

MARKET REACTION TO INDUSTRIAL ACTIONS IN SOUTH AFRICA

by

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,

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DECLARATION

I, Nondumiso Ngidi declare that the research work reported in this dissertation is my own, except where otherwise indicated and acknowledged. It is submitted for the degree of Master of Management in Finance & Investment in the University of the Witwatersrand, Johannesburg. This thesis has not, either in whole or in part, been submitted for a degree or diploma to any other universities.

Nondumiso Ngidi
22 February 2011

ABSTRACT

This study examines the impact of strike action on the stock market in SA, particularly the company share price. In recent years, SA has seen a steady increase in strike actions related to wage increases, which have generally been of short duration. The study is conducted by computing abnormal returns and subsequently cumulative abnormal returns for listed companies that had experienced strikes between 2003 and 2009.

The sample included 49 listed companies on Johannesburg Stock Exchange. The results of the study reveal that stock prices react negatively to the news of a strike action five days prior to the strike and continue on a downward trajectory approximately 5 days post the strike action. The study finds that JSE is not an efficient market as it takes days for the market to return to equilibrium after an announcement.

The research observed that there were numerous factors that influence the occurrence of strikes/industrial actions in South Africa namely; SA's political history, trade unions irrational behaviour, information asymmetry and economic climate among other factor.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The democratic government of South Africa in 1994 inherited a discriminatory socio-economic system and a disorganised politico-administrative framework. Yet the expectations for this government to deliver an improved quality of life are immense. The question is whether the state has the capacity to realise these expectations (Luiz, 2002).

The government has implemented programmes in a broad attempt to improve economic performance and eradicate the consequences of the previous political regime. The initiatives include RDP (Reconstruction and Development Programme), GEAR (Growth, Employment and Redistribution) and the latest, NGP (New Growth Plan).

The RDP policy aimed to provide the basic services to the previously disadvantaged communities, which included jobs, housing, water, electricity and telecommunications. In terms of social security, the RDP achieved some remarkable results. Owing to mismanagement of funds, however, the RDP was officially closed in 1996. Blumenfeld (1996) attributes the failure of the RDP to conceptual uncertainties, lack of funding, institutional uncertainties, ideological struggles and implementation failures.

GEAR represented a paradigm shift and implied that economic development in South Africa should be led by the private sector; the state should play a smaller role in the economy; state-owned assets should be privatised; there should be deep cuts in government spending; and that social service delivery budgets were to be prioritised. Concurrently those social services that could not be provided to all, or that could be undertaken more effectively by the private sector such as social assistance grants, were to be eliminated or scaled down. GEAR did not live up to all the expectations of its planners of enhance growth, employment or redistribution. In the period 1996 to 2001 the economy grew by only 2.7 per cent instead of 6 percent as originally envisaged, and employment shrank by 3 per cent (Visser, 2009).

Despite government efforts to implement a welfare system that benefits all, South Africa (SA) remains a particularly unequal society with regard to wages and living standards because most of government's initiatives fail. It is not inconceivable that the increase in the number of strike actions related to service delivery and wage disputes is caused not only by low wages but also by a big wage gap between the black and white population groups. This study investigates the impact of the increased strike actions on the stock market (company share price).

This first chapter consists of six sections. Section 1.2 provides a brief background on SA's transition to democracy. Section 1.3 presents the research problem. Section 1.4 presents the research aim and objectives of the study. Section 1.5 presents the research questions, and Section 1.6 focuses on the rationale for the study.

1.2 Background

SA experienced political instability for a prolonged period owing to racial segregation. The linchpin of the apartheid political, economic and social regime was the purposive control and manipulation of the labour market in a manner which privileged the white minority while disadvantaging and discriminating against the black majority (Presidential Commission, 1996). The apartheid regime formally ended with the elections in 1994. Prior to 1994, African and white workers received average wages that differed by a factor of 5, although part of that gap, roughly half according to one assessment, can be accounted for by differences in race, in years of education and in location (Schultz and Mwabu, 1998).

Trade unions, particularly Congress of South African Trade Union COSATU, played a pivotal role in narrowing the wage gap between races in SA while most SA unions which emerged in the aftermath of the 1973 strikes sought to prevent a concentration of power in the hands of officials by building a tradition of 'worker control' and

accountability of leadership to their members, particularly through a system of mandated decision making and regular reports. These unions de-emphasised the role of the union official and instead encouraged a tradition in which workers and elected shop floor worker leaders played a prominent role in decision making within the unions.

COSATU was founded in 1985 and is the biggest of the three main trade union federations in SA. The union played a leading role in the struggle against apartheid, organising a range of highly effective wage strikes and also general strikes (termed 'stayaway action', which is an industrial action by a group of employees in the form of absenting themselves from work without permission in support of some socio-political or socio-economic issue which does not relate to their employment situation). From its inception as early as 1986, COSATU and affiliated unions organised mass strike action in Impala Platinum mines involving 30 000 workers. The workers' grievances were related to working conditions and wage differences between the ethnic groups. In September 1989 massive stayaways, demonstrations, an overtime ban and consumer boycotts were launched against the Labour Relations Amendments Act, all aimed at pressurising employers to negotiate. Although the majority of the strikes were for the betterment of working conditions, the other strikes were in protest against the political systems in SA and in favour of democracy. The 3rd August 1992 was marked by a two-day national stayaway in support of democracy and peace.

The strikes were effective in changing the policies that were nothing but detrimental to the SA economy. The annual growth in real gross domestic product (GDP) averaged only 0.9 per cent over the period 1984 to 95, which, together with SA's high population growth rate, resulted in a decline in real per capita GDP of almost 15 percent (Dollery, 1997). Mohr (1994) finds that changes in the world economic growth, world trade, technological progress, gold production, import substitution, and foreign capital flows from 1975 all served to depress SA economic performance. Lowenberg (1997) examines the role of sanctions in changing the political stance of SA and economic suppression and finds that sanctions contributed to the economic crisis. The mass strike actions alerted the international community to the political plight of SA.

Certain sectors were affected by the strike actions, indicating a decrease in growth during that period. Davies and van Seventer (2004) find that the trade ratio (trade ratio is measured as the sum of export and import values to GDP, in current prices, and is a commonly used crude measure of how open an economy is) only started to grow in 1992, perhaps reflecting post-apartheid reintegration. The acceleration after 1999 reflects domestic liberalisation policies starting to make an impact. The ratio's average annual rate of growth was 5.5 per cent between 1993 and 1996, 0.8 per cent between 1997 and 1999 and 9.8 per cent between 2000 and 2002.

The post-apartheid economy has been characterised by soaring unemployment, slow growth and an extremely low rate of investment. After 1994, government anti-poverty efforts aimed at improving living standards in African communities, rather than at helping the poor earn higher incomes through skill development (Makgetla, 2004). This has meant that a significant number of African employees continue to earn low wages. The interesting fact is that, in the recent past SA has experienced protests by various communities against poor service delivery in addition to company strike actions. There were more protests against poor service delivery in 2008 and 2009 than in other post-apartheid years. Municipal IQ measures the performance of SA's municipalities on a range of critical socio-economic and financial issues that reflect the reality of local government circumstances and risk on the ground. Further, Municipal IQ actively compares, contrasts and ranks municipalities, one against the other. In 2009, Municipal IQ recorded 105 service delivery protests for that year, which was a big increase from only 27 protests in 2008. The increase could be a reflection of voters' dissatisfaction with the inability of the government to deliver on the promises made since 1994. In 2006, only two service delivery protests were recorded and that can be attributed to the municipal elections and the efforts put in by local councillors to secure votes during the election period.

For example, in Standerton in Mpumalanga Province protests erupted in October 2009 initially as a result of a lack of water and electricity and later the residents implicated all the local councillors in corruption within the municipality structures. The protests lasted for approximately a week. In Palm Ridge near Katlehong in Gauteng Province similar protests were reported with the same grievances, resulting in 15 people being injured (SABCNEWS, 2009).

Companies in SA continue to experience strike actions, mostly related to wage disputes post apartheid. For instance, on 27 July 2005, workers at Highveld Steel and Vanadium, SA's second-largest steel producer, went on a pay strike after the National Union of Metalworkers of South Africa NUMSA and Solidarity trade unions rejected a revised wage offer of 5.5 per cent. The unions demanded 8.0 per cent and a 5.0 per cent increase in a housing allowance. In a bid to avert the strike, Highveld Steel increased its offer from 5.0 per cent to 5.5 per cent but, after the workers went ahead with the strike, the company reverted to 5.0 per cent. Thousands of Pick and n Pay, a franchise supermarket, staff stayed away on 29 August 2008. The union was demanding a R500 increase, or 12.0 per cent, and the company was offering R350. The union further demanded a one-year agreement of employment instead of the multi-year agreement the company was offering. The union reported that its adjustments to working hours

and general working conditions included a minimum of 108 hours and a 'R3 000 a month' wage for staff members who work when the company needs them.

Previous studies have examined the impact of industrial actions on a macroeconomic scale, and have revealed that they cause a decline in the country's GDP. This may explain the negative GDP growth of -0.7 per cent in 2009 first quarter, the year in which there was the highest number of strikes in the mining industry.

1.3 Research Problem

Working days lost due to labour disputes more than doubled to 2 627 953 in 2005 compared to 2004. The main cause of the disputes was wages, bonus and other compensations, which were sitting at 66.87 per cent in 2004 and 85.6 per cent in 2005 (Industrial Actions annual reports, Department of Labour, 2005). This indicates that industrial action is becoming a common phenomenon in the SA working environment.

The problem is that, despite government's efforts to upgrade the standard of living for black people, when it comes to compensation of employees by companies, there is still a big gap between the wages earned by different ethnic groups. Government initiatives and the trade unions' efforts to address the wage discrimination have evidently failed and the result has been an increase in the number of company strikes and service

delivery protests. While the causes of the industrial strikes are understood, the problem is that the impact of these strikes on share prices and on the economy at large is neither known nor understood. Although research has been carried out in Canada and the USA by Nelson et al (1994) to assess the impact of strikes on various macroeconomic factors, no such study to the researcher's knowledge has been conducted in SA.

1.4 Research Aim and Objectives

The study examines the impact of strike action on the share price in the context of South Africa. It uses JSE data to analyse market reaction to industrial actions. In recent years, SA has seen a steady increase in strike actions related to wage increases, which have generally been of short duration. Specifically, the objectives of this study are to determine:

- The influence of industrial action on stock prices and the time taken to return to equilibrium; and
- The factors that influence the occurrence of strikes.

1.5 Research Questions

The research questions for this research are stated as follows:

- Do stock prices deviate from the fundamentals owing to company strike actions in SA?

- What are economic effects/costs of strike actions in SA?
- What underlying factors contribute to the increase in strike actions in SA in recent years?
- Does the stock price fluctuation reveal the efficiency of the market?

1.6 Rationale for Focusing on the Impact of Strike Actions

Amongst the challenges that confront the SA economy in transition are: maintaining a structure of wages and salaries consistent with avoiding an exodus of high- and middle-level personnel and averting frequent, production crippling social unrests such as strikes and riots (Green, 1991). Because industrial strikes are very common in SA, it is important that researchers know and understand the impact that these strikes have on the economy, in particular on a firm's share prices.

The results of the study should provide an insight into the extent of the impact the strikes have on the company stock price and more significantly on the economy. Company management will benefit from assessing the predictability of strikes and the possibility of averting them. As a result of averting strikes, there will be minimal downtime, which will eventually translate into earnings. Policy makers within government structures can examine the apparent inequality within society due to ineffective prioritisation of service delivery, which has seen communities protesting in

the streets and causing havoc in the process. Policy makers can develop and implement policies to address the apparent inequalities.

In summary, Chapter 1 introduces the thesis, including the background of SA history and on strike actions, the research aim and objectives, and the research problem and rationale for focusing on the impact of strike actions on the stock market. The next chapter presents an extensive literature review of factors that influence stock market reaction to strikes/industrial actions and variables that have explanatory power on the occurrence of strikes.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter summarises relevant studies from a large body of literature related to the current study. Fundamental concepts have also been reviewed to illustrate their relevance with the current study. Section 2.2 reviews the role of unions in wage negotiations. Section 2.3 presents the costs and benefits of strikes in the SA context and Section 2.4 reviews the predictability of strikes. Section 2.5 compares the predicted strike outlook and the actual strike activity for the year 2010, and Section 2.6 examines the effect of public sector strikes on the stock market. Sections 2.7 and 2.8 report on the effect of firm size on strike occurrence and general factors that cause stock price change, respectively, and Section 2.9 focuses on stock market efficiency. Section 2.10 reviews the concept of behavioural finance. Section 2.11 reviews the role of information asymmetry in the occurrence of strikes and the chapter ends with a summary of the findings of the literature review.

2.2 Wage Negotiations and the Role of Unions

The bargaining process requires that the two parties – the employer and the union – provide each other with their respective demands (known as ‘demand points’) and bargain in good faith. Eventually a compromise, somewhere between the demand

points, is reached and the negotiations are concluded. Whether this compromise position is attained without a labour dispute depends on many factors, some of which are financial (Nelson, Amoako-Adu and Smith, 1994).

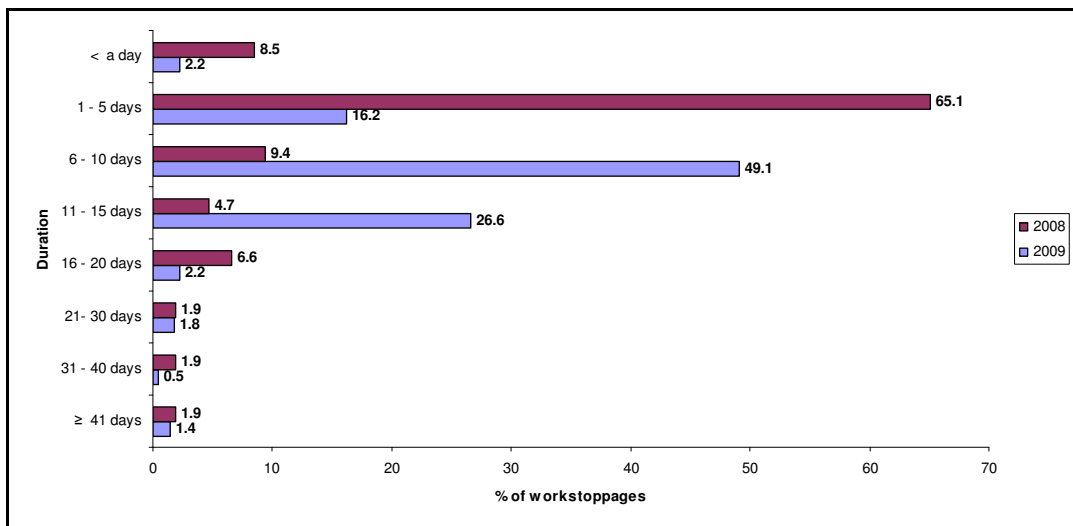
There is a substantial amount of diversity in the SA bargaining system across industries and across firms. Wage bargaining takes place at two levels in SA. At the centralised level, wages are set in bargaining council agreements, which cover specific industry, occupation and area (either the whole country, or a province or city). At the plant level, bargaining occurs in both the firms covered and those not covered by bargaining council agreements (Azam and Rospabe, 2007).

Therefore, intuitively, failure of the bargaining process at centralised level will have a devastating effect on company financial returns and hence the stock price. Dubin's (1965) findings in predicting strike action in the US can be utilised to quantify the impact of strike action at a centralised level on company returns. Analysing the length and intensity of a strike, the possible impact of a strike on the company returns can be inferred. Three measures are used to measure the intensity of a strike: 1) the number of industrial disputes; 2) the number of workers involved; and 3) the proportion of working days lost due to strikes. SA strikes are generally of short duration, approximately six days on average as illustrated in Figure 2.1.

In 2008 65.1 per cent of the strikes had a duration of one to five days and in 2009 49.1 per cent of the strikes lasted between six and 10 days. Only 0.5 per cent work stoppages lasted between 31 and 40 days.

Nelson and Amoaka-Adu and Smith (1994) find that shorter duration and longer duration strikes have differential impacts on firms. Strikes that last a few days tend to reduce stock prices, whereas shareholders gain from longer duration strikes. Firms involved in longer strikes are probably in a better position to reject union demands and prolong the period of impasse, whereas management may help resolve the labour dispute when it is expected that the effect of the strike on the company may be too severe.

Figure 2.1: Strike duration in South Africa



Source: Department of Labour, Strikes Statistics, 2009

According to Neumann (1980), if the company and the unions have the same goal, which is to maximise the company's wealth, then wage negotiations will be conducted so as to achieve a favourable outcome for both parties – then avert the strike (if we assume strikes are costly).

In the SA context, trade unions' main objectives are to rectify the injustices of the apartheid era, which include wage discrimination, rather than to seek a feasible resolution for both parties. Table 2.1 illustrates the main causes of strikes in SA market between 2003 and 2009.

Table 2.1: Working days lost distribution by principal cause of dispute, 2003 – 2009 (in percentage)

Principal cause	2003	2004	2005	2006	2007	2008	2009
Wages, bonus and other compensation	50.8	61.7	66.5	92.7	89.9	43.7	91.2
Working conditions	18.5	10.3	2.67	0.08	6.40	2.0	4.5
Disciplinary matters	12.3	2.1	1.07	0.14	0.06	0.2	0.3
Grievances	10.8	15.5	6.74	1.1	0.93	11.1	2.6
Socio-economic and political conditions	1.4	0	20.9	5.43	0	37.6	1.0
Secondary action	1.2	0	0.53	0.02	1.86	0.6	0.1
Retrenchments/redundancy	1.5	4.1	1.55	0.42	0.47	0.1	0.2
Refusal to bargain	3.1	3.1	0	0.15	0.07	1.0	0.0
Trade union recognition	0	0	0	0	0.31	3.7	0.1

Source: Department of Labour, Strikes Statistics, 2009

Table 2.1 above illustrates the changes in working days lost arranged by cause of the dispute. The 2003 column shows that in that year 50.8 per cent of the working days lost were related to wages, bonuses and other compensation. The data is on an upward trajectory, as noted in 2009, with 91.2 per cent of stoppages related to wages. This is in direct contrast to government's objectives and reports. The strategic plan for the Department of Labour for 2004-2009 states the department's objectives as (among others): 1) ensuring a continuing decline of workdays lost through industrial action; and

2) ensuring an effective and efficient dispute-resolution system (Department of Labour Annual Report, 2010).

Johnson and Ashenfelter (1969) term the occurrence of strikes as irrational behaviour and it gives insight into why strikes occur or increase as is the case with SA strikes in recent years.

An increase in strike actions also correlates with economic factors such as high inflation and high interest rates. This was evident in 2008 during the recession, where employees demanded high wage increases owing to high inflation. Trade unions also contribute to an increase in strike actions. A bargaining model by Johnson and Ashenfelter (1969) reveals that union leadership approaches wage negotiations with the following objectives:

- The survival and growth of the union as an institution; and
- The personal political survival of the leaders of the union.

These objectives are accomplished, in most part, by satisfying the expectations of the rank and file as well as possible. For this reason unions will cause failure of wage negotiations to appear stringent to the firm, thereby giving them a reason for embarking on a strike. Under strike conditions union leadership may appear as adversaries against

management in a crusade which may even raise their political stock. In this way the abovementioned objectives of the unions are achieved and strike actions increase.

2.3 Costs and Benefit of Strikes in South Africa

The evident cost of strikes for a company is lost time in production. When South African Breweries (SAB) employees embarked on a strike in December 2009, 3 500 workers were involved and that translated into a significant decrease in output and sales. But the major cost of a strike is the reputation of the company. When a company embarks on a strike, it causes a disturbance in the supply chain and this eventually causes losses in the value of the company and its market share. This was evident when Nike as multinational company (MNC) made an investment in emerging markets in Asian countries to take advantage of low labour costs. When the host country's labour regulations were not adhered to, Nike experienced strike actions within the company and faced a worldwide boycott of its products. This dented the reputation of the company and its share price.

If the expected benefits from a strike exceed the costs of the strike, workers will embark on a strike action. The cost of the strike to workers is related to the duration of the strike. A strike lasting for an extended period will cause a loss of income in wages.

In a research study of the effects of joint strikes by Ahmed (1989), it was found that strikes impose a joint cost on both the employer and workers. Both the union and management strive to lower this joint cost by developing what Reder and Neumann (1980, in Ahmed, 1989) term 'bargaining protocols'. The cost of strike can be estimated by using the following proxies: 1) Decline in the value of the firm as measured by the stock market; 2) Seller and buyer concentration indices: industries with high buyer or seller concentration have low joint costs of strikes because the customers will find it difficult to satisfy their demand and other firms will find it difficult to satisfy the demand created by work stoppages in the industry in question; 3) Output losses: strikes may cause loss in output in the current, past or future period and inflict losses on both the parties by reducing the absolute share of the pie available to them; and 4) Intra-year coefficients of variation of inventory and shipments.

2.4 Predictability of Strikes

Neumann (1980) and Dubin (1965) contributed immensely to the study of predictability of strikes and their effect on the stock market. Their studies built on the work by Hansen (1921) on the effect of cyclical movements of industry on strikes. Hansen's (1921) study states that when the general trend of prices (in industry) is upward we may expect to find labour becoming aggressive. The struggle between labour and capital becomes more bitter in the years of prosperity for two reasons: 1) it is in the prosperous years that

prices and living costs rise; and 2) the large profits accruing in years of prosperity give rise to a contest over their distribution.

The study suggests that if the industry cycles can be determined then the industry strikes (company strikes) can be predicted with a high level of confidence. It is when strikes can be predicted that their effects can be reduced. The company earnings and stock price will experience fewer fluctuations as a result of wage strike actions. The strategy of increasing company benefits can be implemented to avert wage-related strikes. Increasing benefits may benefit the company as there might be tax incentives for allowances the company provides workers.

2.5 Work Stoppage Future Outlook versus Actual, 2010

The current study reviews the impact of strikes on the SA stock market for the period between 2003 and 2009. It is thus critical that the predictions for economic prospects be reviewed against the actual state of the economy for year 2010. This will provide an insight into the qualitative significance of the annual reports between 2003 and 2010 by the Department of Labour.

Predictions by Department of Labour(2009): The economy will gradually but slowly recover as third-quarter figures for 2009 from Statistics South Africa reveal that real GDP at market prices increased by 0.9 per cent quarter-on-quarter, seasonally adjusted and

annualised (Stats SA, P0441:4). Although the economy is out of recession, workers will continue losing their jobs as the effects of the recession will be with us for some time. Workers might decide to protect their jobs rather than going on strike during this difficult time. Inflation rates remain particularly important if the theory that work stoppages are caused by instabilities such as prices is true. Higher inflation correlates with increased work stoppage activity as workers demand higher wages when the prices of goods and services rise, while lower inflation correlates with decreased work stoppage activity, as the demand for higher wages cannot be justified on the basis of lower prices. However, figures from Statistics South Africa indicate that headline consumer price index (CPI) (for all urban areas) annual inflation rate in November 2009 was 5.8 per cent. This rate was 0.1 per cent of a percentage point lower than the corresponding annual rate of 5.9 per cent in October 2009 (Stats SA, P0141:2). This is well within government's target of 3-6 per cent. The fact that there were a number of wage agreements concluded in 2009, e.g. in the clothing sector, municipal sector, construction sector and some coal, platinum and gold sectors and the road freight sector, might imply that the country is less likely to experience an upsurge in strike activity in the future. It is against this background that we predict less strike activity in 2010 than in 2009 (Department of Labour, 2009).

Actual: The country had a significantly high percentage of public sector strikes and general protests related to service delivery. Company-specific strikes decreased from

2009 but companies involved in the World Cup 2010 experienced 'opportunity' strikes mid-year.

2.6 Determinants of Public Sector Strikes

The public sector strikes represent a decisive trial of strength for the government as it introduces increasing wage and employment flexibility in accordance with its neoliberal policies. The strike actions experienced recently involve issues of principle for unions, having to do with the wage gaps that are the legacies of apartheid, and the struggle for a 'living wage' for workers – a wage that could meet the rising costs of basic necessities and services in a society that is becoming more and more commodified (Barchiesi, 1999).

In their model, Nelson, Stone and Swint (2001) specify the utility function of union leaders and the settlement limitations placed on them by union members. Union leader (UL) utility function is given as:

$$U(\text{UL}) = U_L(X_1, X_2) \quad (1)$$

Where X_1 is the net financial gain to union members and X_2 is the excess of the wage settlement over that level expected by union members. The greater the excess of the wage settlement over union members' expectations (X_2), the greater the level of power and prestige for the union leaders within the union organisation. This is consistent with the motivation of union leaders for personal power and prestige within the union as described in Section 2.2 in the case of the private sector.

The model of aggregate strike activity is tested:

$$S = \alpha + \beta_1 U + \beta_2 w + \beta_3 G + \beta_4 E + \beta_5 T + \beta_6 L + \beta_7 P + \sum \beta_i D_{i-7} + e \quad (2)$$

Where,

S = aggregate level of public sector strikes

U = unemployment rate of public employees

w = percentage change in compensation of private non-agricultural workers

G = consolidated surplus or deficit of all state and local governments

T = time trend

L = dummy variable for the Landrum-Griffin Act of 1959

P = consumer price index, price non-agricultural sector, all persons

D_i = seasonal dummy variable for the first three quarters

e = error term

E = dummy variable for the state of the economy

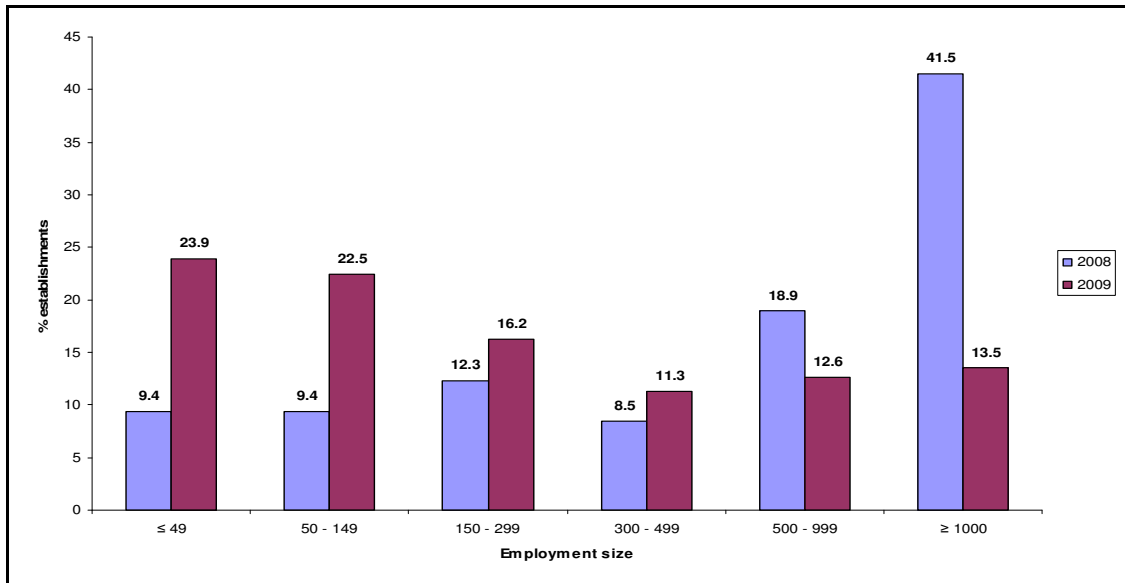
Strikes are extremely rare where there are no union members. Dickerson and Stewart (1993) found that for both manual and non-manual workers in the sample period fewer than one in 100 establishments without union members experienced a strike. As is well known, union presence is much greater in the public sector, both in terms of membership and in terms of recognition. This makes the propensity to strike high in the public sector.

In addition, there is considerable evidence that large plants are more likely to experience strikes than small ones and plants are on average larger in the public sector.

2.7 Firm Size and Strike Proneness

A model by Prais suggests a new way of dealing with the old controversy of what makes people in large plants act differently from those in small ones. Instead of looking at factors such as bureaucratisation and alienation, Prais sets up a model which assumes that people have the same amount of 'conflict-proneness' or 'disputatiousness' whatever the size of the plant. If the model fits the data, it is possible to conclude that the size effect is due not to differences in the characteristics of people in plants of different sizes but to size itself. The results of a similar study the same study by Edwards (1980) indicate that, although the probability of a dispute can be taken to increase in proportion to the increase in plant size, this is counteracted by a slower growth in the number of groups with strike potential. Thus, strike frequency rises with plant size, but at a less-than-proportional rate.

Figure 2.2: Percentage distribution of establishments affected by labour disputes by employment size, 2008 and 2009



Source: Department of Labour, Strikes Statistics, 2009

Figure 2.2 depicts the percentage distribution of the establishments affected by labour disputes by employment size in both 2008 and 2009. The disputes affected both big and small companies. Impala Platinum with more than 20 000 employees was also affected by a labour dispute in 2009, while Lake International in KwaZulu-Natal with fewer than 50 employees in total was affected by a chemical strike. According to Figure 2.2, about 23.9 per cent of establishments affected by labour disputes in 2009 had a total workforce of fewer than 50 employees compared to 9.4 per cent in 2008. Establishments with 1 000 and more employees affected by labour disputes declined in relative terms from 41.5 per cent in 2008 to 13.5 per cent in 2009.

2.8 Factors causing Stock Price Change

Stock prices have been observed to deviate from the fundamentals (accounting data) as a result of numerous factors. Sunde and Sanderson (2009) suggest that the determinants of stock prices include corporate earnings, management, lawsuits, mergers and takeovers, market liquidity and stability, government policy, macroeconomic fundamentals, investor sentiments, technical influences and analysts' reports.

Strike actions can be associated with investor sentiments as they present uncertainty and anxiety for risk-averse investors. A study by Chan (2003) on stock market reaction to news and no news reveals that stocks with bad public news display a negative drift for up to 12 months. This is consistent with investor overreaction to spurious price movements. Investors overreact to price shocks, causing excess trading volume and volatility and leading to reversal.

2.8.1 Management

Although top managers' contribution to firm value is not directly observable, stock returns are a potential source of information. In an efficient market, however, stock return is a noisy measure of management performance. The return reflects only the unexpected component of top management performance and is influenced by a variety of exogenous factors.

Stock price reaction at announcement of a management change can indicate whether the capital market considers the event significant. Then abnormal stock return at announcement is the sum of two components. One is an information component that is negative if the change signals worse management performance than anticipated. The second is the real component that is positive if the changes are in shareholders' interest. A positive net effect is expected only if the real component is larger in absolute value than the information component (Warner, Watts and Wruck, 1988). The results of an investigation by van Zyl (2010) of a correlation between stock prices and management changes indicated that management change announcements are associated with small but statistically significant, abnormal stock price movement, positive in some cases and negative in others.

A study of the impact of an organisation's chief executive officer (CEO) on its financial performance assumes that the CEO has influence over the company's decisions. Finkelstein and Boyd (1998) found that high levels of discretion given to CEOs by their Boards of Directors increase their ability to influence firm performance directly. Central to Finkelstein and Boyd's managerial discretion concept is the idea that strategic leadership, especially as embodied in the role of the CEO, is pivotal to the success of the firm. Higher managerial discretion, and the associated increased riskiness of the CEO role, leads to greater potential impact of the CEO on the firm. The positive impact on firm

performance of a change in CEO requires that the Board of Directors has the ability to recognise and attract a superior successor (Denis and Denis, 1995).

2.8.2 Corporate earnings

There have been extensive studies on the influence of corporate earnings on the stock price. Penman (1987) used aggregate data to examine how the timing of quarterly and annual earnings' announcements impacts stock returns. He found that aggregate corporate earnings' reports arriving at the market during the first half-month of calendar quarters tend to be good news, while earnings' reports later in the quarter tend to be bad news. Zarowin (1989) used individual firm data to investigate the question of stock market overreaction to corporate earnings' changes and found that firm size is a more important factor than simply overreaction behaviour by investors.

Babcock (1970) showed that earnings per share (EPS) can be decomposed into the product of five financial ratios:

$EPS = Tax \times Margin \times Turnover \times Leverage \times Book\ Value\ per\ share$ where

$Tax = \frac{After\text{-}tax\ earnings}{Before\text{-}tax\ earnings}$

$Margin = \frac{Before\text{-}tax\ earnings}{Sales}$

$Turnover = \frac{Sales}{Total\ assets}$

$Leverage = \frac{Total\ assets}{Shareholders'\ equity}$

$Book\ value\ per\ share = \frac{Shareholders'\ equity}{Number\ of\ common\ shares}$

An increase in any one of the five financial ratios results in an increase in corporate earnings. Foster (1973) measures reaction of individual investor to the EPS estimates by computing $V_{i,t}$, weekly average of daily percentage of shares traded prior to the announcement and post-announcement to determine if investors perceive such an announcement to have any informational content. A firm's stock prices react immediately to earnings' reports, continue to drift in the same direction for three quarters, then partially reverse in quarter four (Kothari, Lewellen and Warner, 2006).

Zarowin (1989) finds that although the poorest earnings' performers outperform the best earnings' performers by a statistically significant percentage over the event window, subsequent to the extreme earnings' year, the result is due primarily to differences in size between the two groups. Poor earners tend to be smaller firms than good earners. When poor earners are matched with good earners of equal size, there is little difference in return behaviour. When poor (or good) earners of disparate sizes are compared, small firms outperform large firms, and smaller winners outperform larger losers.

2.8.3 Analysts' reports

The analysts' new buy stock recommendations compared with new sells are associated with: i) overoptimism bias (as measured by the optimistic tone of language used in their research reports compared with subsequent lack of stock outperformance); ii)

representativeness bias (as measured by previous stock price performance, growth status of the firm (low book-to-market) and firm size); and iii) corporate relationships between their investment bank employers and the firms they are following (Mokoaleli-Mokoteli, Taffler and Agarwal, 2009). The event study reveals that in the case of new buys, market reaction is complete by the end of the month in which the recommendation is issued, while, in contrast, the market continues to react for up to a year to new sell recommendations.

In making recommendations, one source of potential bias could be the practice of analysts to recommend stocks after an abnormal price decline, so that the abnormal returns during the recommendation period are biased upwards (Bjerring, Lakpnishok and Vermaelen, 1983).

Analysts are generally required to rank firms using their brokerage's particular equity ranking system (e.g. buy/hold/sell). Typically, the number of categories available to an analyst is limited to only a few. Most brokerages restrict analysts to issue recommendation, using one of a small number of equity-ranking categories. While the contents of an analyst's full report contain significantly more detail than simply this recommendation, it is the analyst's categorical recommendation that is widely reported in the media (Morgan and Stocken, 2003). Therefore, the stock price will adjust to conform to the analyst's expectations.

Bhana (1990) performed an evaluation of the effectiveness of share recommendations by two large firms of stockbrokers in the SA environment. The result of the study suggested that the evident ability of stockbrokers to provide better investment recommendations stems from their superior access to new information that is processed more quickly and efficiently than most investors. Prayag and van Rensburg (2006) found that an investor generally earns significantly higher returns by acting on downgrades instead of strictly following the level of SA stock broking firms' analysts' consensus buy, hold and sell recommendations.

2.8.4 Government

A study by Bialkowski, Gottschalk and Wisniewski (2007) investigated the relationship between politics and stock markets by focusing both on the entire term of office and on the day on which voters cast their ballots. The conclusion from the analysis reveals that investors do not re-adjust their discount rates in response to election results.

Governments shape the environment in which the private sector operates. They affect firms in many ways: by imposing taxes, providing subsidies, enforcing laws, regulating competition, and defining environmental policies. Pastor and Veronesi's (2010) analysis of uncertainty about government policy categorises uncertainty as policy uncertainty and political uncertainty. The results of the study show that, on average, stock prices fall at

the announcement of a policy change. Given the government's economic motive, any policy change that lifts stock prices is mostly expected, so that much of its effect is priced in before the announcement. In contrast, negative announcement returns tend to be larger because they occur when the announcement of a policy change contains a bigger element of surprise.

The presence of political risk is a worldwide phenomenon that affected most national bond and stock markets in the 20th century. Beaulieu and Cosset et al (2005), when examining the impact of political risk on the volatility of stock returns in Canada, found that unfavourable political news has a more significant impact on the volatility of stock returns than favourable political news. However, the exposure to political risk varies with two characteristics of firms: 1) nature of their assets and 2) the level of their international activities.

The impact of political risk on the volatility of stock returns is based on the premise that the value of a firm is equal to the present value of its expected cash flows, whereas the discount rate represents investors' required rate of return (Beaulieu, Cosset and Essaddam, 2005).

2.9 Stock Market Efficiency

Market efficiency in economic literature has been equated with market outcomes by perfect competition. Under perfectly competitive conditions, the interplay of sellers and buyers leads to the establishment of a unique market price in which the marginal cost of supply is equal to the marginal satisfaction obtained by buyers; supply costs are everywhere minimised; and no market participant can gain without loss to another (Collins, 1966).

A capital market is said to be efficient with respect to an information item if the prices of securities fully impound the returns' implications of that item. In an efficient market, when a new information item is added to the market, its revaluation implications for security returns are instantaneously and unbiasedly impounded in the current market price. Several studies have empirically tested the reaction of security prices to the release of different information (Raja and Sudhakar, 2010).

Another measure of efficiency is the capitalisation ratio. Jefferis and Smith (2005) listed the capitalisation ratios of different African stock markets to highlight the changes in their efficiency. SA's stock market was found to be weak-form efficient during the evaluation period. This implies that the prices fully reflect the information implicit in the sequence of past prices. The other forms of market efficiency include semi-strong and efficient.

However, Thaler (1999) finds that there are five areas in which behaviour in the real world seems most at odds with the theories:

a) Volume

The standard model of asset markets predicts that participants will trade very little. Of course, pinning down exactly how little volume should be expected in this world is difficult because in the real world people have liquidity and rebalancing needs, but it seems safe to say that 700 million shares a day on the New York Stock Exchange (NYSE) is far more trading than the standard market model would expect.

b) Volatility

In a rational world, prices change only when news arrives. Shiller's (1981) conclusion states that stock and bond prices are more volatile than advocates of rational efficient market theory would predict.

c) Dividends

Modigliani and Miller (1958) showed that in an efficient market with no taxes, dividend policy is irrelevant. Therefore, the reaction of stock prices, specifically a rise in stock price when dividends are initiated or increased, can be attributed to irrationality.

d) Equity Premium Puzzle

One would expect returns on equities to be higher because they are riskier than T-bills, but a return differential of 7 per cent a year is too much to be explained by risk alone.

e) Predictability

In an efficient market, future returns cannot be predicted on the basis of existing information. In recent history, it has been accepted that stock prices are at least partly predictable (example by Fama, 1991) on the basis of past returns: such measures of value as price-to-earnings or price-to-book ratios, company announcements of earnings, dividend changes, and share repurchases and seasoned equity offerings. Although considerable controversy remains about whether the observed predictability is best explained by mispricing or risk, no one can has been able to specify an observable risk measure that can explain the existing data pattern.

2.10 Behavioural Finance

Behavioural finance does not try to define 'rational' behaviour or label decision making as biased or faulty; it seeks to understand and predict systematic financial market implications of psychological decision processes.

In financial markets, analysts and investors generate information for trading through means such as interviewing management, verifying rumours and analysing financial statements. If an investor overestimates his ability to generate information, or to identify the significance of existing data that others neglect, he will underestimate his forecast errors. If he is more overconfident about signals or assessments with which he has greater personal involvement, he will tend to be overconfident about the information he has generated (Daniel, Hirshliefer and Subrahmanyam, 1998). Their study reveals that overconfident-informed overweights the private signal relative to the prior, causing the stock price to overreact.

Bernard and Thomas (1990) suggest that investors ignore autocorrelation patterns in quarterly earnings' reports and are thus surprised by predictable changes in earnings. The price response to earning announcements aligns closely with this prediction (Kothari, Lewellen and Warner, 2006).

Conservatism, as documented by Edward (1968), states that individuals are slow to change their beliefs in the face of new evidence. In his experiments he found that individuals update their posteriors in the right direction, but by too little in magnitude relative to the rational Bayesian benchmark. Conservatism is extremely suggestive of the underreaction evidence already discussed.

A second important phenomenon documented by psychologists is the representativeness heuristic. The important manifestation of the representativeness heuristic is that people think they see patterns in truly random sequences. This aspect of the representative heuristic is suggestive of the overreaction evidence already discussed (Barberis, Shleifer and Vishny, 1998).

In addition, empirical evidence suggests that decision behaviours contribute to the following investment-related characteristics: 1) Excessive stock-price volatility and bubbles in prices; 2) Follow-the-leader or herding behaviour among investors; 3) Asset prices appearing to over- or under-react to new market information; 4) Popular investments earning poorer-than-desired returns; and 5) individual investors holding poorly diversified portfolios (Olsen, 1998).

The reaction of stock prices to the announcements of strikes is found to have a negative effect on the returns. Although the strike does temporarily affect production output, in theory, the strike should not be able to affect the stock price since, as noted earlier, SA strikes are usually of short duration, lasting between one and five days. The negative reaction can only be attributed to investor sentiments and the factor of uncertainty.

2.11 Information Asymmetry

Information asymmetry is an economic model that examines what happens when one party in a transaction knows more than another. The concept of asymmetric information was first introduced in Akerlof's 1970 paper. His basic argument is that in many markets the buyer uses some market statistic to measure the value of a class of goods. Thus, the buyer sees the average of the whole market while the seller has more intimate knowledge of a specific item. Akerlof argues that this information asymmetry gives the seller an incentive to sell goods of less-than-the-average market quality. The process results in adverse selection.

This theory has been applied in different industries. Qian and Zhong (2009) examine a firm's R&D investments prior to equity issuance. When companies go to the public market to raise money, their managers are likely to have better information about the investment opportunities than potential outside investors. Because of the information asymmetry between issuers and investors, 'good' issuers may have to signal their information to the market so as to distinguish themselves from bad issuers.

Samuelson (1984) examines the optimal bargaining behaviour for the informed and uninformed agents. The conclusions from Samuelson's (1984) study reveal that an uninformed buyer achieves his maximal attainable expected profit when he has the opportunity to make a first-and-final offer which the seller can accept or reject. More

significantly, the study shows that for an economic exchange to be possible, a necessary and sufficient condition is that the buyer can make a profitable first-and-final offer.

The concept of asymmetric information can also be applied in the current study. In labour negotiations, especially wage negotiations, both parties have to have access to the same information to prevent adverse selection and a strike.

The role of unions in wage negotiations in SA has been examined in previous studies. There are models that have been developed that link strike action to faulty information. Firstly, workers may systematically misestimate the future state of the economy. For example, it has been argued that workers' expectations of inflation are adaptive, while firms' expectations are rational. Thus, in the short run, unions will lag behind in adjusting their expectations to the actual rate of inflation (Kaufman, 1981). Secondly, a firm may have access to private information not available to the union. In this formulation, the strike serves as an information-gathering mechanism that allows the union to infer the firm's private information, based on management's actions. Thirdly, as argued by Cousineau and Lacroix (1986), union and management uncertainty over each other's bargaining power raises the difficulty in reaching an agreement and thus contributes to strikes (Gramm, Hendricks and Kahn, 1988).

2.12 Summary

Strikes have a devastating impact on the company stock price. There are numerous factors that have been cited as affecting the stock price, including change in government policies, announcement of bad or good news pertaining to a company's financial status, strike/industrial disputes, and so forth.

The current study reviews the determinants of strikes in the case of SA. The determinants that have been outlined are: 1) the trade union's objective when conducting wage negotiations differs from the objective of the company; 2) the economic climate plays a role in the occurrence of strikes; and 3) information asymmetry that exists between the trade union and company management is a catalyst in the process. Understanding these factors enables the prediction of strikes and therefore minimises the impact on the company production and the stock price.

The SA stock market has been identified as falling between weak-form and semi-strong, which determines how soon the news of a looming strike is incorporated into the stock price. Weak-form efficiency states that stock prices instantly and fully reflect all information of the past prices. This means that future price movements cannot be predicted by using past prices. Semi-strong market efficiency states that asset prices fully reflect all of the public and inside information available. Therefore, no one can have an

advantage on the market in predicting prices since there is no data that would provide any additional value to the investors.

This suggests that stock prices will adjust to the news of a looming strike and therefore the event window should be between a few days prior to the strike and a few days after the strike as elaborated on in Chapter 3.

The concept of behavioural finance was also introduced in this chapter to help explain the irrational behaviour of some investors. Investor sentiments play a vital role in stock price movements. The announcement of a strike can be classified as bad news and it leads to a decrease in stock price, as discussed in this literature review.

Chapter 3 outlines the methodology used to conduct the study. It also presents the sample and the sample-selection criteria.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discusses the research approach and methodology employed to achieve the research objectives and answer the research questions posed by this study. Section 3.2 describes the data and its sources and how the sample was selected. Section 3.3 discusses the event study methodology used to assess the impact of strikes on share prices. Section 3.4 discusses the regression model used to assess the predictability of strikes. The chapter ends with a summary of its main points.

3.2 Data, Data Source and Sample Selection

The data used to carry out this analysis is financial data for companies listed on the JSE (Johannesburg Stock Exchange), more specifically the stock price of companies that had experienced industrial actions. The source of such data is McGregor BFA because the data is updated frequently and is more reliable. The research period for the study is from 2003 to 2009. This period is presumed to be long enough to ascertain that the empirical results are valid and accurate. The industrial actions that occurred during the research period are obtained from the Department of Labour. The data needed for the regression model included company performance and economic indicators: repo rate and this data are obtained from McGregor BFA. The company codes used by the financial database

McGregor BFA are used to reference companies in the sample, as indicated in Appendix A to this report.

The Department of Labour defines a strike action as : The partial or complete concerted refusal to work, or the retardation or obstruction of work, by persons who are or have been employed by the same employer or by different employers, for the purpose of remedying a grievance or resolving a dispute in respect of any matter of mutual interest between employer and worker, and every reference to work in this definition includes overtime work, whether it is voluntary or compulsory (Industrial Action Annual Report, 2009,pp 48).

The sample for the study is selected using the following criterion: all companies that experienced industrial action/strikes between 2003 and 2009. The sample is reduced further, using the criteria listed in Table 3.1 below.

Table 3.1: Sample-selection criteria

SAMPLE-SELECTION CRITERIA	No.
Companies experiencing industrial action/strike between 2003 and 2009	495
Exclude unlisted companies	414
Exclude companies with incomplete information, for example earnings' report, strike date and so forth	32
Total sample	49

Table 3.1 above illustrates the sample-selection process. All unlisted companies were excluded from the sample because they do not have share price data. Additionally, companies that had not disclosed their financial results, published the date of strike action and so forth were discarded from the study because it was expected to be difficult to quantify the impact of the strike on the stock price of those companies.

3.3 Research Design and Event Study Methodology

The aim of this research is to assess the impact of firm strike/industrial action on the stock price and to measure the extent to which the industrial actions can be predicted using the regression model. Nelson, Amoako-Adu and Smith (1994) found that company stock price in Canada experienced a decline of 2.1 per cent 50 days prior to the strike day. Their study also revealed that shorter duration strikes experienced a decrease in stock value of 6.2 per cent while longer strikes experienced a decrease of only 2.8 per cent. Becker and Olson (1986) found that the NYSE-listed companies experienced a 4.1 per cent decrease in shareholder equity 30 days preceding the strike action involving an average of 1 000 workers.

The impact of all the industrial actions SA has experienced in the recent past has not been quantified. This research aims to assess the impact of the strikes on the stock prices, as conducted in Canada, USA, Netherlands and so forth.

3.3.1 Event study methodology

Event studies, introduced by Fama et al (1969), produce useful evidence on how stock prices respond to information. Many studies focus on returns in a short window (a few days) around a cleanly dated event. An advantage of this approach is that because daily expected returns are close to zero, the model for expected returns does not have a big effect on inferences about abnormal returns.

The assumption in studies that focus on short-return windows is that any lag in the response of prices to an event is short lived. There is a developing literature that challenges this assumption, arguing that stock prices adjust slowly to information, so one must examine returns over long horizons to get a full view of market inefficiency (Fama, 1998).

There are essentially four types of event studies: 1) information content (Ball and Brown); 2) market efficiency (FFJR – Fama, Fisher, Jensen and Roll); 3) model evaluation; and 4) metric explanation. Bowman (1983) further presents the structure of event study as being made up of five steps: identify the event of interest; model the security price reaction; estimate excess returns; organise and group excess returns; and analyse the results.

This study utilised the abovementioned steps to answer the research questions.

3.3.1.1 Calculating returns

To estimate the distribution of abnormal returns over time, cumulative abnormal returns (CARs) have to be estimated. CARs are aggregated average abnormal returns calculated over the event window. For the market model residual returns, it is assumed that the nominal stock returns are generated by the following process:

$$R_{it} = \alpha + \beta_i R_{mt} + e_{it} \quad (3)$$

R_{it} is the natural logarithm of the return for firm i in week t , and R_{mt} is the natural logarithm of the return on the relevant market index; α and β are the parameters to be estimated for the 60-week period. The benefit of using the market model is dependent on the R^2 of the market model regression. The higher the R^2 the greater is the variance reduction of the abnormal return and the larger is the gain (Raja and Sudhahar, 2010).

The daily returns are calculated for both individual securities as well as the industry index, using the following equation:

$$R_{it} = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100 \quad (4)$$

Where

R_{it} – reruns on security i on time t

P_t – price of security at time t

P_{t-1} – price of the security at time $t-1$

Abnormal Returns (ARs) under **market-adjusted abnormal returns** are calculated by using the equation as below:

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad (5)$$

Where,

$AR_{i,t}$ = Abnormal returns on security i at time t

$R_{i,t}$ = Actual returns on security i at time t

$R_{m,t}$ = Actual returns on industry index

Cumulative returns are computed using the following formula:

$$CAR = \sum AR_{i,t} \quad (6)$$

For the purpose of this study, the above model is modified to use the industry index (not market index – ALL SHARE INDEX) to calculate abnormal returns.

Existing literature suggests that examining the response of stock prices over a period of less than a month does not accurately measure the return to an investor who holds a

security for a long post-event period. These studies recommend using the BHAR (buy and hold abnormal returns) model. For this study, the following reasons by Fama (1998) led to the choice of the CAR over the BHAR model: one, asset pricing models commonly assume normally distributed returns. Normality is a better approximation for shorter horizons like a month than for longer horizons, where skewness becomes increasingly important. Two, the empirical tests of asset pricing models, invoked to justify applying the models in tests of market efficiency, typically use monthly returns. Three, BHAR can give false impressions of the speed of price adjustment to an event. The reason is that BHARs can grow with the return horizon even when there is no abnormal return after the first period.

Industrial actions in SA are of short duration, lasting between one and five days; therefore, the BHAR model was not deemed appropriate as it measures the abnormal returns over a longer horizon.

On the basis of the literature review, it is expected that the results of the study would reveal that company-specific strikes have a negative effect on the stock market in SA. Therefore, the critical findings of this study will be to determine the efficiency of the stock market. This will be observed by the auto-correction factor of the market.

Using a sample of listed companies on the JSE, the CAR model is tested using the event study methodology to exploit information on companies (within the same industry) that do not experience strike action and the industry index.

3.3.1.2 t-statistic

To judge the statistical significance of the ARs, the Dodd and Warner (1983) methodology is then used to compute standardised ARs and their test statistics. To test the null hypothesis that the mean BHAR is equal to zero for a sample of n firms, the conventional t-statistic is utilised:

$$t = \frac{AR_{mean}}{\sigma(AR\tau) / \sqrt{n}} \quad (7)$$

where

AR_{mean} – sample mean

$\sigma(AR\tau)$ – cross-sectional sample standard deviation of abnormal returns for the sample of n firms.

(Lyon, Barber and Tsai, 1999)

3.3.2 Benchmark formation

Fama and French (1992) illustrate that the size (ME) and book-to-market equity of average stock (BE/ME) provide a simple and powerful characterisation of the cross-

section of average stock returns for the 1963 to 1990 period in the NYSE, AMEX and NASDAQ stock exchanges. In a later study (1995) they also present evidence that small stocks have much lower profitability than large stocks. For this reason in formulating the benchmark for determining CAR pre/post the strike action, a portfolio is constructed, based on size and industry. The justification for inclusion of industry is: company returns are affected by industry policies and the economic climate.

Owing to the sample-selection criteria stated in the previous section, six value-weighted portfolios are formed by sorting the sample by industry classification first, and subsequently sorting the data by company size. Company size is measured by market capitalisation (market capitalisation = stock price x number of shares outstanding). The average number of companies in a portfolio is was two, with the exception of the Mining Industry Portfolio and General Retailers.

3.3.3 Problems with heteroskedasticity and dependence

There are several potential problems in hypothesis testing, owing to the fact that frequently the AR estimators are not independent or they do not have identical variance. For instance, often the AR estimators: 1) are cross-sectionally (in event time) correlated; 2) have different variances across firms; 3) are not independent across time for a given firm; or 4) have greater variance during the event period than in the surrounding periods (Binder, 1998).

Cross-sectional dependence is not a problem when the event periods are randomly dispersed through calendar time; i.e., the event dates are not, in the terminology of Brown and Warner (1980), 'clustered'. The study used this approach to avoid interdependence.

3.4 Propensity to Strike: Probabilistic Model

The second part of the study aimed at building a regression model that can predict whether a firm will encounter industrial action. Factors identified in the literature review are tested for correlation, using the following model:

$$Y_{\text{strike occurrence}} = \alpha + \beta_1 X_{\text{FIRM_SIZE}} + \beta_2 X_{\text{FIRM_PERFORM}} + \beta_3 X_{\text{ECONOMIC_IND}} + \beta_4 X_{\text{UNION_PRES}} + \epsilon_0 \quad (8)$$

Where:

β_1 – FIRM_SIZE

β_2 – FIRM_PERFORM

β_3 – ECONOMIC_IND (repo)

β_4 – UNION_PRES

The independent variable was identified as the occurrence of a strike and the explanatory variables as trade union presence, size in a firm, company performance, information asymmetry and the other factors such as economic climate causing the occurrence of strikes.

Firm size is hypothesised as a predictor because the bigger the size of the company the greater the probability of unionisation. This hypothesis was validated by the statistics obtained from the Department of Labour, which indicated that a large percentage of work stoppages occur in companies with workforces of greater than 1 000. This variable is FIRM_SIZE in the model and is measured by market capitalisation, with data obtained from McGregor BFA. The Department of Labour defines firm size by employment size, but for regression analysis market capitalisation is used to indicate firm size.

Company performance is hypothesised as a predictor because the struggle between labour and capital becomes increasingly bitter in the years of prosperity for two reasons: 1) it is in the prosperous years that prices and living costs rise, and 2) the large profits accruing in years of prosperity give rise to a contest over their distribution, as discussed by Neumann (1980) and Dubin (1965). This variable is FIRMS_PERFORM in the model and is measured by profit margin in percentage, with the data obtained from McGregor BFA.

Economic indicator (specifically the REPO rate) is hypothesised as a predictor because, for strikes to be effective as a show of force, the union needs to win a substantial demand. Unions are most likely to win substantial demands in periods of economic upturn, when the demand for a firm's products is high and the firm will quickly settle to avoid losing valuable orders and market share. Thus, in times of economic upturn, unions

can maximise their share of the value added and reap the reputational or membership benefits of successful strikes by going on short strikes. Furthermore, one would expect unions to engage in short strikes in economic upturns *even if the firm agrees to the wage demand prior to the strike* because the membership gain associated with a show of force exceeds the loss of revenues from a brief strike. In times of economic downturn, the demand for the firm's products will be low and the firm will have less incentive to settle. Because strikes will take longer to win in an economic downturn, they become more expensive for unions, and consequently unions will engage in fewer short, 'frivolous' strikes for a show of force. Instead, strikes in an economic downturn are likely to be defensive in nature and protracted and are more likely to be over wage cuts than wage hikes, as presented by Teitelbaum (2007). This variable is ECONOMIC_IND in the model and it is measured by the REPO rate. The REPO data is obtained from the South African Reserve Bank's website (<http://www.reservebank.co.za/>).

Union presence is hypothesised as a predictor because a high unionisation rate implies that the union would have stronger bargaining power than the firm in wage negotiations. Failure of wage negotiations would affect the firm in terms of loss of production or downtime.

Data on unionisation rate/union presence for individual firms is not readily available and could not be obtained within the prescribed timeframe. This meant that the union presence variable had to be excluded from the model.

3.5 Summary

Using the event study methodology outlined by Bowman (1983), ARs were computed to determine the overall effect of strikes on the stock market, the JSE. Additionally, a probabilistic model was tested to ascertain whether firm size, firm performance and the economic indicator REPO rate have explanatory power on the occurrence of strikes.

CHAPTER 4

DATA DESCRIPTION AND EMPIRICAL RESULTS

4.1 Introduction

This chapter describes the data used in the analysis and subsequently shows the performance of the firms that experienced a strike 14 days before the strike and 14 days after the strike. Section 4.2 describes the data used for the research study. Section 4.3 presents the results of CAR calculation prior to and post the strike. Section 4.4 presents the firm performance during the strike period. Section 4.5 presents the output of the regression model: predictive model.

4.2 Data Description

Table 4.1 describes the data used in this research. The table illustrates that strike incidents have decreased from 2005 but that is not aligned with the number of days of work stoppages in the same period. The cause of the increase in work stoppages is an increase in multi-employer strikes as opposed to single company only. The average size of the firm involved in a majority of industrial disputes between 2003 and 2009 is 580.

Table 4.1: Data description

Year	No. of strikes	Average size	Industry	Unionisation rate	Average number of employees
2003	63	350	Manufacturing	-	83 533
2004	49	400	Manufacturing	-	395 301
2005	105	350	Community services	-	399 291
2006	99	560	Community services	23.8	250 787
2007	75	600	Community services	24.2	608 919
2008	57	1 100	Community services	24.2	118 979
2009	51	700	Transport	25.1	169922

The average number of workers involved in strike actions peaked in 2007 at 608 919, which can be associated with the pre-recessionary period; in 2008 the number of workers on strike decreased as the country went into a recessionary phase. The average number of strikes experienced over the eight years is 71, with the highest number of strikes happening in 2005.

The industry that has consistently been affected by numerous strikes over time is community services. The industry dispute is related to the inability of government to deliver services and sufficiently compensate public sector workers.

It is noted that an increase in unionisation rate will continue to be the major cause of strikes in SA, as mentioned under the literature review above. In the SA context, trade unions' main objectives are to rectify the injustices of the apartheid era, which include wage discrimination, rather than to seek a feasible resolution for both parties.

4.3 Share Performance

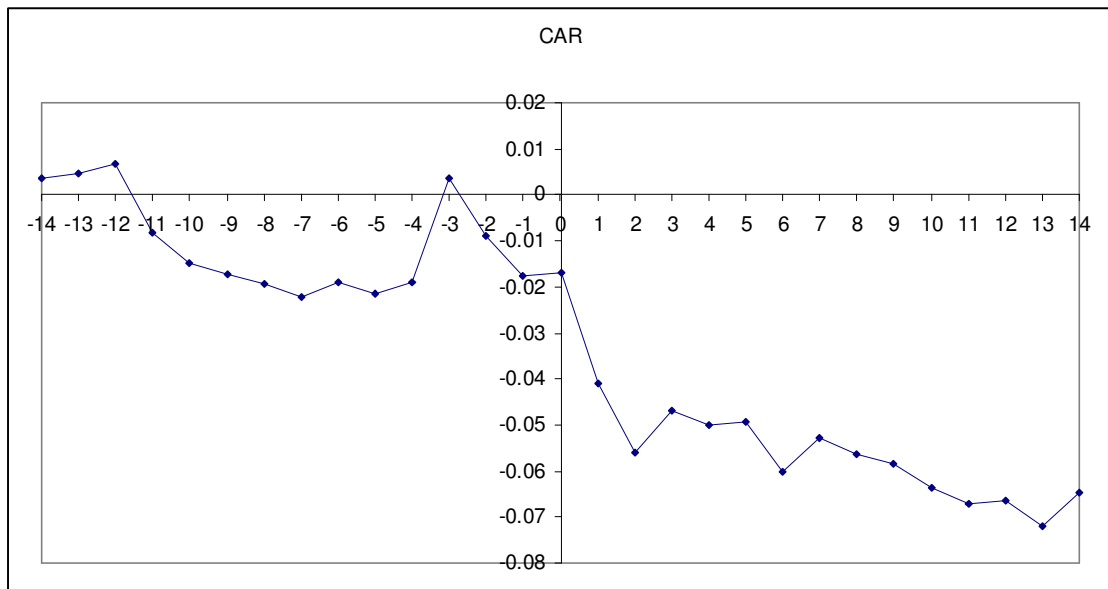
This section analyses share performance of the 49 firms that made up the study sample 14 days before the strike and 14 days after the strike. The expected return is calculated by using equation (4) and ARs are computed using equation (5). CARs use equation (6).

Table 4.2: Performance measure using CAR

DAY	Cumulative Abnormal Return (CAR)	t-stat
-14	0.0034	1.5723
-13	0.0045	4.4610
-12	0.0068	1.6601
-11	-0.0082	-0.0002
-10	-0.0147	-3.6321
-9	-0.0174	1.2891
-8	-0.0194	1.1032
-7	-0.0222	-2.6321
-6	-0.0191	2.8711
-5	-0.0213	-1.1878
-4	-0.0191	1.0324
-3	0.0035	0.0004
-2	-0.0089	-7.2490
-1	-0.0177	-5.3001
0	-0.0169	8.0567
1	-0.0409	0.0005
2	-0.0559	0.0001
3	-0.0468	4.7755
4	-0.0500	7.3732
5	-0.0494	2.5200
6	-0.0599	-7.2231
7	-0.0529	2.3891
8	-0.0564	-2.9053
9	-0.0582	-7.4126
10	-0.0637	-3.1404
11	-0.0670	-1.6733
12	-0.0663	2.6779
13	-0.0721	-3.7004
14	-0.0646	4.8223

Table 4.2 presents the results of the CARs for the sample used in the study. The CARs are significantly negative within the event window. Pre-event CAR changes from 0.0068 in day 12 to -0.0082 in day 11. It can be inferred that the market merely reacts to the news for the 'looming strike' prior commencement. Post the strike, the stock price continues to decrease in value until the end of the event window. In day 14, there is evidence of the stock price recovering from the strike action. Market reaction is graphically represented in Figure 4.1. t-stat (4.8223) analysis indicates that the probability that the ARs experienced by the firm occurred by chance is small and is statistically significant and can be accepted for the analysis.

Figure 4.1: Cumulative Abnormal Returns (CARs)



4.4 Additional Analysis

In this additional analysis, six portfolios were formed. Two out of the six portfolios that were created could be used to measure the CARs for the industry, arranged by size, because the five other portfolios could not be used because of size. The portfolios are listed in Table 4.3. Two portfolios, the mining industry portfolio and general retailers, could be used in the computation of CARs for the study. Analysing industry portfolios depicts the actual reaction of the industry to a strike and provides a platform from which to infer the efficiency of the stock market.

Table 4.3: Types of portfolios

PORTFOLIO	NO. OF COMPANIES
Mining	30
General Retailers	13
Beverages	1
Food Producers	2
Telecommunication	2
Oil and Gas Producers	1

Figure 4.2: CARs for the mining industry

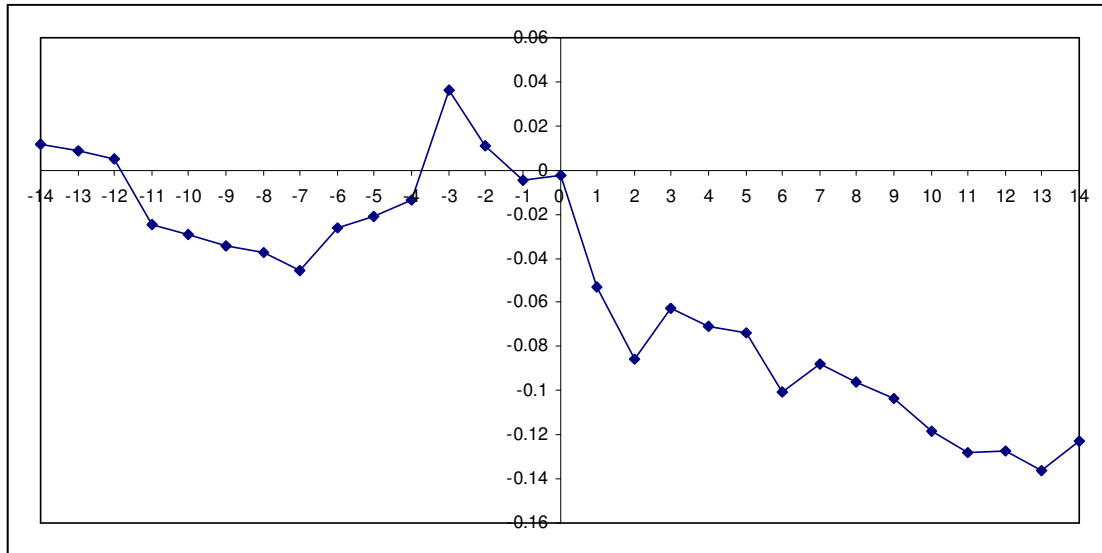


Figure 4.2 indicates that average returns for mining industry stock decrease in value 11 days prior to the strike but rebound three days prior to the strike. The downward trajectory is evident after the strike up to the end of the event window.

The mining industry portfolio is bigger in size than the other portfolio; therefore, overall CARs for the sample in Figure 4.1 are substantially influenced by the trajectory of the mining industry portfolio.

Figure 4.3: CARs for general retailers

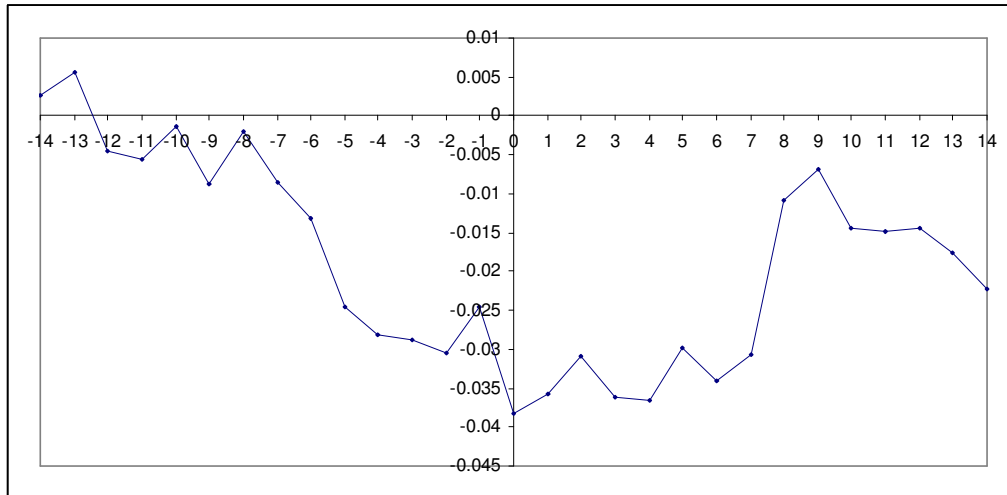


Figure 4.3 illustrates the reaction of the stock market to a strike in the general retailers industry. Stock returns decrease 12 days prior to the strike and continue to decrease to the end of the event window. Therefore, the stock price takes longer than 14 days to return to equilibrium and inference can be made regarding the efficiency of the SA stock market, the JSE.

Table 4.4 summarises the results for the CARs and the corresponding tests for statistical significance. The t-stat values reveal that the results are statistically significant.

Table 4.4: Industry portfolio result summary

DAY	Mining Industry Portfolio CAR	Mining Industry Portfolio t-stat	General Retailers Portfolio CAR	General Retailers t-stat
-14	0.0116	1.4887	0.0026	-0.1046
-13	0.0089	-0.4129	0.0056	0.8552
-12	0.0050	-0.3012	-0.0046	1.4891
-11	-0.0250	1.0516	-0.0055	6.7981
-10	-0.0293	1.2008	-0.0014	0.1010
-9	-0.0348	0.6556	-0.0087	0.9597
-8	-0.0370	0.2088	-0.0020	0.0702
-7	-0.0457	0.5928	-0.0085	0.8284
-6	-0.0260	1.0379	-0.0133	0.6102
-5	-0.0211	0.5346	-0.0246	0.1069
-4	-0.0137	0.7189	-0.0281	0.0570
-3	0.0360	1.1999	-0.0288	0.0876
-2	0.0108	2.1944	-0.0305	0.4691
-1	-0.0050	1.4885	-0.0246	0.0602
0	-0.0023	0.1301	-0.0382	2.6573
1	-0.0527	1.0744	-0.0357	0.8449
2	-0.0855	1.5298	-0.0308	0.9987
3	-0.0625	2.2379	-0.0362	1.3297
4	-0.0707	2.2406	-0.0366	0.1616
5	-0.0741	0.3678	-0.0298	0.1995
6	-0.1006	2.0288	-0.0341	0.8174
7	-0.0878	2.4364	-0.0306	0.4218
8	-0.0964	1.2411	-0.0109	3.4748
9	-0.1036	0.8065	-0.0068	0.5867
10	-0.1184	2.1526	-0.0145	0.5048
11	-0.1280	0.1103	-0.0148	0.0679
12	-0.1273	0.0962	-0.0145	0.0839
13	-0.1365	0.6453	-0.0177	0.5032
14	-0.1230	0.9709	-0.0221	-0.7852

4.5 Firm Performance

Table 4.5 shows the empirical result of the reaction of the market to strike actions for the specified sample of companies. Average ARs pre-event are -0.0012 and post-event returns are -0.0022. The average ARs prior to the event are higher than the average returns post the event. This is indicative of investors reacting to the strike news post the event. The investors only adjust their expectations after the announcement of the strike.

Table 4.5: Analysis of ARs

Day	Average Abnormal Returns
-1 to -14	-0.00127
0	0.00083
1 to 14	-0.00313
-14 to 14	-0.00223

Figure 4.4: Average ARs

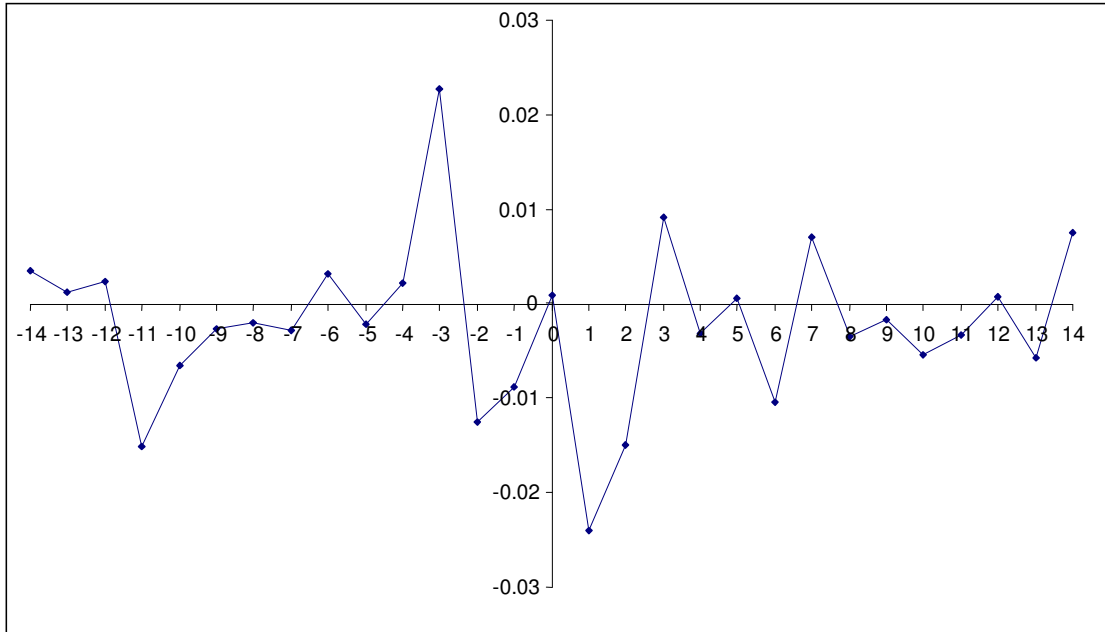


Figure 4.4 indicates that the market reacts to the announcement of a looming strike action and adjusts the expectations, which causes a decrease in the average ARs in day - 2 (pre-event). The average ARs between day - 14 and day - 1 are computed to be -0.00127. The market reaches equilibrium between day 5 and day 7 (post-event) at -0.00313.

As per the finding of Kramer and Vasconcellos (1996), there is evidence of a share price rebound after the settlement of the strike that was sufficiently strong to balance the negative share price effect associated with the beginning of the strike. This does not support the asymmetric information hypothesis that strikes are primarily a means by

which firms reveal profit information held only by the management. Instead, it suggests that the negative stock price response to a strike is felt only during the strike period and that the negative effect is largely erased by a positive price reaction to the end of the strike. Therefore, the stock price adjusted to reflect the costs of being on strike rather than the need for a permanent reevaluation of the firm as suggested by the asymmetric information hypothesis (Kramer and Hyclak, 2002).

The model in equation (3) was tested using regression analysis and the results are presented in Appendix C. The regression of expected average company returns, R_i for the sample with expected market returns, R_m shows that the P-value is statistically significant at 0.003454 at 95% confidence level, t-stat, 3.20525026. A generally reliable method specifies that a t-stat of greater than +2 is acceptable and states that the higher the t-stat, the greater the confidence in the coefficient being the predictor. Therefore the t-stat for the sample is statically significant.

4.6 Probabilistic Model

The probabilistic model regression output shown in Appendix D indicates that the factors outlined are not statistically significant in explaining the occurrence of strike action. The results are in contrast with the literature review findings. Numerous factors could be identified as attributing to the discrepancy.

The ideal model in equation (9) only tested three variables: company performance, firm size and economic indicator. Therefore, the other variable, trade union presence in a company, is not included in the model and might have manifested in the three variables that were tested.

The p-value for company performance, firm size and economic indicator is 0.644933, 0.260886 and 0.97899 respectively at 95% confidence level. The p-value indicates that the company performance, firm size and repo rate are statistically insignificant. This implies that these factors do not have explanatory powers for the probability of occurrence of company strikes.

4.6.1 Univariate tests

The univariate test results for the model are presented in Table 4.6. The regression analysis suggests that performance and size have no explanatory power regarding the probability of occurrence of a company strike. However, the p-value of 0.057808 for economic indicator implies that the economic climate influences the probability of occurrence of company strikes. This suggests that other factors need to be investigated to determine their influence on the predictability of the strike. Factors such as trade union membership, management, firm size relative to the industry, and employee turnover can be tested using the probabilistic model.

There are numerous factors that have an influence on these values and these factors are discussed at length in the following chapter section.

Explanatory Variable	Estimate (t-stat)	P-value
Firm performance	-0.46228	0.647105
Firm size	1.161549	0.2542845
Economic indicator	0.053334	0.057808

Table 4.6: Univariate regression

Detailed univariate regression analysis is presented in Appendix E.

4.7 Summary

The chapter presents the computation of CAR for the selected sample. CAR indicates that the stock price decreases prior to the strike and experiences a significant decrease at day -5; the trend is prevalent post the strike action. Stock price stabilises outside the event window.

The data gives insight into the efficiency of the SA stock market, the JSE. Information pertaining to the strike is not immediately incorporated into the valuation of the stock.

Probabilistic model analysis indicates that the abovementioned variables have no explanatory power regarding the dependent variable: probability of occurrence of a company strike. This means that other factors have to be investigated using the model.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 Introduction

This chapter discusses the results presented in Chapter 4. Section 5.2 presents a discussion of the results. Section 5.3 discusses the probabilistic model regression results. Section 5.4 concludes the study.

5.2 Discussion

The CAR for the event window was found to fluctuate between positive and negative for the days studied.

Miller and Modigliani (1961) attribute the decrease of the stock price at the announcement of a strike to: a strike is classified as 'bad' news and decreases the firm's expected future cash flows and therefore the value of the firm decreases around the period of the strike and with it the stock price.

It was noted earlier that SA strikes are predominately of short duration and therefore the company stock price decreases in value prior to the strike and post the strike but

the effect is short lived, as illustrated in Figure 4.1. This is aligned with the finding of Nelson and Amoaka-Adu and Smith (1994) that strikes lasting only a few days tend to reduce the stock price. The phenomenon can be related to the costs and benefits of strikes.

Pre-strike CAR (between day -14 and -1) is computed to be -0.00127 and statistically significant. According to Imberman (1979), pre-strike costs emanate from several different sources. The first type of pre-strike cost results from publicised disagreements between union leaders and management. Such conflicts commonly result in worker animosity and a corresponding decrease in work effort and worker concern for the finished product. The second type of pre-strike cost arises from companies finding it necessary to stockpile finished products in order to appease their customers who fear an interruption of supply. Such stockpiling usually involves paying a great deal of overtime pay to workers, incurring transportation costs to outside warehouses, and paying for the warehousing space itself. Standard costs of the second type outlined by Imberman (1979), costs incurred during the strike, include the obvious ones such as lost production, shipments, and revenues, and the cost of idle equipment. However, in addition, Imberman (1979) pointed out the less obvious cost of lost management time and salaries, as many companies assign managers to fill the voids left in production and shipping. Standard costs of the third type outlined by Imberman (1979) are longer-term costs that are experienced after

the strike is settled. These costs include the loss of trained employees who exit the firm during the strike and overtime expenses paid to replenish depleted inventories. Also, firms may lose future business as customers discover substitutes and alternative sources.

The results of the industry portfolio are shown in Table 4.4. A statistically positive CAR is observed to be -0.0023 and -0.0382 for the mining industry portfolio and the general retailers' portfolio, respectively. It is observed that most of the CARs for industry portfolios are statistically significant.

The effect of a company strike is easily observable by analysing the reaction of the industry portfolio. The impact of the strike is highly correlated to the size of the firm/market share. The same reasoning applies in this case as well; company output decreases during the strike period.

5.3 Probabilistic Model Results

The model tested the explanatory power of the following variables: 1) firm performance; 2) firm size; and 3) economic indicator, with the probability of occurrence of a strike.

The multi-variable regression indicates that all the specified variables do not have explanatory power over the dependent variable.

The results are in direct contrast to the findings by Prais (1978) on the relationship between strike occurrence and firm size. Prais (1978) finds that the relationship between the percentage of manufacturing plants affected by an officially recorded stoppage and plant size, measured in terms of employment, is such that the likelihood of a plant being stoppage-free decreases with size. This tendency is gradual, but increases rapidly in the 1 000 to 5 000 employee plant size range. Second, the average number of stoppages per plant per annum rises in almost direct proportion with size of plant. Third, the number of working days lost per plant per annum rises much more sharply than in proportion to plant size.

In the SA context, it can be assumed that there are other factors at play that cause strikes to occur. The factors that could be considered include the SA political history. As discussed as part of the literature review, trade unions' decisions are solely based on

rectifying the injustices of the previous political regime (apartheid) and on increasing union membership. This suggests that in SA strikes occur because trade union leadership fails to seek a mutually beneficial decision for the company and its members.

In SA, a study by Hansen (1921) on the effect of cyclical movements of industry on strikes is challenged by the regression results for the current study. Hansen's results suggest that if one can predict industry cycles then one can predict industry strikes. Industry strikes trend upward during 'boom' years (prosperity) because workers expect to share in company profits and the general price increase: living costs. SA remains an unequal society in numerous aspects but particularly prominently in wage discrimination.

Univariate regression results suggest that the state of the economy (repo rate) of SA is a predictor of strike occurrence. Macroeconomic principles are re-validated by these results. Macroeconomic principles state that a decrease in the repo rate causes a decrease in the prime rate. Credit becomes easily accessible and increases consumer spending and consumer confidence. Prices gradually increase and workers eventually demand an increase in wages and generally strike occurrences increase.

Analysing the CAR in Figure 4.1 shows the predictability of strikes in SA. The market reacts very slightly over the period immediately before a strike onset. Thus, there is some evidence that market participants are able to predict strikes. That likelihood is consistent

with the findings of Becker and Olson (1986). However, the strong negative return on day -4 shows that strikes are not completely predictable.

5.4 Conclusion

The findings of the study indicate that the market reacts to the news of a strike action approximately five days prior to commencement, which has been labelled as day 0. The effect prevails until day 5. Therefore, the stock prices deviate from the fundamentals and are influenced by investor sentiment during the event window, as illustrated by Barberis, Shleifer and Vishny (1998). Utilising the efficient market hypothesis (EMH) model it can be deduced that the JSE is an inefficient stock market but is indicative of a semi-strong market.

However, one test of market efficiency is not sufficient to declare conclusively that the JSE is inefficient. Therefore, a second test can be performed using unit root tests to stock price indices to assess the efficiency.

The traditional market model has been adjusted for industry. That is, the industry index is used as a benchmark and is specific to the industry and allows for a more accurate analysis of the ARs due to strike actions. Although the results of the study reveal a negative effect of strike actions on the stock returns, the following factors have to be

considered: i) the sample size is small and ii) the sample period is shorter than 10 years owing to the limited availability of data.

Sample size is a concern because the t-statistics used in the event study framework are based on normality assumptions associated with large samples. Additionally, many event studies are based on long-event windows (McWilliams and Siegel, 1997).

The probabilistic model results are not conclusive as they exhibit the effect of heteroskedasticity. In the study lack of data for one omitted variable caused the model to reveal inconclusive results. Sample size and sample period also influence the results of the probabilistic model.

Given SA's political history and results from previous studies, it is believed that there is a correlation between trade union presence in a firm and the propensity to strike.

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APPENDICES

APPENDIX A - SAMPLE

APPENDIX B – ABNORMAL RETURNS

APPENDIX C – REGRESSION OUTPUT

APPENDIX D – PROBABLISTIC MODEL REGRESSION OUTPUT

APPENDIX A

SAMPLE

COMPANY	DESCRIPTION
HAPS	HARMONY GOLD MINING COMPANY LIMITED
GOGOF	GOLD FIELDS LIMITED
NPK	NAMPAK LIMITED
EHS	EVRAZ HIGHVELD STEEL & VANADIUM LTD
WOWOW	WOOLWORTHS HOLDINGS LIMITED
IMPO	IMPALA PLATINUM HOLDINGS LIMITED
PWK	PICK N PAY HOLDINGS LIMITED
SAB	SABMILLER PLC
TIIH	TIGER BRANDS LIMITED
CUL	CULLINAN HOLDINGS LIMITED
SHP	SHOPRITE HOLDINGS LIMITED
SHP	SHOPRITE HOLDINGS LIMITED
SUI	SUN INTERNATIONAL LIMITED
SAB	SABMILLER PLC
DRDD	DRDGOLD LIMITED
IMPO	IMPALA PLATINUM HOLDINGS LIMITED
IMPO	IMPALA PLATINUM HOLDINGS LIMITED
LOLMI	LONMIN PLC
DRDD	DRDGOLD LIMITED
NHM	NORTHAM PLATINUM LIMITED
PWK	PICK N PAY HOLDINGS LIMITED
SOL	SASOL LIMITED
SIIF	SIMMER AND JACK MINES LIMITED
RDI	ROCKWELL DIAMONDS INCORPORATED
MDC	MEDI-CLINIC CORPORATION LIMITED
UUU	URANIUM ONE INC
MSM	MASSMART HOLDINGS LIMITED
BHP	BHP BILLITON PLC
COM	VODACOM GROUP LIMITED

APPENDIX B
ABNORMAL RETURNS

	HAPS	GOGOF	NPK	EHS	WOWOW	IMPO	PWK	SAB	TIIH	CUL	SHP	SHP
-14	-0.0004	0.01635	-0.0176	0.016588	-0.00838	0.001582	0.02891	2.4544E-08	-0.008996	0.03915	-0.00737	-0.0031
-13	-0.002854	0.01704	0.01571	-0.00995	0.008656	0.00303	0.00953	-1.5803E-07	0.003523	0.015632	-0.01381	0.010581
-12	-0.01424	0.01221	0.00317	0.027581	-0.00105	-0.006357	-0.0173	9.7394E-08	0.008485	0.031255	-0.04373	0.008661
-11	0.019673	0.00768	-0.0058	0.012064	0.003423	0.012558	-0.0029	-3.5242E-08	-0.003307	0.030984	0.001155	0.002378
-10	0.015628	0.00917	0.00608	-0.01638	-0.00535	0.016505	-0.0121	0	-0.0015	-0.02595	0.053015	0.010824
-9	0.005384	-0.00066	-0.011	0.005763	-0.04607	0.026102	0.0065	1.1655E-08	-0.003879	-0.04205	-0.01875	-0.01052
-8	0.02493	0.00603	0.00529	-0.00571	0.027659	-0.000776	0.01271	-6.6496E-08	-0.002273	0.024027	0.031021	-0.00703
-7	0.002441	0.0068	0.00097	0.010598	0.021856	-0.024279	-0.0055	-5.2884E-08	-0.004065	0.063133	-0.03907	0.015901
-6	0.014633	0.0232	-0.0111	0.000113	0.035943	-0.032172	-0.0229	1.5902E-07	-0.007478	0.06866	-0.0044	0.00428
-5	-0.007351	-0.01951	-0.0331	0.004425	-0.02092	0.048366	-0.0138	-7.926E-09	-0.021126	-0.05004	-0.00564	-0.00663
-4	2.5E-05	-0.00872	-0.0209	-0.00275	-0.00887	-0.024777	-0.0011	-1.6378E-07	0.008327	0.014519	0.000602	0.01192
-3	0.030312	0.00483	0.01014	0.011431	0.004765	-0.021554	-0.006	2.0857E-07	0.011697	0.055072	-0.01797	0.003581
-2	-0.007378	-0.00845	-0.0179	-0.02519	0.001843	0.037893	-0.0013	-3.6867E-08	-0.000462	-0.02609	-0.00225	-0.00618
-1	-0.017587	-0.02101	0.01368	-0.00347	0.000449	0.039038	0.03795	-6.2859E-08	-0.008912	-0.05766	-0.00505	-0.02776
0	0.004453	-0.02374	-0.0036	0.00668	-0.02544	0.073352	-0.0068	2.91E-08	-0.005913	-0.08819	-0.01259	-0.03793
1	-0.010758	0.0091	0.005	0.006205	0.002306	-0.025572	0.01229	-1.715E-08	0.00025	-0.04239	-0.0031	-0.00527
2	-0.03475	-0.02134	-0.0107	-0.01282	0.003613	-0.048804	-0.0068	-6.8448E-08	-0.018194	-0.03786	0.010581	0.029435
3	-0.021679	-0.00835	-0.0084	0.113805	0.009639	-0.013326	-0.0098	5.0261E-08	0.00809	0.034416	0.008661	-0.01294
4	0.006094	-0.00067	0.00964	-0.01029	0.008578	-0.020377	-0.0043	3.4483E-09	-0.002165	-0.03396	0.002378	-0.00547
5	-0.024961	0.00802	-0.0141	0.012027	0.00233	0.028608	0.03096	-3.5551E-08	0.007334	-0.04435	0.010824	-0.02751
6	-0.018484	-0.01838	-0.0151	-0.00687	0.003188	-0.015333	-0.0218	-3.7036E-08	-0.009029	-0.03303	-0.01052	0.001411
7	0.009345	-0.00241	-0.0008	-0.01148	-0.006	0.017289	0.00476	1.3168E-08	0.007953	0.065612	-0.00703	0.024156
8	0.014762	0.00748	0.00519	-0.00058	-0.0032	0.013854	0.03913	2.9229E-08	0.003572	-0.03938	0.015901	0.016512
9	-0.009525	-0.02388	-0.0155	-0.00545	0.006237	0.000707	-0.0037	1.281E-07	0.002952	0.067032	0.00428	0.007617
10	-0.005301	0.0024	0.01969	-0.0219	-0.00021	-0.059705	-0.0203	-2.0644E-07	-0.000479	-0.0066	-0.00663	-0.005
11	-0.001628	-0.00259	0.0213	-0.00784	-0.01164	-0.023203	-0.0121	7.7166E-08	-0.003655	0.005421	0.01192	0.005937
12	-0.032284	0.01855	-0.0022	0.032934	-0.01561	0.050772	0.01225	-5.386E-08	0.002191	0.023776	0.003581	-0.00264
13	-0.023629	0.00034	-0.0146	0.015708	-0.01706	0.024188	0.00309	7.8851E-08	-0.009028	-0.16707	-0.00618	0.011278
14	-0.003456	0.02053	0.0128	-0.01595	0.013959	0.021545	-0.0073	4.7143E-09	0.014532	-0.01222	-0.02776	-0.01686

	SAB	DRDD	IMPO	IMPO	LOLMI	DRDD	NHM	PWK	SOL	SIIF	RDI
-14	3.895E-08	-0.0179015	0.02574376	-0.0011081	0.02226225	-0.0356331	0.02999382	-0.012448	-5.7E-08	0.0685631	0.01225895
-13	-1.378E-07	-0.0259198	0.02632542	-0.0197745	-0.0032266	-0.0423363	0.02268695	-0.000429	-5.3E-07	-0.0157161	-0.0295232
-12	1.468E-08	0.01630041	0.02028524	0.0071769	-0.0087246	-0.0142591	-0.0070651	0.0060056	2.45E-07	0.0203571	0.00677721
-11	7.981E-08	-0.0160787	0.01623492	0.0209811	2.1034E-05	-0.0246273	0.00589464	0.0002058	-1.9E-07	-0.0027943	-0.3524627
-10	-1.173E-08	-0.013315	-0.0014529	-0.015037	0.00611829	0.00655612	0.00052777	-0.018449	5.7E-07	-0.0223176	0.00350311
-9	-1.523E-08	-0.0270261	-0.0161044	-0.0272525	-0.0079203	0.01958724	-0.0093412	0.00556	-6.7E-07	-0.0461724	0.06910513
-8	2.774E-08	0.01150191	0.00531706	0.011997	-0.0151647	-0.0058635	-0.0020345	-0.00652	2.48E-07	-0.015842	0.05024669
-7	-1.004E-07	-0.0035348	-0.0016357	-0.021169	0.00431316	0.01898214	0.02558433	-0.016262	4.3E-07	-0.0404292	-0.0144375
-6	8.073E-08	-0.0307708	0.01080251	-0.0138803	-0.0071326	-0.0087504	0.0111185	-0.004614	-4.8E-08	0.0067958	-0.0468619
-5	1.248E-08	-0.0171044	0.01433509	-0.0090075	-0.0052101	0.01281004	0.0201731	0.0042905	-1.8E-07	0.013344	0.01385863
-4	-4.718E-08	0.01318442	0.04371245	0.0038619	0.00196608	0.08496519	0.02330099	-0.0109	1.97E-07	-0.0162048	0.01943767
-3	-3.45E-08	-0.0052948	-0.0011081	0.0379467	0.01131667	0.00849541	-0.0184922	0.0213243	-2.5E-07	-0.0320674	0.00269735
-2	8.146E-08	-0.0157305	-0.0197745	-0.0235184	0.01670223	-0.0976038	-0.0164584	0.0005397	-3.4E-07	0.0167571	0.00491338
-1	1.295E-09	0.00240683	0.00717691	-0.026893	-0.0097121	0.05625447	-0.0147638	0.0186919	2.73E-07	0.0127423	-0.0246813
0	-3.953E-08	0.00819054	0.02098107	-0.0055022	-0.010491	-0.0500586	0.01066852	-0.006832	-2.8E-08	-0.0222069	-0.0476523
1	4.104E-08	0.00141842	-0.015037	-0.0191899	0.00599909	0.00606128	-0.000128	-0.005876	-1.9E-07	0.0470936	-0.6079059
2	-1.078E-07	0.00108132	-0.0272525	-0.0194312	-0.0054045	-0.0006174	-0.0234501	-0.003648	4.7E-07	0.0196132	0.01852976
3	1.043E-07	0.02083064	0.01199705	0.0221557	0.00817588	0.00267942	-0.0110045	-0.005073	-1.2E-08	0.0799366	0.01890082
4	-1.261E-08	-0.0153539	-0.021169	0.0063912	-0.0126117	-0.025328	0.00032527	0.0070096	-5.3E-07	0.0036729	-0.0118442
5	7.545E-09	-0.0317679	-0.0138803	0.0205365	-0.000915	-0.0484255	0.02445366	0.0082625	1.73E-07	0.0043805	-0.0218957
6	-5.589E-09	-0.0126582	-0.0090075	0.0086589	-0.0078244	-0.1637264	-0.0108739	0.0060069	9.51E-08	0.0033876	0.00527842
7	1.654E-08	0.01887443	0.0038619	0.0108929	0.00128159	0.00905421	0.01221535	-0.000524	-3E-07	0.0010787	0.02759445
8	4.835E-08	-0.0329625	0.03794674	-0.0050547	0.00877065	-0.0569213	-0.0157052	0.0154527	5.72E-07	-0.0057868	-0.0216735
9	1.158E-08	-0.0356331	-0.0235184	-0.008922	0.00590275	0.01897577	0.01745465	0.0004524	-3.4E-07	-0.0050788	-0.0208887
10	-1.546E-07	-0.0423363	-0.026893	-0.023263	-0.025178	0.03282358	-0.0187573	-0.021121	-1.6E-07	0.017414	-0.0107165
11	7.164E-08	-0.0142591	-0.0055022	-0.0209724	-0.009315	0.02047345	0.00159422	0.0100416	4.34E-07	0.0163806	0.01984727
12	1.15E-08	-0.0246273	-0.0191899	-0.0035104	-0.0019791	-0.0113496	-0.0001091	-0.004066	-3.2E-07	-0.0145217	0.05544956
13	6.848E-08	0.00655612	-0.0194312	0.0142038	-0.0023791	0.03397251	-0.009978	0.0037166	1.81E-07	0.0114215	0.03966694
14	-1.145E-07	0.01958724	0.02215568	0.003413	-0.0017963	0.03283002	-0.0168703	0.0115689	-3.4E-07	-0.0570352	0.15964592

	MDC	UUU	MSM	BHP	COM	AVERAGE AR	CAR
-14	-0.0528054	-0.0251459	-0.0083261	-0.0078919	0.03624113	0.0034508	0.0034508
-13	0.0165955	0.03224618	-0.0032328	-0.0306122	0.05944505	0.00113873	0.00458953
-12	0.0579101	-0.1473652	-0.0061321	0.0336717	0.09926824	0.00228733	0.00687687
-11	-0.0239344	-0.1081888	-0.0080275	0.0274914	-0.030096	-0.0151259	-0.008249
-10	-0.0204837	-0.0034076	0.01258561	-0.0430798	-0.1307409	-0.0065449	-0.014794
-9	-0.0076969	0.00622251	0.00626807	-0.0135008	0.03050462	-0.0026343	-0.0174283
-8	0.0085068	-0.119196	-0.0237674	-0.0109786	-0.0216958	-0.0019786	-0.0194068
-7	0.0211707	-0.162742	-0.0167533	0.0130532	0.01620416	-0.0028536	-0.0222605
-6	-0.0130767	0.22817958	-0.0189953	0.0020985	-0.0568578	0.00311198	-0.0191485
-5	-0.0412841	0.09183906	-0.0226087	-0.0086843	-0.0117216	-0.0021733	-0.0213218
-4	0.0107986	-0.0808258	-0.0155129	0.0087913	0.00856873	0.00212519	-0.0191966
-3	0.0004954	0.54079679	-0.003999	-0.0120894	0.00901579	0.02274932	0.00355271
-2	0.0034415	-0.1256908	-0.0034586	-0.0171417	-0.0061949	-0.0124848	-0.0089321
-1	-0.0574012	-0.1080702	-0.0208777	-0.0143842	-0.043635	-0.0088176	-0.0177496
0	-0.0160123	0.23227156	0.00138909	0.0025719	0.00194371	0.00082619	-0.0169234
1	0.0148402	-0.0351646	0.00463972	-0.057146	0.00284044	-0.0240085	-0.0409319
2	0.0162034	-0.2832457	0.00763024	0.0138423	0.00573712	-0.0150255	-0.0559574
3	0.0025173	0.02781749	-0.0180936	0.0019575	-0.0066411	0.00910184	-0.0468556
4	0.0038222	0.00703569	-0.0065624	-0.0064622	0.02755457	-0.0031801	-0.0500357
5	0.0038493	0.0730405	-0.00841	-0.0023197	0.01019824	0.00055998	-0.0494757
6	-0.0155597	-0.080324	0.01341549	0.024238	0.06131495	-0.010501	-0.0599766
7	-0.0223198	0.02043931	0.00448993	0.0227887	0.02924659	0.00700346	-0.0529732
8	0.0045177	-0.0026935	0.01479423	-0.0349015	-0.1179189	-0.003505	-0.0564782
9	0.0038055	-0.0704269	0.01760714	0.0130778	-0.0095012	-0.0017731	-0.0582513
10	0.008633	-0.0649437	0.01946357	-0.0059815	0.10873587	-0.0054524	-0.0637037
11	0.0122608	-0.1251511	0.0058753	0.0041583	0.00274546	-0.0033922	-0.0670958
12	-0.0209615	-0.0143801	-0.0035461	-0.0011384	0.00275425	0.00071955	-0.0663763
13	-0.0043755	-0.0187063	-0.0111094	-0.0006629	-0.008403	-0.0057363	-0.0721125
14	0.0258343	0.02438033	0.00241746	-0.0102585	0.00069683	0.00746249	-0.06465

APPENDIX C
REGRESSION OUTPUT

**SUMMARY
OUTPUT**

<i>Regression Statistics</i>	
Multiple R	0.525002176
R Square	0.275627285
Adjusted R Square	0.248798666
Standard Error	0.008748976
Observations	49

<i>ANOVA</i>					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.000786391	0.00078639	10.27363	0.003453805
Residual	48	0.002066704	7.6545E-05		
Total	49	0.002853095			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.002508565	0.001658155	1.51286485	0.141932	0.005910819	0.000894	-0.00591	0.000894
X Variable 1	1.388610112	0.433229857	3.20525026	0.003454	0.499695881	2.277524	0.499696	2.277524

APPENDIX D
PROBABLISTIC MODEL REGRESSION OUTPUT

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.224867
R Square	0.050565
Adjusted R Square	-0.04765
Standard Error	0.339239
Observations	60

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	0.177745	0.059248	0.514831	0.67531
Residual	57	3.337407	0.115083		
Total	60	3.515152			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.828132	0.35824	2.311669	0.028098	0.095449	1.560815	0.095449	1.560815
X Variable 1	-0.00038	0.000805	-0.46567	0.644933	-0.00202	0.001272	-0.00202	0.001272
X Variable 2	5.04E-13	4.4E-13	1.146683	0.260886	-3.9E-13	1.4E-12	-3.9E-13	1.4E-12
X Variable 3	0.001088	0.04096	0.026563	0.97899	-0.08268	0.08486	-0.08268	0.08486

APPENDIX E

UNIVARIATE REGRESSION RESULTS

REPO

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.009578672
R Square	9.1751E-05
	-
Adjusted R Square	0.032163354
Standard Error	0.336721815
Observations	60

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.000322519	0.000323	0.002845	0.957808
Residual	59	3.514828997	0.113382		
Total	60	3.515151515			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.862006205	0.320064207	2.693229	0.011314	0.209231	1.514781	0.209231	1.514781
X Variable 1	0.001963674	0.036818258	0.053334	0.057808	-0.07313	0.077055	-0.07313	0.077055

FIRM SIZE

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.204224
R Square	0.041707
Adjusted R Square	0.010795
Standard Error	0.32964
Observations	60

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.146607	0.146607	1.3491959	0.254285
Residual	59	3.368544	0.108663		
Total	60	3.515152			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.842136	0.065486	12.85969	5.7679E-14	0.708575	0.975697	0.708575	0.975697
X Variable 1	4.9E-13	4.22E-13	1.161549	0.2542845	-3.7E-13	1.35E-12	-3.7E-13	1.35E-12

PERFORMANCE

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.082744076
R Square	0.006846582
Adjusted R Square	0.025190625
Standard Error	0.335582534
Observations	60

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.024066773	0.024067	0.213707	0.647105434
Residual	59	3.491084742	0.112616		
Total	60	3.515151515			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.875499098	0.058849016	14.87704	1.16E-15	0.755475738	0.995522	0.755476	0.995522
X Variable 1	0.000337196	0.000729411	-0.46228	0.647105	-0.001824839	0.00115	-0.00182	0.00115