The total number of firms that made dividend announcements over this period is 313 with a total number of events of 3498. This is before controlling for any earnings announcements as described in the sample selection criteria section. An upward trend in the total number of dividend events over the period 2004 to 2008 is observed followed by a marginal decrease in 2009. Similar trend is notable for the number of firms making these announcements. It is worth noting further, that the relationship between number of announcements and number of dividends is not one-to-one. However, Panel A shows that there exists a positive relationship between the two.

Since the primary focus of this research is final cash dividend announcements, Panel B shows the number of announcements associated with FC announcement over the same period. We observe that the relationship between number of FC announcements and number of firms making FC declarations is on average one-to-one. This is not surprising due to the fact that final dividends are declared for the financial year end by definition and it is a normal practice within the corporate market for FC dividends to be declared once a year. The total number of final cash paying companies over the period of study is 307, with 1701 total number of dividend announcements before controlling for earnings. Dividends in South Africa are declared in South African Cents (ZAC). One South African Rand (ZAR) is equivalent to 100 ZAC.

Panel C shows the sum of dividend per share (DPS) over the period of study. Figure 3 shows the trend in DPS for the overall sample (313 firms) and for the FC sample (307 firms). In 2009, a significant decline in the overall monetary value of DPS (Figure 3, Panel A) is evident. This decline can be attributed to the economic conditions resulting from the GFC 2007. A similar trend is observed for the final cash dividend sample (Figure 3, Panel B). DPS declined by 44% across all dividend types and final cash dividends decreased by 34% (Figure 3, Panel C). The final cash DPS over the pre-crisis period, 2004 to 2006, has been trending upwards and started to decrease from 2007.

**Table 5: Market and dividend data summary**

| **Panel A: Dividend Types** | | **No of dividend events per year: 2004 -2009** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type | Code | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Grand Total |
| Corporate Action | CA | | 4 | 2 | 6 | 2 | 1 | 15 |
| Final Capital Issue | FA | | | | | 1 | 1 | 2 |
| Final Cash | FC | 276 | 274 | 286 | 292 | 288 | 285 | 1701 |
| Final Option | FO | 2 | 2 | 1 | 1 | 2 | 6 | 14 |
| Interim Capital Issue | IA | | | | | | 1 | 1 |
| Interim Cash | IC | 223 | 234 | 249 | 268 | 286 | 285 | 1545 |
| Interim Dollar | IO | | | | | 1 | 4 | 5 |
| Interim Proforma | IQ | 19 | 14 | 12 | 9 | 12 | 11 | 77 |
| Special Cash | SC | 27 | 31 | 30 | 25 | 13 | 8 | 134 |
| Special Option | SO | | 1 | | | | | 1 |
| Special Script | SS | | | 1 | 1 | 1 | | 3 |
| Grand Total | | 547 | 560 | 581 | 602 | 606 | 602 | 3498 |
| **No of firms** | | **276** | **282** | **295** | **297** | **294** | **294** | **313** |

| **Panel B: FC** | | **No of dividend events per year: 2004 -2009** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type | Code | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Grand Total |
| Final Cash | FC | 276 | 274 | 286 | 292 | 288 | 285 | **1701** |
| **No of firms** | **N** | 270 | 273 | 284 | 289 | 288 | 284 | **307** |

| Panel C: DPS | | Sum of Dividend Per Share (1ZAR = 100ZAC) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type | Code | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Grand Total |
| Corporate Action | CA | - | - | - | - | - | - | - |
| Final Capital Issue | FA | - | - | - | - | - | 0 | 0 |
| Final Cash | FC | **91** | **116** | **147** | **213** | **222** | **146** | **935** |
| Final Option | FO | 2 | 0 | 0 | 3 | 4 | 8 | 16 |
| Interim Capital Issue | IA | - | - | - | - | - | 2 | 2 |
| Interim Cash | IC | 55 | 91 | 102 | 132 | 170 | 89 | 638 |
| Interim Dollar | IO | - | - | - | - | 1 | 4 | 4 |
| Interim Proforma | IQ | 4 | 9 | 1 | 1 | 2 | 1 | 19 |
| Special Cash | SC | 37 | 117 | 50 | 95 | 64 | 8 | 370 |
| Special Option | SO | - | 0 | - | - | - | - | 0 |
| Special Script | SS | - | - | 1 | 1 | 0 | - | 1 |
| Grand Total | | 189 | 333 | 300 | 445 | 462 | 257 | 1,986 |

**Figure 3: Announcements, number of firms and dividend per share trend**

## 4.3 Dividend change model

The mathematical description of the dividend change model was introduced in Section 3.5.2. Results of the application of this model on the final dividend event sample consisting of an unbalanced panel data of 249 events is provided in this section. In a nutshell, the model is used to decompose the 249 dividend events into events relating to dividend increases, dividend reductions and no change in dividends. Panel A of Table 6 shows that the 249 dividend events constitute 150 dividend increase events, 55 no changes and 44 dividend reduction events.

Panel B shows the frequency of dividend changes for the final sample of dividend events. The number of dividend increases over the pre-crisis period (2004 to 2006) is higher than the number of dividend increases during the crisis period (2007 – 2009). This implies that fewer companies announced dividend increases during the crisis period. Number of dividend decreases on the other hand increased during the crisis period which implies more companies announced dividend reductions during the economic downturn period. This is intuitive as it is expected that during economic downturn periods like the GFC 2007, company profits tend to be lower compared to normal economic periods. Since dividends are paid out of earnings, it is expected that more firms will reduce dividends during economic downturns.

Figure 4 exhibits the trend explained above and confirms that the frequency of dividend increases decreased post 2006, while the frequency of dividend decreases increased over the same period. The frequency of no change in dividends fluctuated between that of dividend increases and decreases. Therefore it can be deduced from the opposite relationship between the frequencies of dividend increases and decreases that post 2006, the period that marked the beginning of GFC, frequency of dividend increases decreased as companies resorted to reducing dividends or keeping them constant. Similar trend is observed for the number of dividend events.

**Table 6: Sample selection and dividend change model**

| **Panel A: Sample as per the selection criteria** | Dividend Increases | No Change | Dividend Decreases | Total |
|---|---|---|---|---|
| Total number of dividend events after adjusting for missing earnings data | 714 | 240 | 209 | 1163 |
| Dividend events which earnings announcements occurs within 10 trading days of dividend change announcement | 125 | 54 | 37 | 216 |
| Dividend events which earnings announcements are made on the same day as dividend announcements | 439 | 131 | 128 | 698 |
| Total excluded dividend events | 564 | 185 | 165 | 914 |
| Total number of dividend events for analysis | **150** | **55** | **44** | **249** |

**Panel B: Frequency of dividend changes per year**

| | Dividend Increases | | No Change | | Dividend Decreases | | Total per Year | |
|---|---|---|---|---|---|---|---|---|
| | Number | Percent. (%) | Number | Percent. (%) | Number | Percent. (%) | Number | Percent. (%) |
| 2004 | 30 | 20.00% | 12 | 21.82% | 8 | 18.18% | 50 | 20.08% |
| 2005 | 29 | 19.33% | 7 | 12.73% | 6 | 13.64% | 42 | 16.87% |
| 2006 | 37 | 24.67% | 9 | 16.36% | 3 | 6.82% | 49 | 19.68% |
| 2007 | 28 | 18.67% | 8 | 14.55% | 6 | 13.64% | 42 | 16.87% |
| 2008 | 17 | 11.33% | 10 | 18.18% | 5 | 11.36% | 32 | 12.85% |
| 2009 | 9 | 6.00% | 9 | 16.36% | 16 | 36.36% | 34 | 13.65% |
| | **150** | **100.00%** | **55** | **100.00%** | **44** | **100.00%** | **249** | **100.00%** |

**Figure 4: Frequency of dividend changes**

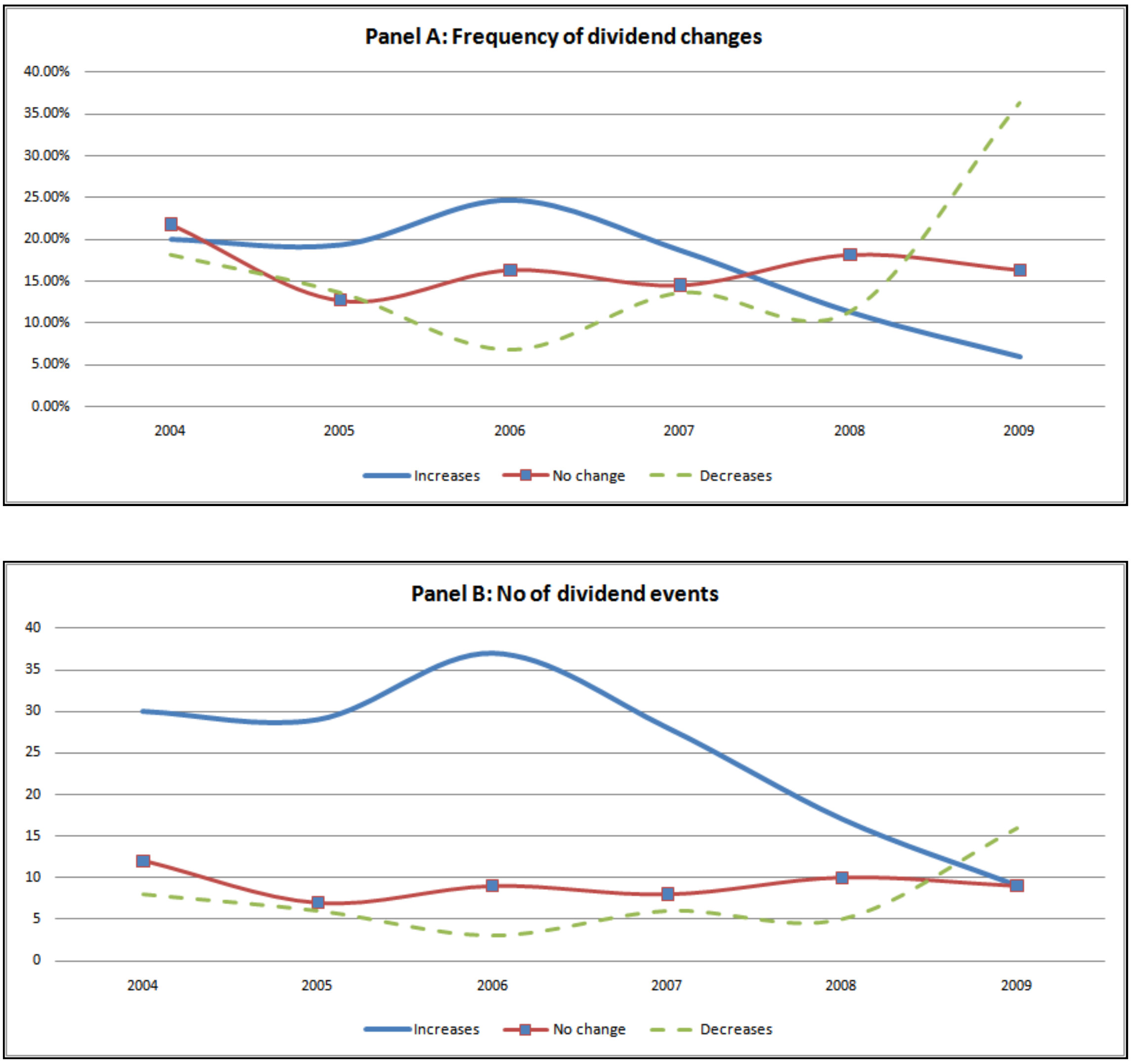



Table 7 below shows the number of dividend events split according to the pre and during crises period for the final dataset. The number of dividend increases declined by 44% during the crisis period while the number of dividend reduction announcements increased by 59%.

**Table 7: Pre and during crisis number of dividends**

| | No of dividend events | | |
|---|---|---|---|
| Period | Dividend Increases | No change | Decreases |
| Pre-crisis | 96 | 28 | 17 |
| During crisis | 54 | 27 | 27 |
| Total | **150** | **55** | **44** |
| % change | -43.75% | -3.57% | 58.82% |

## 4.4 Dividend descriptive statistics

Table 8 (Panel A) reports summary statistics for the final dividend sample consisting of 128 JSE listed firms over the study period 2004 to 2009. In addition to DPS (dividend per share), an additional variable, dividend yield which is calculated by dividing DPS by the share price on the day before dividend announcement is included. Below is the expression for calculating dividend yield:

$$DY_{i,t} = \frac{DPS_{i,t}}{P_{i,t-1}} \tag{21}$$

where

$DY_{i,t}$ *is the dividend yield of firm i on day t*

$DPS_{i,t}$ *is dividend per share of firm i on day t*

$P_{i,t-1}$ *is the share price of firm i on the day before dividend announcement*

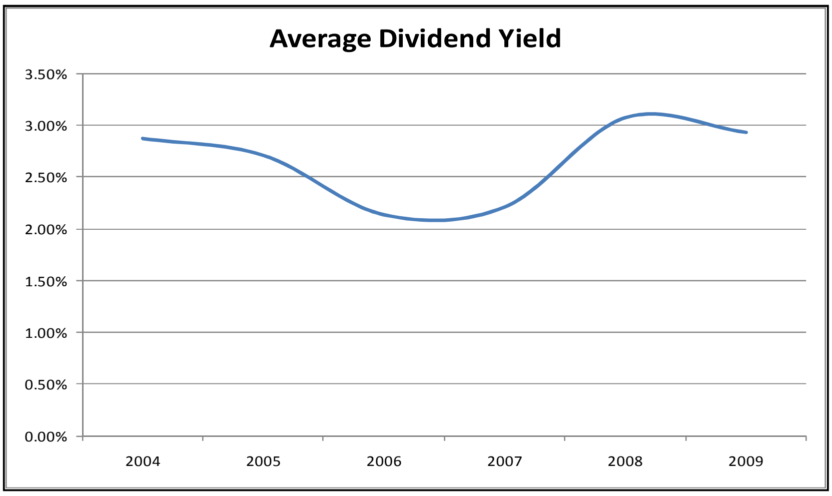
**Table 8: Dividend summary statistics**

| **Panel A** | **DPS, Cents (ZAC)** | **Dividend Changes, ZAC** | **Dividend Yield** |
|---|---|---|---|
| Measure | | All dividend events (N=249) | |
| Mean | 48.5901 | 0.2294 | 0.0253 |
| Median | 25.0000 | 1.9500 | 0.0237 |
| Std. Deviation | 71.8860 | 42.6598 | 0.0235 |
| | | Dividend increases (N=150) | |
| Mean | 57.0614 | 14.1296 | 0.0325 |
| Median | 34.0000 | 5.5000 | 0.0300 |
| Std. Deviation | 70.4059 | 24.1709 | 0.0242 |
| | | No changes (N=55) | |
| Mean | 25.6109 | 14.1296 | 0.0325 |
| Median | 0.0000 | 0.0000 | 0.0000 |
| Std. Deviation | 68.1469 | 0.0000 | 0.0214 |
| | | Decreases (N=44) | |
| Mean | 49.3620 | -43.3120 | 0.0156 |
| Median | 12.0000 | -15.0000 | 0.0139 |
| Std. Deviation | 77.6816 | 64.3690 | 0.0131 |

| **Panel B** | **Dividend yield per year: 2004 -2009** | | | |
|---|---|---|---|---|
| | Average Dividend Yield | Increase | No Change | Decrease |
| 2004 | 2.88% | 3.710% | 1.680% | 2.156% |
| 2005 | 2.71% | 3.298% | 1.548% | 1.794% |
| 2006 | 2.14% | 2.530% | 0.719% | 1.236% |
| 2007 | 2.21% | 2.473% | 0.911% | 1.885% |
| 2008 | 3.08% | 3.915% | 0.769% | 1.420% |
| 2009 | 2.94% | 5.840% | 2.733% | 1.163% |

Panel A shows that the mean DPS across all 128 companies is 48.59 cents, and dividend change on average is 0.2294 cents with mean dividend yield of 0.0253. For the dividend decrease sample, the mean dividend yield is lower than the mean dividend yield of dividend increases sample. The volatility of DPS, change in DPS and dividend yield is high on the dividend reductions sample than on the dividend increases sample. Panel B shows the average dividend yield trend across all events and also on split samples. Figure 5 shows the average dividend yield over the period 2004 to 2009 across all dividend events:

**Figure 5: Average dividend yield across all dividend events trend**




It is interesting to note the downward trend in mean dividend yield over the pre-crisis period which was subsequently followed by an upward trend during the crisis period. Stock Research Pro (2007) indicates that excessive dividend yield is one of the early warning signs to dividend cuts. The authors posit that, while every investor wants to achieve the highest yield possible from their investments, most companies prefer that their dividend yield be in line with historical and industry averages and may consider cutting the dividend to return to that balance. The turning point for average dividend yield is in 2006 and post this period started increasing until 2008. It appears from Figure 6 that in 2009 the average yield started trending downwards towards the 2004 levels. This supports the argument presented above, that post 2006 companies may have cut dividends to return them to the levels they were at before the financial crisis.

## 4.5 Abnormal performance measurement

This section presents results of abnormal return tests. The objective is to assess the market reaction to dividend reductions before and during the financial crisis. As previously mentioned, the study period is decomposed into two periods. First period, 2004 to 2006 is referred to as pre-crisis period and the remaining period, 2007 to 2009, is the crisis period. Dividend changes made during the pre-crisis period are considered to be firm-specific changes. Changes in dividends made during the financial crisis period are referred to as systemic changes. For this analysis, abnormal return tests have been conducted and Table 9 reports all tests and metrics used in the analysis.

**Table 9: Abnormal return tests**

| | **Metrics used to test abnormal return and test type** | | | |
|---|---|---|---|---|
| | Average Abnormal Return (AAR) | | Cumulative Abnormal Return (CAR) | |
| Return Type | Parametric | Non-parametric | Parametric | Non-parametric |
| Market Adjusted | X | √ | X | √ |
| Market Model | X | √ | X | √ |
| Buy and Hold | N/A | √ | N/A | N/A |

This section is structured as follows. Performance measurement results under each approach marked with a √ are presented; starting with test results under the average abnormal approach (AAR) followed by cumulative abnormal return (CAR) approach test results. Under each of these approaches, we test for abnormal return significance using cross-sectional or non-parametric tests explained in research design section. Due to the small sample size, only non-parametric tests are conducted.

Results of the analyses are tabulated according to the abnormal return approach and the metric used to test for the significance of the returns thereof. Each table has two Panels, Panel A and Panel B. Since non-parametric CAR tests are not applicable to the Buy-and-Hold (BHAR) approach, only non-parametric AAR tests are conducted for BHAR approach. Panel A represents average abnormal return approach results and Panel B is the cumulative abnormal return approach results.

### *4.5.1 Market Adjusted Abnormal Return*

Findings reported in Table 10 and Table 11 show the average and cumulative MAAR test results for the pre-crisis and crisis periods respectively. Formulae for calculating the average and cumulative MAAR are presented below.

$$\overline{MAAR_t} = \frac{\sum_{i=1}^{N_t} MAAR_{i,t}}{N_t} \quad (a) \qquad\qquad CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} \overline{MAAR_t} \quad (b)$$

Results are reported for 10 days before and after the announcement date. For full event window (-20, 20) results, see Table 20 in the Appendix. The objective is to assess how the market reacts to dividend reductions made before and during the financial crisis. Tests are performed at the 1%, 5% and 10% significance levels.

**Table 10: MAAR pre-crisis (2004 -2006) AAR and CAR test analysis**

| Market Adjusted Abnormal Return (MAAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pre-crisis period: 2004 - 2006 (N=17) | | | | | | | |
| Day | Avg MAAR% | t-Statistic | Significance | 3-day window | Cum MAAR % | t-Statistic | Significance |
| -10 | 2.11% | 1.36 | | CAR(-11;-9) | 3.20% | 1.62 | |
| -9 | -0.11% | -0.39 | | CAR(-10;-8) | 1.65% | 0.95 | |
| -8 | -0.35% | -1.13 | | CAR(-9;-7) | -0.66% | -0.83 | |
| -7 | -0.20% | -0.34 | | CAR(-8;-6) | -0.97% | -1.26 | |
| -6 | -0.42% | -1.42 | | CAR(-7;-5) | -1.13% | -1.55 | |
| -5 | -0.51% | -2.01 | * | CAR(-6;-4) | -1.01% | -1.36 | |
| -4 | -0.08% | -0.14 | | CAR(-5;-3) | -0.38% | -0.44 | |
| -3 | 0.21% | 0.56 | | CAR(-4;-2) | -0.24% | -0.29 | |
| -2 | -0.36% | -1.64 | | CAR(-3;-1) | -0.16% | -0.20 | |
| -1 | -0.01% | -0.02 | | CAR(-2;0) | -0.54% | -1.19 | |
| 0 | -0.17% | -0.31 | | CAR(-1;1) | 2.04% | 0.86 | |
| 1 | 2.22% | 0.88 | | CAR(0;2) | 1.91% | 0.82 | |
| 2 | -0.14% | -0.45 | | CAR(1;3) | 1.92% | 0.74 | |
| 3 | -0.16% | -0.72 | | CAR(2;4) | -1.10% | -1.94 | * |
| 4 | -0.81% | -2.42 | ** | CAR(3;5) | -3.57% | -1.87 | * |
| 5 | -2.61% | -1.36 | | CAR(4;6) | -3.81% | -1.94 | * |
| 6 | -0.39% | -0.80 | | CAR(5;7) | -3.95% | -1.90 | * |
| 7 | -0.96% | -1.68 | | CAR(6;8) | -1.10% | -1.69 | |
| 8 | 0.25% | 0.51 | | CAR(7;9) | 0.63% | 1.36 | |
| 9 | 1.34% | 3.37 | *** | CAR(8;10) | 2.09% | 2.61 | ** |
| 10 | 0.51% | 1.45 | | CAR(9;11) | 1.53% | 1.62 | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

Results presented for the pre-crisis period (Table 10) show that the average MAAR on the day of dividend announcement, day 0, is -0.17% with a *t-statistic* of -0.31. This negative reaction is not statistically significant which could be attributable to the fact that the market may have been expecting the reduction few days before the announcement. This implies that the dividend announcement carries no surprise to the market. It is also evident from the above that the average MAAR is significant on day -5 (10% significance level), day 4 (5% significance level) and day 9 (1% significance level). This signifies that the market reacts either earlier or later relative to the event date. Upon examining the full event window, market reaction is observed most frequently on the days prior to the announcement date. Infrequently, the average MAAR is positive which means the stock prices react negatively to dividend decreases. This supports the notion that stock prices move in the same direction as the dividend change. The pre-crisis cumulative abnormal return analysis is based on 3-day rolling window analysis. The cumulative MAAR around the event date (-1 to +1) is 2.04%. This return is not statistically significant with a *t-statistic* value of 0.86. Frequently, the 3-day cumulative MAAR is negative and not statistically significant in the periods before event date. Cumulative returns starting from day 2 (2 to 4), (3 to 5) and (4 to 6) are negative and statistically significant at 10% significance level signifying negative wealth effects at periods later than the event date. None of the cumulative returns are statistically significant in all periods prior to the event date (see Table 21 in the Appendix). Table 11 below reports the crisis period results.

**Table 11: MAAR crisis (2007-2009) AAR and CAR test analysis**

| Market Adjusted Abnormal Return (MAAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crisis period: 2007 - 2009 (N=27) | | | | | | | |
| Day | Avg MAAR% | t-Statistic | Significance | 3-day window | Cum MAAR % | t-Statistic | Significance |
| -10 | 0.87% | 1.52 | | CAR(-11;-9) | -0.50% | -0.58 | |
| -9 | -1.26% | -2.19 | ** | CAR(-10;-8) | 0.19% | 0.23 | |
| -8 | 0.59% | 1.16 | | CAR(-9;-7) | -0.61% | -0.69 | |
| -7 | 0.07% | 0.14 | | CAR(-8;-6) | -0.02% | -0.02 | |
| -6 | -0.68% | -1.34 | | CAR(-7;-5) | 0.38% | 0.31 | |
| -5 | 0.99% | 1.20 | | CAR(-6;-4) | -0.18% | -0.15 | |
| -4 | -0.49% | -1.16 | | CAR(-5;-3) | -1.15% | -0.75 | |
| -3 | -1.65% | -1.41 | | CAR(-4;-2) | -0.89% | -0.61 | |
| -2 | 1.25% | 1.58 | | CAR(-3;-1) | -0.62% | -0.45 | |
| -1 | -0.22% | -0.27 | | CAR(-2;0) | 0.23% | 0.26 | |
| 0 | -0.80% | -1.01 | | CAR(-1;1) | -0.96% | -0.86 | |
| 1 | 0.06% | 0.13 | | CAR(0;2) | -0.97% | -0.76 | |
| 2 | -0.23% | -0.41 | | CAR(1;3) | -0.14% | -0.14 | |
| 3 | 0.03% | 0.07 | | CAR(2;4) | 0.07% | 0.06 | |
| 4 | 0.27% | 0.42 | | CAR(3;5) | 1.17% | 1.09 | |
| 5 | 0.87% | 1.70 | | CAR(4;6) | 1.77% | 1.70 | |
| 6 | 0.63% | 1.12 | | CAR(5;7) | -0.49% | -0.30 | |
| 7 | -2.00% | -1.05 | | CAR(6;8) | -0.77% | -0.40 | |
| 8 | 0.59% | 1.23 | | CAR(7;9) | -0.65% | -0.34 | |
| 9 | 0.76% | 1.28 | | CAR(8;10) | 2.21% | 2.71 | ** |
| 10 | 0.86% | 1.43 | | CAR(9;11) | 1.83% | 1.99 | * |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

It is interesting to note that during the crisis period, the market reaction based on the average MAAR is only significant on day -9. Infrequent statistically significant average abnormal returns are observed during the financial crisis period. Cumulative returns are significant much later, day 8 to 10 and 9 to 11. Comparing the pre-crisis and crisis period abnormal returns reveals that, pre-crisis reaction is more pronounced than the crisis period reaction. This is because the market reacts more when reductions are firm-specific and less when the reductions are systemic. This implies that during the crisis period, the market expects companies to reduce dividends. Figure 6 below illustrates the comparison between pre-crisis and crisis period average MAAR over the 41-day event window. The frequency of negative average MAAR during normal economic conditions is higher than average MAAR during the crisis period. This is evident from Figure 6. This means that stock prices generally react negatively to dividend reductions made in normal economic conditions.

**Figure 6: Pre-crisis and crisis average MAAR comparison**

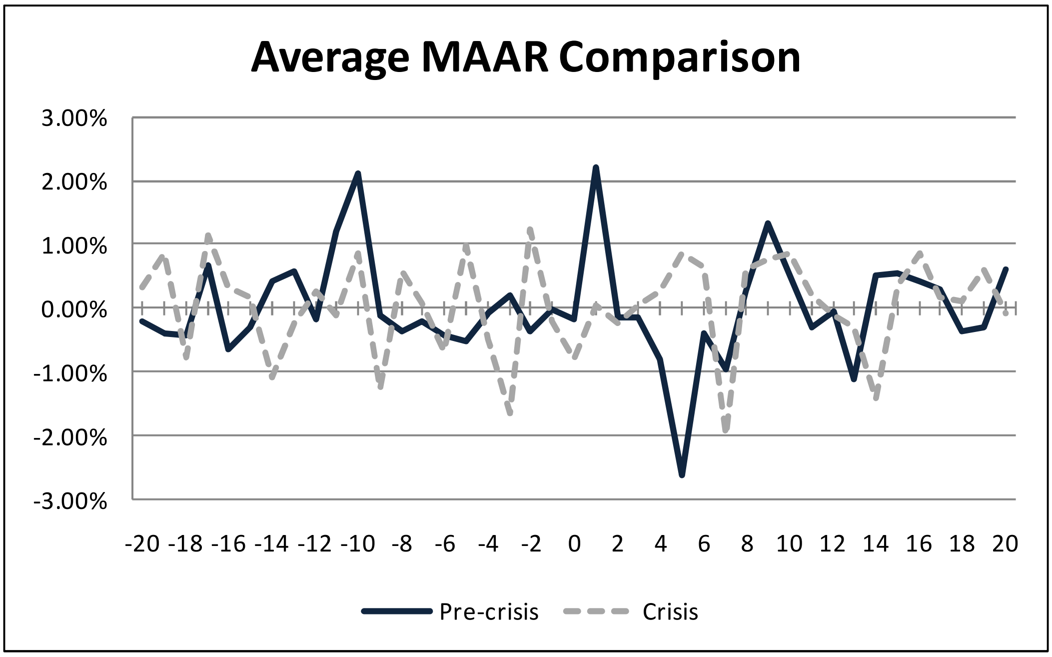



Table 12 presents descriptive statistics for the average MAAR for both periods of analysis. Findings reported are in line with expectations. The pre-crisis minimum average MAAR is -2.61% versus -2% for the crisis period returns.

**Table 12: Average MAAR event window descriptive statistics**

| Average MAAR Event Window Analysis | | |
|---|---|---|
| | *Pre-crisis* | *During crisis* |
| Minimum | -2.61% | -2.00% |
| Maximum | 2.22% | 1.25% |
| Mean | 0.01% | 0.04% |
| Std. Dev | 0.82% | 0.77% |
| Greater than 0 frequency | 36.59% | 60.98% |
| Less than 0 frequency | 63.41% | 39.02% |

The mean of these average market adjusted returns over the event window is lower during the pre-crisis period. Average MAAR is also more volatile in the pre-crisis period than the crisis period. More negative average market adjusted returns are also observed in the pre-crisis period. Approximately 64% of the average MAAR are negative in the pre-crisis period which supports an earlier comment about more negative average MAAR being observed during the pre-crisis period than the crisis period. Moving on to cumulative MAAR comparison shows similar results to the average MAAR analysis.

**Figure 7: Pre-crisis and crisis cumulative MAAR comparison**

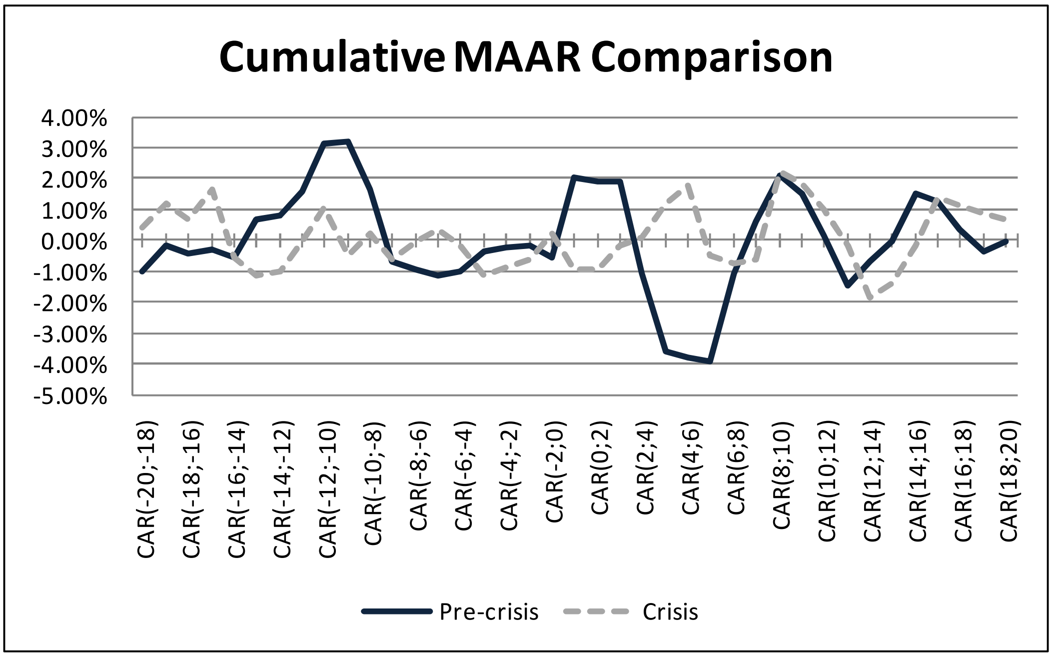


**Table 13: Cumulative MAAR event window descriptive statistics**

| Cumulative MAAR Event Window Analysis | | |
|---|---|---|
| | *Pre-crisis* | *During crisis* |
| Minimum | -3.95% | -1.83% |
| Maximum | 3.20% | 2.21% |
| Mean | 0.02% | 0.09% |
| Std. Dev | 1.65% | 1.01% |
| Greater than 0 frequency | 41.03% | 46.15% |
| Less than 0 frequency | 58.97% | 53.85% |

The next section discusses results obtained under the single index model, the Market Model Abnormal Return (MAAR).

### *4.5.2 Market Model Abnormal Return*

Findings reported in Table 14 and Table 15 show the average and cumulative MMAR test results for the pre-crisis and crisis periods respectively. Formulae for calculating the average and cumulative MMAR are presented below.

$$\overline{MMAR_t} = \frac{\sum_{i=1}^{N_t} MMAR_{i,t}}{N_t} \quad (a) \qquad\qquad CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} \overline{MMAR_t} \quad (b)$$

**Table 14: MMAR pre-crisis (2004 - 2006) AAR and CAR test analysis**

| Market Model Abnormal Return (MMAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pre-crisis period: 2004 - 2006 (N=17) | | | | | | | |
| Day | Avg MMAR% | t-Statistic | Significance | 3-day window | Cum MMAR % | t-Statistic | Significance |
| -10 | 1.85% | 1.16 | | CAR(-11;-9) | 3.11% | 1.57 | |
| -9 | 0.10% | 0.34 | | CAR(-10;-8) | 2.00% | 1.15 | |
| -8 | 0.05% | 0.14 | | CAR(-9;-7) | 0.41% | 0.49 | |
| -7 | 0.25% | 0.49 | | CAR(-8;-6) | 0.22% | 0.30 | |
| -6 | -0.08% | -0.29 | | CAR(-7;-5) | 0.03% | 0.04 | |
| -5 | -0.15% | -0.58 | | CAR(-6;-4) | -0.38% | -0.61 | |
| -4 | -0.15% | -0.25 | | CAR(-5;-3) | -0.05% | -0.06 | |
| -3 | 0.25% | 0.82 | | CAR(-4;-2) | 0.50% | 0.66 | |
| -2 | 0.40% | 2.44 | ** | CAR(-3;-1) | 0.64% | 1.01 | |
| -1 | -0.01% | -0.01 | | CAR(-2;0) | 0.53% | 2.05 | * |
| 0 | 0.14% | 0.28 | | CAR(-1;1) | 2.81% | 1.12 | |
| 1 | 2.68% | 1.08 | | CAR(0;2) | 3.06% | 1.20 | |
| 2 | 0.24% | 0.83 | | CAR(1;3) | 2.83% | 1.12 | |
| 3 | -0.08% | -0.45 | | CAR(2;4) | -0.53% | -0.88 | |
| 4 | -0.68% | -1.82 | * | CAR(3;5) | -3.05% | -1.68 | |
| 5 | -2.28% | -1.32 | | CAR(4;6) | -2.84% | -1.56 | |
| 6 | 0.13% | 0.26 | | CAR(5;7) | -2.94% | -1.55 | |
| 7 | -0.78% | -1.52 | | CAR(6;8) | -0.38% | -0.60 | |
| 8 | 0.28% | 0.56 | | CAR(7;9) | 0.37% | 0.75 | |
| 9 | 0.88% | 2.97 | *** | CAR(8;10) | 1.31% | 1.82 | * |
| 10 | 0.16% | 0.43 | | CAR(9;11) | 0.42% | 0.46 | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

Results presented in Table 14 shows no market reaction on the day of announcement. However on day -2, there is a significant reaction at the 5% level. Significant reaction is further observed on day 4 and day 9, result similar to average MAAR in the previous section. This reaction is consistent with the notion that dividend reductions convey negative information to the market. There is no other significant reaction after day 9 which shows that the market has adjusted to the dividend reduction. Moving on to cumulative MMAR based on 3-day rolling window, it can be seen that there is a significant market reaction in the -2 to 0 event window and day 8 to 10 window. There is no significant market reaction during the window -1 to 1. There is more market reaction to dividend reductions during the crisis period. This is illustrated in Table 15 below.

**Table 15: MMAR crisis period (2007-2009) AAR and CAR test analysis**

| **Market Model Abnormal Return (MMAR)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crisis period: 2007 - 2009 (N=27) | | | | | | | |
| Day | Avg MMAR% | t-Statistic | Significance | 3-day window | Cum MMAR % | t-Statistic | Significance |
| -10 | 1.06% | 1.87 | * | CAR(-11;-9) | 0.53% | 0.59 | |
| -9 | -0.72% | -1.07 | | CAR(-10;-8) | 0.82% | 0.81 | |
| -8 | 0.48% | 1.02 | | CAR(-9;-7) | -0.36% | -0.38 | |
| -7 | -0.12% | -0.31 | | CAR(-8;-6) | 0.03% | 0.04 | |
| -6 | -0.33% | -0.65 | | CAR(-7;-5) | 0.87% | 0.77 | |
| -5 | 1.32% | 1.66 | | CAR(-6;-4) | 0.61% | 0.55 | |
| -4 | -0.38% | -1.20 | | CAR(-5;-3) | -0.63% | -0.37 | |
| -3 | -1.56% | -1.30 | | CAR(-4;-2) | -1.10% | -0.68 | |
| -2 | 0.85% | 1.04 | | CAR(-3;-1) | -0.94% | -0.68 | |
| -1 | -0.23% | -0.28 | | CAR(-2;0) | 0.27% | 0.32 | |
| 0 | -0.35% | -0.50 | | CAR(-1;1) | -0.31% | -0.30 | |
| 1 | 0.26% | 0.56 | | CAR(0;2) | -0.40% | -0.33 | |
| 2 | -0.32% | -0.59 | | CAR(1;3) | 0.23% | 0.24 | |
| 3 | 0.28% | 0.78 | | CAR(2;4) | 0.13% | 0.15 | |
| 4 | 0.17% | 0.30 | | CAR(3;5) | 1.72% | 1.84 | * |
| 5 | 1.27% | 2.78 | *** | CAR(4;6) | 1.94% | 1.96 | * |
| 6 | 0.51% | 0.97 | | CAR(5;7) | -0.21% | -0.13 | |
| 7 | -1.99% | -1.05 | | CAR(6;8) | -1.05% | -0.56 | |
| 8 | 0.43% | 1.10 | | CAR(7;9) | -0.41% | -0.22 | |
| 9 | 1.15% | 2.38 | ** | CAR(8;10) | 2.69% | 3.79 | *** |
| 10 | 1.11% | 1.94 | * | CAR(9;11) | 2.26% | 2.69 | ** |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

There is no significant market reactions in the periods before the dividend announcement since the market could have been expecting such news. However, reaction is observed 5 days after the announcement on the average MMAR. No reaction is observed for the 10 days prior to announcement on the cumulative MMAR. All raw cumulative MMAR returns that are significant are positive. Figure 8 shows the comparison of the pre-crisis and crisis period average MMAR. Interpreted in conjunction with Table 16, it can be seen that the pre-crisis negative raw MMAR occur more frequently in the pre-crisis period than the crisis period. This outcome compares favourably with the MAAR outcome. However, more variation is observed in the crisis period in this case, but the difference in variation is marginal. The raw MMAR on the announcement day are close to zero for the pre-crisis and crisis periods.

**Figure 8: Pre-crisis and crisis average MMAR comparison**

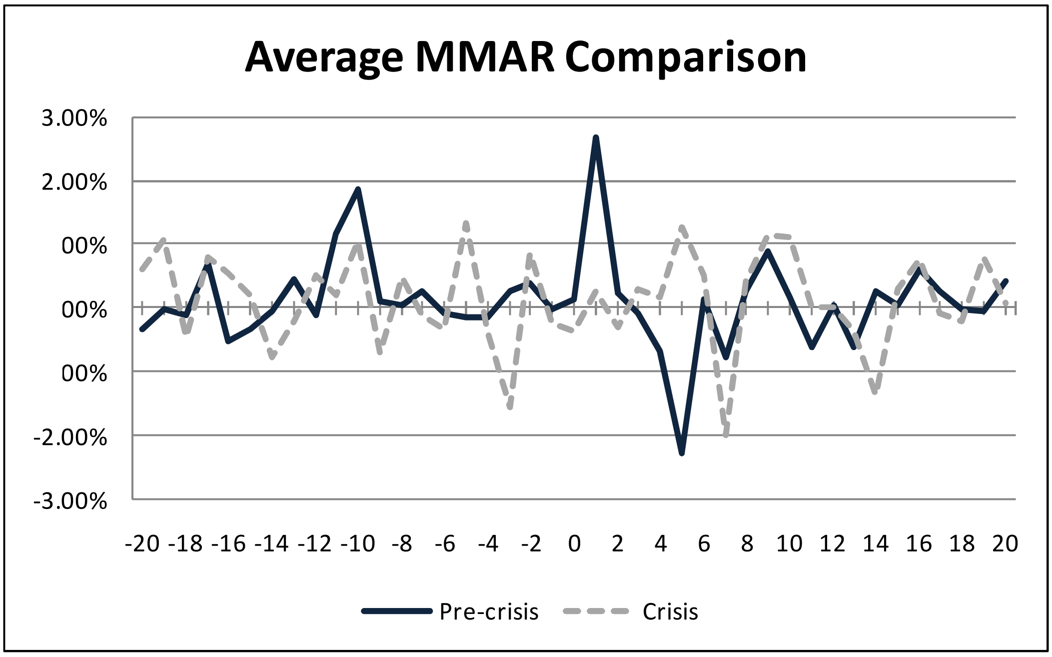



**Table 16: Average MMAR event window descriptive statistics**

| Average MMAR Event Window Analysis | | |
|---|---|---|
| | *Pre-crisis* | *During crisis* |
| Minimum | -2.28% | -1.99% |
| Maximum | 2.68% | 1.32% |
| Mean | 0.11% | 0.13% |
| Std. Dev | 0.74% | 0.75% |
| Greater than 0 frequency | 53.66% | 60.98% |
| Less than 0 frequency | 46.34% | 39.02% |

Figure 9 shows the 3-day cumulative returns comparison. It can be seen that the cumulative return around the dividend announcement date, period -1 to +1, is positive before the crisis and negative during the crisis period.

**Figure 9: Cumulative MMAR event window descriptive statistics**

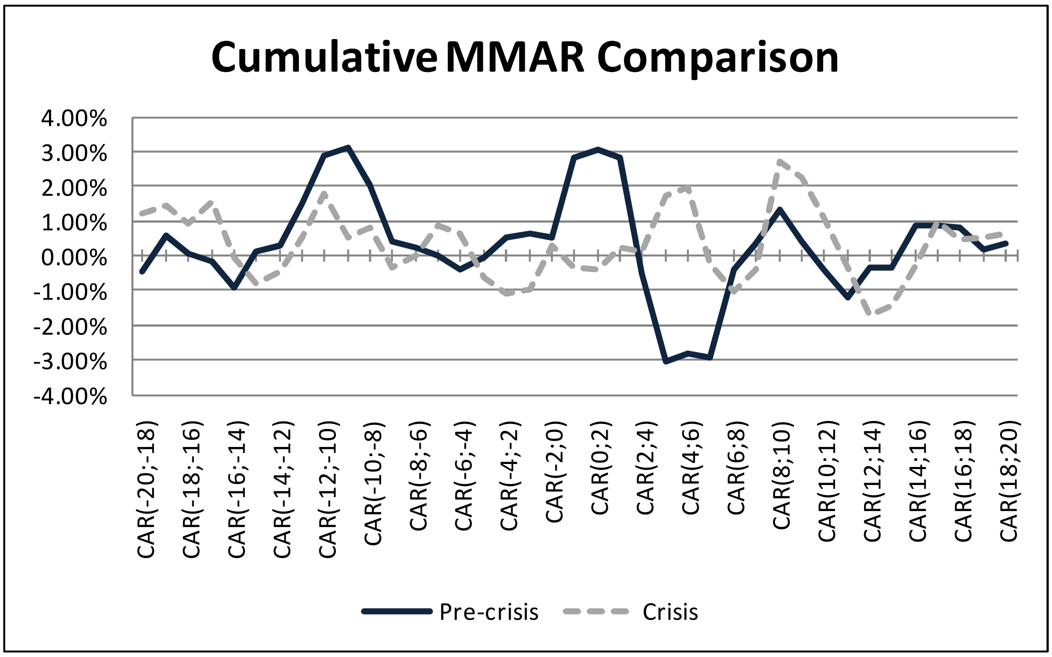



Table 17 shows that the frequency of negative 3 day cumulative MMAR is higher during the crisis period than the pre-crisis period. This is consistent with the findings of the MMAR analysis. However, the mean cumulative return variation is not different between the two crisis periods. During the pre-crisis period, the cumulative returns are more volatile than in the crisis period. This is also consistent with the finding that the market expects reductions during the financial crisis than during normal economic conditions. Thus the news of a reduction during the financial crisis does not catch the market by surprise.

**Table 17: Cumulative MMAR event window descriptive statistics**

| Cumulative MMAR Event Window Analysis | | |
|---|---|---|
| | *Pre-crisis* | *During crisis* |
| Minimum | -3.05% | -1.71% |
| Maximum | 3.11% | 2.69% |
| Mean | 0.33% | 0.33% |
| Std. Dev | 1.46% | 1.03% |
| Greater than 0 frequency | 64.10% | 58.97% |
| Less than 0 frequency | 35.90% | 41.03% |

The next section concludes the return tests by presenting results of the BHAR approach.

### *4.5.3 Buy-and-hold Abnormal Return*

Findings reported in Table 18 show the average and cumulative BHAR test results for the pre-crisis and crisis periods respectively. Also referred to as the characteristic-based matching approach, BHAR formula is presented below.

$$BHAR_{\,i(a\ to\ b)} = \prod_{t=a}^{t=b}(1 + R_{i,t}) - \prod_{t=a}^{t=b}(1 + R_{m,t})$$

Table 18 shows earlier market reaction on days -7 to 5 for the pre-crisis period. The average BHAR over this period is negative which shows that the market was expecting bad news in the form of dividend reduction. However, for the window surrounding the announcement date, the result is not significant. Few days after the announcement significant reaction is observed. For the crisis period analysis, no significant reaction before dividend reduction announcement was observed. The market was expecting this reduction. There is a significant reaction after the announcement for BHAR calculated over day 4 to day 6.

**Table 18: BHAR pre-crisis (2004 – 2006) and crisis (2007 – 2009) AAR test analysis**

| Buy and Hold Abnormal Return (BHAR) | | | | | | |
|---|---|---|---|---|---|---|
| | Pre-crisis period: 2004 - 2006 (N=17) | | | Crisis period: 2007 - 2009 (N=27) | | |
| 3-day window | Avg BHAR% | t-Statistic | Significance | Avg BHAR% | t-Statistic | Significance |
| BHAR(-10;-8) | 1.35% | 0.78 | | 0.16% | 0.19 | |
| BHAR(-9;-7) | -0.75% | -0.96 | | -0.58% | -0.67 | |
| BHAR(-8;-6) | -1.10% | -1.44 | | 0.01% | 0.01 | |
| BHAR(-7;-5) | -1.26% | -1.76 | * | 0.43% | 0.34 | |
| BHAR(-6;-4) | -0.93% | -1.29 | | -0.15% | -0.13 | |
| BHAR(-5;-3) | 0.04% | 0.07 | | -1.14% | -0.75 | |
| BHAR(-4;-2) | 0.06% | 0.13 | | -0.86% | -0.59 | |
| BHAR(-3;-1) | -0.24% | -0.29 | | -0.77% | -0.55 | |
| BHAR(-2;0) | -0.78% | -1.86 | * | 0.06% | 0.07 | |
| BHAR(-1;1) | 1.89% | 0.79 | | -0.98% | -0.87 | |
| BHAR(0;2) | 2.11% | 0.91 | | -0.90% | -0.70 | |
| BHAR(1;3) | 1.88% | 0.73 | | -0.10% | -0.10 | |
| BHAR(2;4) | -1.11% | -2.47 | ** | 0.09% | 0.08 | |
| BHAR(3;5) | -3.20% | -1.68 | | 1.20% | 1.09 | |
| BHAR(4;6) | -3.44% | -1.75 | * | 1.80% | 1.71 | * |
| BHAR(5;7) | -3.75% | -1.82 | * | -0.70% | -0.39 | |
| BHAR(6;8) | -0.63% | -0.83 | | -0.87% | -0.43 | |
| BHAR(7;9) | 0.72% | 1.54 | | -0.70% | -0.36 | |
| BHAR(8;10) | 1.59% | 2.35 | ** | 2.21% | 2.71 | ** |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

Figure 10 portrays the comparison of the average BHAR over the event window. The results as shown in Table 19 are consistent with the rest of the results presented for the MAAR and MMAR tests.

**Figure 10: Pre-crisis and crisis period BHAR comparison**

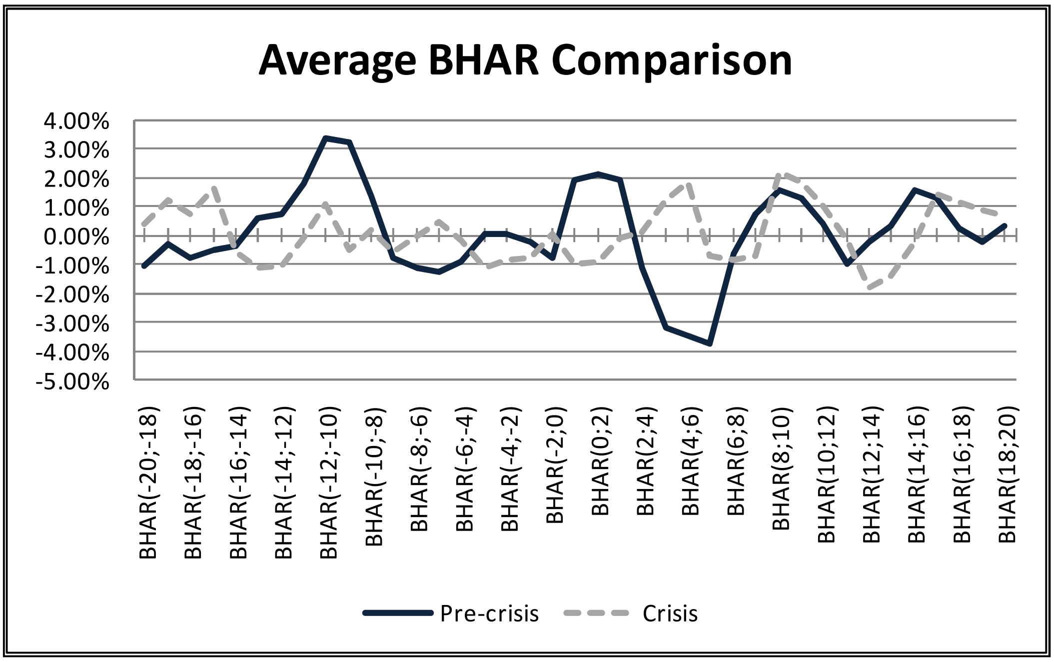



**Table 19: Average BHAR event window descriptive statistics**

| Cumulative BHAR Event Window Analysis | | |
|---|---|---|
| | *Pre-crisis* | *During crisis* |
| Minimum | -3.75% | -1.84% |
| Maximum | 3.38% | 2.21% |
| Mean | 0.07% | 0.08% |
| Std. Dev | 1.57% | 1.02% |
| Greater than 0 frequency | 51.28% | 48.72% |
| Less than 0 frequency | 48.72% | 51.28% |

# Chapter 5: Conclusions and recommendations

## 5.1 Introduction

This chapter summarises the findings and conclusions of the research. Section 5.2 provides this summary with particular reference to the context in which the research objectives were specified. The findings of the research are compared and contrasted with findings of published research cited in this research. Section 5.3 concludes by making suggestions for future research.

## 5.2 Conclusions of the study

In this research, the analysis of stock market reaction to dividend reductions was performed in the context of the South African stock market, the Johannesburg Securities Exchange. After controlling for the effect of joint dividend and earnings announcement, the final sample of companies was 128. The selection criteria in other emerging market studies such as Asquith and Mullins (2003), Vieira and Raposo (2000) and Dasilas (2004) were applied to arrive at the final sample. It was found that majority of JSE listed companies make joint dividend and earnings announcements i.e. announce dividend and earnings announcements on the same day. To control for the confounding effects of earnings, joint announcement events were eliminated. This resulted in an unbalanced panel data of 249 events. These events span the study period 2004 to 2009 which was decomposed into pre-crisis period (2004 to 2006) and crisis period (2007 to 2009).

Abnormal return approaches were used to analyse how the market reacted to dividend reductions if the reduction is made prior to the crisis and during the crisis. Results of the analysis show that there is no significant market reaction on the day that the dividend reduction is announced across all measures of abnormal performance around the event date. In a similar study performed in the Greek market, Dasilas (2004) posits that there is a statistically significant market reaction on the dividend announcement day. This is not in line with the empirical findings of this research. However results of the market adjusted abnormal return show that the early significant market reaction is 5 days prior to the announcement and 4 days after the announcement before the financial crisis. In both instances the reaction is negative as evidenced by negative abnormal returns. For the crisis period, findings show that the early reaction is 9 days prior to the announcement and 14 days after the announcement. The market reaction is negative too for the crisis period. This outcome tends to support the notion that dividend reductions convey negative information to the public which results in a subsequent fall in stock price. This negative reaction persisted for few days after the announcement. In terms of the frequency of negative returns, the study found that more negative returns are observed before the crisis period than during the crisis period. This shows that the stock market sees dividend reductions during normal economic conditions more often as bad news than reductions induced during crisis period.

The analysis of market model abnormal returns show that market reaction occurs later in comparison to the market adjusted abnormal return case as described above. Prior to the crisis, statistically significant reaction is observed 2 days prior to announcement date. Recall that the MAAR reaction was 5 days. The statistically not significant results show that the markets are efficient and adjust quickly to announcement information. During the crisis period, significant reaction is observed 10 days prior to announcement then 5 days after the announcement. The frequency of negative MMAR raw returns is higher during the crisis.

The analysis of the BHAR reveals no statistical significance on the announcement day. Similar to the cumulative abnormal returns, measured over a 3 day window, more significant market reaction is observed in the periods after the announcement during the crisis period. This measure yields positive raw returns despite the dividend reduction.

Analysing the volatility of abnormal returns shows that the abnormal returns before the financial crisis are more volatile than abnormal returns during the crisis period.

Since this study is the first attempt to gauge JSE listed firm's reaction to dividend reductions over the pre and during crisis periods, more research needs to start forthcoming going forward. Based on a small sample data due to the nature of dividend announcement practice in South Africa, results presented in this report do contribute towards understanding the effects of firm-specific and systemic related dividend reductions. From the findings it was also shown that the abnormal return volatility is higher in the pre-crisis period.

In conclusion, the research indicates that there is no statistically significant market reaction on the dividend announcement day. The market reaction observed after the announcement date implies that dividend reductions affect firm stock prices, consequently shareholder value. It can therefore be concluded that the findings of this research do not seem to support the Irrelevance Theory.

## 5.3 Suggestions for further research

Future studies conducted in the context of the South African market should be directed towards the following. The research found that controlling for confounding effects of joint dividend and earnings announcements resulted in a small sample for a comprehensive analysis. The joint effect has to be separated by analysing interactions or relationship between earnings change and dividend change. This is likely to increase the sample size and thus improve on the results. The main focus of the research was on market's reaction to final cash dividend reductions. Interim and special cash dividend analysis is left for future research since these types of corporate actions are also significant (total DPS) in South Africa. Application of the dividend change model can be used to determine how the market reacts to increases in dividends during the two periods of comparison.

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# Appendix

## Table 20: MAAR pre-crisis average and cumulative return analysis

| Market Adjusted Abnormal Return (MAAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pre-crisis period: 2004 - 2006 (N=17) | | | | | | | |
| Day | Avg MAAR% | t-Statistic | Significance | 3-day window | Cum MAAR % | t-Statistic | Significance |
| -20 | -0.20% | -0.83 | | | | | |
| -19 | -0.40% | -1.08 | | CAR(-20;-18) | -1.03% | -1.50 | |
| -18 | -0.43% | -1.04 | | CAR(-19;-17) | -0.16% | -0.17 | |
| -17 | 0.67% | 0.99 | | CAR(-18;-16) | -0.42% | -0.41 | |
| -16 | -0.66% | -1.37 | | CAR(-17;-15) | -0.29% | -0.32 | |
| -15 | -0.30% | -0.84 | | CAR(-16;-14) | -0.54% | -0.39 | |
| -14 | 0.42% | 0.39 | | CAR(-15;-13) | 0.70% | 0.99 | |
| -13 | 0.58% | 0.70 | | CAR(-14;-12) | 0.80% | 1.11 | |
| -12 | -0.19% | -0.88 | | CAR(-13;-11) | 1.59% | 0.96 | |
| -11 | 1.20% | 1.28 | | CAR(-12;-10) | 3.12% | 1.61 | |
| -10 | 2.11% | 1.36 | | CAR(-11;-9) | 3.20% | 1.62 | |
| -9 | -0.11% | -0.39 | | CAR(-10;-8) | 1.65% | 0.95 | |
| -8 | -0.35% | -1.13 | | CAR(-9;-7) | -0.66% | -0.83 | |
| -7 | -0.20% | -0.34 | | CAR(-8;-6) | -0.97% | -1.26 | |
| -6 | -0.42% | -1.42 | | CAR(-7;-5) | -1.13% | -1.55 | |
| -5 | -0.51% | -2.01 | * | CAR(-6;-4) | -1.01% | -1.36 | |
| -4 | -0.08% | -0.14 | | CAR(-5;-3) | -0.38% | -0.44 | |
| -3 | 0.21% | 0.56 | | CAR(-4;-2) | -0.24% | -0.29 | |
| -2 | -0.36% | -1.64 | | CAR(-3;-1) | -0.16% | -0.20 | |
| -1 | -0.01% | -0.02 | | CAR(-2;0) | -0.54% | -1.19 | |
| 0 | -0.17% | -0.31 | | CAR(-1;1) | 2.04% | 0.86 | |
| 1 | 2.22% | 0.88 | | CAR(0;2) | 1.91% | 0.82 | |
| 2 | -0.14% | -0.45 | | CAR(1;3) | 1.92% | 0.74 | |
| 3 | -0.16% | -0.72 | | CAR(2;4) | -1.10% | -1.94 | * |
| 4 | -0.81% | -2.42 | ** | CAR(3;5) | -3.57% | -1.87 | * |
| 5 | -2.61% | -1.36 | | CAR(4;6) | -3.81% | -1.94 | * |
| 6 | -0.39% | -0.80 | | CAR(5;7) | -3.95% | -1.90 | * |
| 7 | -0.96% | -1.68 | | CAR(6;8) | -1.10% | -1.69 | |
| 8 | 0.25% | 0.51 | | CAR(7;9) | 0.63% | 1.36 | |
| 9 | 1.34% | 3.37 | *** | CAR(8;10) | 2.09% | 2.61 | ** |
| 10 | 0.51% | 1.45 | | CAR(9;11) | 1.53% | 1.62 | |
| 11 | -0.32% | -0.47 | | CAR(10;12) | 0.13% | 0.16 | |
| 12 | -0.06% | -0.12 | | CAR(11;13) | -1.50% | -2.03 | * |
| 13 | -1.12% | -2.32 | ** | CAR(12;14) | -0.66% | -1.94 | * |
| 14 | 0.52% | 1.38 | | CAR(13;15) | -0.04% | -0.07 | |
| 15 | 0.55% | 2.28 | ** | CAR(14;16) | 1.49% | 2.03 | * |
| 16 | 0.41% | 0.68 | | CAR(15;17) | 1.25% | 1.33 | |
| 17 | 0.28% | 0.85 | | CAR(16;18) | 0.32% | 0.38 | |
| 18 | -0.37% | -1.16 | | CAR(17;19) | -0.39% | -0.73 | |
| 19 | -0.31% | -0.98 | | CAR(18;20) | -0.07% | -0.09 | |
| 20 | 0.60% | 1.28 | | | | | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

## Table 21: MAAR crisis period average and cumulative return analysis

| Market Adjusted Abnormal Return (MAAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crisis period: 2007 - 2009 (N=27) | | | | | | | |
| Day | Avg MAAR% | t-Statistic | Significance | 3-day window | Cum MAAR % | t-Statistic | Significance |
| -20 | 0.33% | 0.67 | | | | | |
| -19 | 0.86% | 1.44 | | CAR(-20;-18) | 0.42% | 0.53 | |
| -18 | -0.77% | -1.86 | * | CAR(-19;-17) | 1.22% | 1.47 | |
| -17 | 1.13% | 2.55 | ** | CAR(-18;-16) | 0.70% | 0.79 | |
| -16 | 0.34% | 0.69 | | CAR(-17;-15) | 1.63% | 1.76 | * |
| -15 | 0.16% | 0.32 | | CAR(-16;-14) | -0.57% | -0.74 | |
| -14 | -1.07% | -2.10 | ** | CAR(-15;-13) | -1.15% | -1.47 | |
| -13 | -0.24% | -0.54 | | CAR(-14;-12) | -1.04% | -1.17 | |
| -12 | 0.28% | 0.60 | | CAR(-13;-11) | -0.07% | -0.11 | |
| -11 | -0.10% | -0.25 | | CAR(-12;-10) | 1.04% | 1.18 | |
| -10 | 0.87% | 1.52 | | CAR(-11;-9) | -0.50% | -0.58 | |
| -9 | -1.26% | -2.19 | ** | CAR(-10;-8) | 0.19% | 0.23 | |
| -8 | 0.59% | 1.16 | | CAR(-9;-7) | -0.61% | -0.69 | |
| -7 | 0.07% | 0.14 | | CAR(-8;-6) | -0.02% | -0.02 | |
| -6 | -0.68% | -1.34 | | CAR(-7;-5) | 0.38% | 0.31 | |
| -5 | 0.99% | 1.20 | | CAR(-6;-4) | -0.18% | -0.15 | |
| -4 | -0.49% | -1.16 | | CAR(-5;-3) | -1.15% | -0.75 | |
| -3 | -1.65% | -1.41 | | CAR(-4;-2) | -0.89% | -0.61 | |
| -2 | 1.25% | 1.58 | | CAR(-3;-1) | -0.62% | -0.45 | |
| -1 | -0.22% | -0.27 | | CAR(-2;0) | 0.23% | 0.26 | |
| 0 | -0.80% | -1.01 | | CAR(-1;1) | -0.96% | -0.86 | |
| 1 | 0.06% | 0.13 | | CAR(0;2) | -0.97% | -0.76 | |
| 2 | -0.23% | -0.41 | | CAR(1;3) | -0.14% | -0.14 | |
| 3 | 0.03% | 0.07 | | CAR(2;4) | 0.07% | 0.06 | |
| 4 | 0.27% | 0.42 | | CAR(3;5) | 1.17% | 1.09 | |
| 5 | 0.87% | 1.70 | | CAR(4;6) | 1.77% | 1.70 | |
| 6 | 0.63% | 1.12 | | CAR(5;7) | -0.49% | -0.30 | |
| 7 | -2.00% | -1.05 | | CAR(6;8) | -0.77% | -0.40 | |
| 8 | 0.59% | 1.23 | | CAR(7;9) | -0.65% | -0.34 | |
| 9 | 0.76% | 1.28 | | CAR(8;10) | 2.21% | 2.71 | ** |
| 10 | 0.86% | 1.43 | | CAR(9;11) | 1.83% | 1.99 | * |
| 11 | 0.21% | 0.50 | | CAR(10;12) | 0.98% | 1.16 | |
| 12 | -0.10% | -0.18 | | CAR(11;13) | -0.20% | -0.20 | |
| 13 | -0.31% | -0.81 | | CAR(12;14) | -1.83% | -1.96 | * |
| 14 | -1.43% | -2.23 | ** | CAR(13;15) | -1.38% | -1.41 | |
| 15 | 0.35% | 0.54 | | CAR(14;16) | -0.20% | -0.20 | |
| 16 | 0.87% | 2.19 | ** | CAR(15;17) | 1.39% | 1.85 | * |
| 17 | 0.17% | 0.38 | | CAR(16;18) | 1.16% | 1.07 | |
| 18 | 0.12% | 0.17 | | CAR(17;19) | 0.89% | 0.90 | |
| 19 | 0.61% | 1.19 | | CAR(18;20) | 0.64% | 0.73 | |
| 20 | -0.08% | -0.25 | | | | | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

## Table 22: MMAR pre-crisis period average and cumulative return analysis

| Market Model Abnormal Return (MMAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pre-crisis period: 2004 - 2006 (N=17) | | | | | | | |
| Day | Avg MMAR% | t-Statistic | Significance | 3-day window | Cum MMAR % | t-Statistic | Significance |
| -20 | -0.32% | -1.34 | | | | | |
| -19 | -0.01% | -0.04 | | CAR(-20;-18) | -0.45% | -0.75 | |
| -18 | -0.11% | -0.29 | | CAR(-19;-17) | 0.59% | 0.68 | |
| -17 | 0.71% | 1.09 | | CAR(-18;-16) | 0.07% | 0.07 | |
| -16 | -0.53% | -0.93 | | CAR(-17;-15) | -0.14% | -0.14 | |
| -15 | -0.32% | -1.00 | | CAR(-16;-14) | -0.89% | -0.56 | |
| -14 | -0.04% | -0.04 | | CAR(-15;-13) | 0.09% | 0.14 | |
| -13 | 0.45% | 0.51 | | CAR(-14;-12) | 0.31% | 0.49 | |
| -12 | -0.10% | -0.54 | | CAR(-13;-11) | 1.51% | 0.93 | |
| -11 | 1.16% | 1.29 | | CAR(-12;-10) | 2.90% | 1.47 | |
| -10 | 1.85% | 1.16 | | CAR(-11;-9) | 3.11% | 1.57 | |
| -9 | 0.10% | 0.34 | | CAR(-10;-8) | 2.00% | 1.15 | |
| -8 | 0.05% | 0.14 | | CAR(-9;-7) | 0.41% | 0.49 | |
| -7 | 0.25% | 0.49 | | CAR(-8;-6) | 0.22% | 0.30 | |
| -6 | -0.08% | -0.29 | | CAR(-7;-5) | 0.03% | 0.04 | |
| -5 | -0.15% | -0.58 | | CAR(-6;-4) | -0.38% | -0.61 | |
| -4 | -0.15% | -0.25 | | CAR(-5;-3) | -0.05% | -0.06 | |
| -3 | 0.25% | 0.82 | | CAR(-4;-2) | 0.50% | 0.66 | |
| -2 | 0.40% | 2.44 | ** | CAR(-3;-1) | 0.64% | 1.01 | |
| -1 | -0.01% | -0.01 | | CAR(-2;0) | 0.53% | 2.05 | * |
| 0 | 0.14% | 0.28 | | CAR(-1;1) | 2.81% | 1.12 | |
| 1 | 2.68% | 1.08 | | CAR(0;2) | 3.06% | 1.20 | |
| 2 | 0.24% | 0.83 | | CAR(1;3) | 2.83% | 1.12 | |
| 3 | -0.08% | -0.45 | | CAR(2;4) | -0.53% | -0.88 | |
| 4 | -0.68% | -1.82 | * | CAR(3;5) | -3.05% | -1.68 | |
| 5 | -2.28% | -1.32 | | CAR(4;6) | -2.84% | -1.56 | |
| 6 | 0.13% | 0.26 | | CAR(5;7) | -2.94% | -1.55 | |
| 7 | -0.78% | -1.52 | | CAR(6;8) | -0.38% | -0.60 | |
| 8 | 0.28% | 0.56 | | CAR(7;9) | 0.37% | 0.75 | |
| 9 | 0.88% | 2.97 | *** | CAR(8;10) | 1.31% | 1.82 | * |
| 10 | 0.16% | 0.43 | | CAR(9;11) | 0.42% | 0.46 | |
| 11 | -0.62% | -0.86 | | CAR(10;12) | -0.42% | -0.48 | |
| 12 | 0.04% | 0.07 | | CAR(11;13) | -1.19% | -1.64 | |
| 13 | -0.62% | -1.18 | | CAR(12;14) | -0.31% | -1.00 | |
| 14 | 0.27% | 0.89 | | CAR(13;15) | -0.31% | -0.43 | |
| 15 | 0.04% | 0.19 | | CAR(14;16) | 0.90% | 1.15 | |
| 16 | 0.59% | 0.88 | | CAR(15;17) | 0.88% | 0.98 | |
| 17 | 0.25% | 0.84 | | CAR(16;18) | 0.82% | 0.96 | |
| 18 | -0.03% | -0.16 | | CAR(17;19) | 0.19% | 0.38 | |
| 19 | -0.04% | -0.13 | | CAR(18;20) | 0.35% | 0.61 | |
| 20 | 0.41% | 0.98 | | | | | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

## Table 23: MMAR crisis period average and cumulative return analysis

| Market Model Abnormal Return (MMAR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crisis period: 2007 - 2009 (N=27) | | | | | | | |
| Day | Avg MMAR% | t-Statistic | Significance | 3-day window | Cum MMAR % | t-Statistic | Significance |
| -20 | 0.60% | 1.22 | | | | | |
| -19 | 1.07% | 2.16 | ** | CAR(-20;-18) | 1.22% | 1.60 | |
| -18 | -0.45% | -1.09 | | CAR(-19;-17) | 1.43% | 1.74 | * |
| -17 | 0.81% | 1.79 | * | CAR(-18;-16) | 0.92% | 1.18 | |
| -16 | 0.56% | 1.29 | | CAR(-17;-15) | 1.56% | 1.76 | * |
| -15 | 0.19% | 0.42 | | CAR(-16;-14) | -0.02% | -0.03 | |
| -14 | -0.77% | -1.63 | | CAR(-15;-13) | -0.79% | -1.06 | |
| -13 | -0.21% | -0.53 | | CAR(-14;-12) | -0.47% | -0.50 | |
| -12 | 0.52% | 1.04 | | CAR(-13;-11) | 0.50% | 0.79 | |
| -11 | 0.19% | 0.62 | | CAR(-12;-10) | 1.77% | 2.16 | ** |
| -10 | 1.06% | 1.87 | * | CAR(-11;-9) | 0.53% | 0.59 | |
| -9 | -0.72% | -1.07 | | CAR(-10;-8) | 0.82% | 0.81 | |
| -8 | 0.48% | 1.02 | | CAR(-9;-7) | -0.36% | -0.38 | |
| -7 | -0.12% | -0.31 | | CAR(-8;-6) | 0.03% | 0.04 | |
| -6 | -0.33% | -0.65 | | CAR(-7;-5) | 0.87% | 0.77 | |
| -5 | 1.32% | 1.66 | | CAR(-6;-4) | 0.61% | 0.55 | |
| -4 | -0.38% | -1.20 | | CAR(-5;-3) | -0.63% | -0.37 | |
| -3 | -1.56% | -1.30 | | CAR(-4;-2) | -1.10% | -0.68 | |
| -2 | 0.85% | 1.04 | | CAR(-3;-1) | -0.94% | -0.68 | |
| -1 | -0.23% | -0.28 | | CAR(-2;0) | 0.27% | 0.32 | |
| 0 | -0.35% | -0.50 | | CAR(-1;1) | -0.31% | -0.30 | |
| 1 | 0.26% | 0.56 | | CAR(0;2) | -0.40% | -0.33 | |
| 2 | -0.32% | -0.59 | | CAR(1;3) | 0.23% | 0.24 | |
| 3 | 0.28% | 0.78 | | CAR(2;4) | 0.13% | 0.15 | |
| 4 | 0.17% | 0.30 | | CAR(3;5) | 1.72% | 1.84 | * |
| 5 | 1.27% | 2.78 | *** | CAR(4;6) | 1.94% | 1.96 | * |
| 6 | 0.51% | 0.97 | | CAR(5;7) | -0.21% | -0.13 | |
| 7 | -1.99% | -1.05 | | CAR(6;8) | -1.05% | -0.56 | |
| 8 | 0.43% | 1.10 | | CAR(7;9) | -0.41% | -0.22 | |
| 9 | 1.15% | 2.38 | ** | CAR(8;10) | 2.69% | 3.79 | *** |
| 10 | 1.11% | 1.94 | * | CAR(9;11) | 2.26% | 2.69 | ** |
| 11 | 0.01% | 0.02 | | CAR(10;12) | 1.12% | 1.47 | |
| 12 | 0.01% | 0.01 | | CAR(11;13) | -0.34% | -0.37 | |
| 13 | -0.35% | -1.01 | | CAR(12;14) | -1.71% | -1.89 | * |
| 14 | -1.36% | -2.20 | ** | CAR(13;15) | -1.41% | -1.45 | |
| 15 | 0.30% | 0.46 | | CAR(14;16) | -0.30% | -0.31 | |
| 16 | 0.76% | 2.31 | ** | CAR(15;17) | 0.99% | 1.29 | |
| 17 | -0.07% | -0.18 | | CAR(16;18) | 0.47% | 0.54 | |
| 18 | -0.22% | -0.34 | | CAR(17;19) | 0.51% | 0.59 | |
| 19 | 0.79% | 1.70 | | CAR(18;20) | 0.64% | 0.76 | |
| 20 | 0.07% | 0.25 | | | | | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level

## Table 24: BHAR pre-crisis and crisis period average and cumulative return analysis

| | Average abnormal return cross-sectional test | | | | | |
|---|---|---|---|---|---|---|
| | Buy and Hold Abnormal Return (BHAR) | | | | | |
| | Pre-crisis period: 2004 - 2006 (N=17) | | | Crisis period: 2007 - 2009 (N=27) | | |
| 3-day window | Avg BHAR% | t-Statistic | Significance | Avg BHAR% | t-Statistic | Significance |
| BHAR(-20;-18) | -1.04% | -1.67 | | 0.41% | 0.51 | |
| BHAR(-19;-17) | -0.28% | -0.32 | | 1.24% | 1.49 | |
| BHAR(-18;-16) | -0.81% | -0.96 | | 0.70% | 0.79 | |
| BHAR(-17;-15) | -0.52% | -0.68 | | 1.62% | 1.75 | * |
| BHAR(-16;-14) | -0.40% | -0.31 | | -0.56% | -0.73 | |
| BHAR(-15;-13) | 0.58% | 0.83 | | -1.15% | -1.50 | |
| BHAR(-14;-12) | 0.74% | 1.04 | | -1.04% | -1.18 | |
| BHAR(-13;-11) | 1.77% | 1.03 | | -0.07% | -0.11 | |
| BHAR(-12;-10) | 3.38% | 1.75 | | 1.06% | 1.18 | |
| BHAR(-11;-9) | 3.20% | 1.61 | | -0.53% | -0.63 | |
| BHAR(-10;-8) | 1.35% | 0.78 | | 0.16% | 0.19 | |
| BHAR(-9;-7) | -0.75% | -0.96 | | -0.58% | -0.67 | |
| BHAR(-8;-6) | -1.10% | -1.44 | | 0.01% | 0.01 | |
| BHAR(-7;-5) | -1.26% | -1.76 | * | 0.43% | 0.34 | |
| BHAR(-6;-4) | -0.93% | -1.29 | | -0.15% | -0.13 | |
| BHAR(-5;-3) | 0.04% | 0.07 | | -1.14% | -0.75 | |
| BHAR(-4;-2) | 0.06% | 0.13 | | -0.86% | -0.59 | |
| BHAR(-3;-1) | -0.24% | -0.29 | | -0.77% | -0.55 | |
| BHAR(-2;0) | -0.78% | -1.86 | * | 0.06% | 0.07 | |
| BHAR(-1;1) | 1.89% | 0.79 | | -0.98% | -0.87 | |
| BHAR(0;2) | 2.11% | 0.91 | | -0.90% | -0.70 | |
| BHAR(1;3) | 1.88% | 0.73 | | -0.10% | -0.10 | |
| BHAR(2;4) | -1.11% | -2.47 | ** | 0.09% | 0.08 | |
| BHAR(3;5) | -3.20% | -1.68 | | 1.20% | 1.09 | |
| BHAR(4;6) | -3.44% | -1.75 | * | 1.80% | 1.71 | * |
| BHAR(5;7) | -3.75% | -1.82 | * | -0.70% | -0.39 | |
| BHAR(6;8) | -0.63% | -0.83 | | -0.87% | -0.43 | |
| BHAR(7;9) | 0.72% | 1.54 | | -0.70% | -0.36 | |
| BHAR(8;10) | 1.59% | 2.35 | ** | 2.21% | 2.71 | ** |
| BHAR(9;11) | 1.28% | 1.30 | | 1.85% | 1.98 | * |
| BHAR(10;12) | 0.38% | 0.55 | | 0.99% | 1.17 | |
| BHAR(11;13) | -1.02% | -1.79 | * | -0.19% | -0.19 | |
| BHAR(12;14) | -0.25% | -0.72 | | -1.84% | -1.94 | * |
| BHAR(13;15) | 0.29% | 0.53 | | -1.39% | -1.40 | |
| BHAR(14;16) | 1.58% | 2.22 | ** | -0.21% | -0.22 | |
| BHAR(15;17) | 1.25% | 1.33 | | 1.41% | 1.86 | * |
| BHAR(16;18) | 0.23% | 0.26 | | 1.16% | 1.08 | |
| BHAR(17;19) | -0.24% | -0.47 | | 0.90% | 0.93 | |
| BHAR(18;20) | 0.30% | 0.41 | | 0.64% | 0.72 | |

Note: *** statistically significant at 0.01 level, ** statistically significant at 0.05 level, * statistically significant at 0.1 level