The determinants of aggregate domestic merger activity for companies listed on the Johannesburg Stock Exchange

Bevan S. Smith
11356368

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

7 November 2012

ABSTRACT

Mergers and acquisitions remain a constant feature of both the local and international markets, but little is definitely know about what determinants of aggregate merger activity

The aim of this research report is to evaluate the dynamic relationship between a selected number of determinants and aggregate merger activity. We limited our selection of determinants to either macroeconomic or market factors, and limited our acquirers listed on the Johannesburg Stock Exchange.

We defined aggregate merger activity using three measures, namely, quarterly deal frequency, quarterly deal value and a relative measure, which took the ratio of deal value over the JSE All Share Index. We utilised Gross Domestic Product, the Repurchase Rate, Consumer Price Index (CPI) and Producer Price Index (PPI) as our macroeconomic variables. Our market variables were the JSE All Share Index, the All Bond Index and the USD/ZAR Foreign Exchange Rate. Employing the appropriate data transformations, unit root, regression analysis and cointegration tests we were able to statistically test for the hypothesized relationships.

Results indicated that only the Repurchase Rate was applicable in explaining the variation in the deal frequency variable, while none of the chosen determinants were significant in explaining the variation in the deal value and relative deal value measures. Overall, we found in all three cases that the fitted regression model did not explain the variation in our aggregate merger measure well.

On a long-term equilibrium basis, we found that the All Bond Index and CPI were cointegrated with the deal frequency measure. The deal value measure had a long-term equilibrium relationship with the JSE All Share Index, while the relative deal value measure had a long term equilibrium relationship with the All Bond Index, CPI and PPI

KEYWORDS

mergers; acquisitions; macroeconomic factors; merger activity

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____

Bevan Stephen Smith

07 November 2012

ACKNOWLEDGEMENTS

"You take the blue pill - the story ends, you wake up in your bed and believe whatever you want to believe. You take the red pill - you stay in Wonderland and I show you how deep the rabbit-hole goes."

Morpheus, From The Matrix (1999)

I wish to dedicate this research report my dearest mother Marcia, and my late father Edward. Dad – Through your fight with cancer, I am always reminded that life should be lived to the fullest; and without regret. Mom – Thanks you for your fanatical support, love and prayers. I hope I have made you proud.

To my supervisor, Mr. Max MacKenzie, thank you for your guidance, words of encouragement and the time you invested in this research report. Your insight and positivity helped me through the low points, and in many cases pulled me to the top of the peaks.

To my family and friends; especially Jovan, Merlyn, Phumelelakahle, Stuart and Monique – Thank you for sharing in this very personal journey with me. Your presence eased the tough times. To my dearest nieces and nephews, I hope that through my efforts, you are inspired to achieve and reach for your dreams.

To the Modular MBA Class of 2011/2012 – It's been real. A real life-changing event, surrounded by the leaders of tomorrow, equipped with the tools to bring about real change. Catch you on the flip side.

CONTENTS

CHAPTER 1: INTRODUCTION TO RESEARCH PROBLEM 1

1.1 Introduction 1

1.2 Research Title 2

1.3 Research Problem and Purpose 3

1.4 Research Motivation 3

1.5 Research Aim 5

1.6 Research Objectives 5

CHAPTER 2: LITERATURE REVIEW 7

2.1 Motives for Mergers and Acquisitions 7

2.2 Measuring the Success of Mergers and Acquisitions 10

2.3 Merger Waves 11

2.3.1 Neoclassical Hypothesis for Merger Waves 12

2.3.2 Behavioural Hypothesis for Merger Waves 14

2.3.3 Managerial Discretion Hypothesis for Merger Waves 16

2.4 Determinants of Aggregate Merger Activity 16

2.5 Statistical Techniques 20

CHAPTER 3: RESEARCH HYPOTHESES 23

3.1 Propositions 23

3.2 Hypothesis 1 23

3.3 Hypothesis 2 24

3.4 Hypothesis 3 24

CHAPTER 4: RESEARCH METHODOLOGY 25

4.1 Research Design 25

4.2 Unit of Analysis 25

4.3 Sampling Methodology and Size 25
4.4 Population of Relevance 26
4.5 Data Collection Process 27
4.6 Data Analysis Approach 27
4.6.1 Aggregate Merger Activity 27
4.6.2 Macroeconomic Factors 28
4.6.3 Statistical Analysis 28
4.6.3.1 Unit Root Test 29
4.6.3.2 Cointegration Tests 30
4.7 Research Limitations 30
4.6.1 Aggregate Merger Activity Data 30
4.6.2 Determinants of Aggregate Merger Activity 31
4.6.3 Statistical Techniques 31
CHAPTER 5: DATA PRESENTATION 33
5.1 Description of Sample 33
5.2 Measures of Aggregate Merger Activity 34
5.2.1 Quarterly Deal Frequency 34
5.2.2 Quarterly Deal Value 35
5.2.3 Relative Transaction Value 37
5.2.4 Time Series Observations 39
5.3 Determinants of Aggregate Merger Activity 42
5.3.1 Macroeconomic Factors 42
5.3.1.1 Gross Domestic Product (GDP) 42
5.3.1.2 Repurchase Rate 43
5.3.1.3 Consumer Price Index (CPI) 43

5.3.1.4 Producer Price Index (PPI) 44
5.3.2 Market Factors 45
5.3.2.1 JSE All Share Index (ALSI) 45
5.3.2.2 All Bond Index (ALBI) 46
5.3.2.3 USD/ ZAR Foreign Exchange Rate 46
5.4 Determinants of Aggregate Merger Activity – Time Series Graphs 47
5.5 Determinants of Aggregate Merger Activity – Pearson Correlation Coefficients 51
CHAPTER 6: DISCUSSION OF RESULTS 54
6.1 Augmented Dickey-Fuller unit root tests 54
6.1.1 Aggregate Merger Activity 55
6.1.2.1 Quarterly Deal Frequency 55
6.1.2.2 Quarterly Deal Value 56
6.1.2.3 Quarterly Relative Deal Value 56
6.1.2 Macroeconomic Determinants 57
6.1.2.1 Quarterly Gross Domestic Product 57
6.1.2.2 Quarterly Repurchase Rate 58
6.1.2.3 Consumer Price Index 58
6.1.2.4 Quarterly Producer Price Index 59
6.1.3 Market Determinants 60
6.1.3.1 Quarterly All Bond Index 60
6.1.3.2 Quarterly USD/ ZAR Foreign Exchange Rate 60
6.1.3.3 Quarterly JSE All Share Index 61
6.2 Testing of Hypotheses 62

6.2.1 Hypothesis 1 – Aggregate Merger Activity – Deal Frequency Measure 63

6.2.1.1 OLS Regression Results – Deal Frequency Measure 63

6.2.1.2 Granger Causality Results – Deal Frequency Measure 64

6.2.2 Hypothesis 2 – Aggregate Merger Activity – Deal Value Measure. 65

6.2.2.1 OLS Regression Results – Deal Frequency Measure 65

6.2.2.2 Granger Causality Results – Deal Value Measure 65

6.2.3 Hypothesis 3 – Aggregate Merger Activity – Relative Deal Value Measure 67

6.2.3.1 OLS Regression Results – Relative Deal Value Measure..... 67

6.2.3.1 Granger Causality Results – Relative Deal Value Measure 68

CHAPTER 7: CONCLUSION 69

8. REFERENCES 71

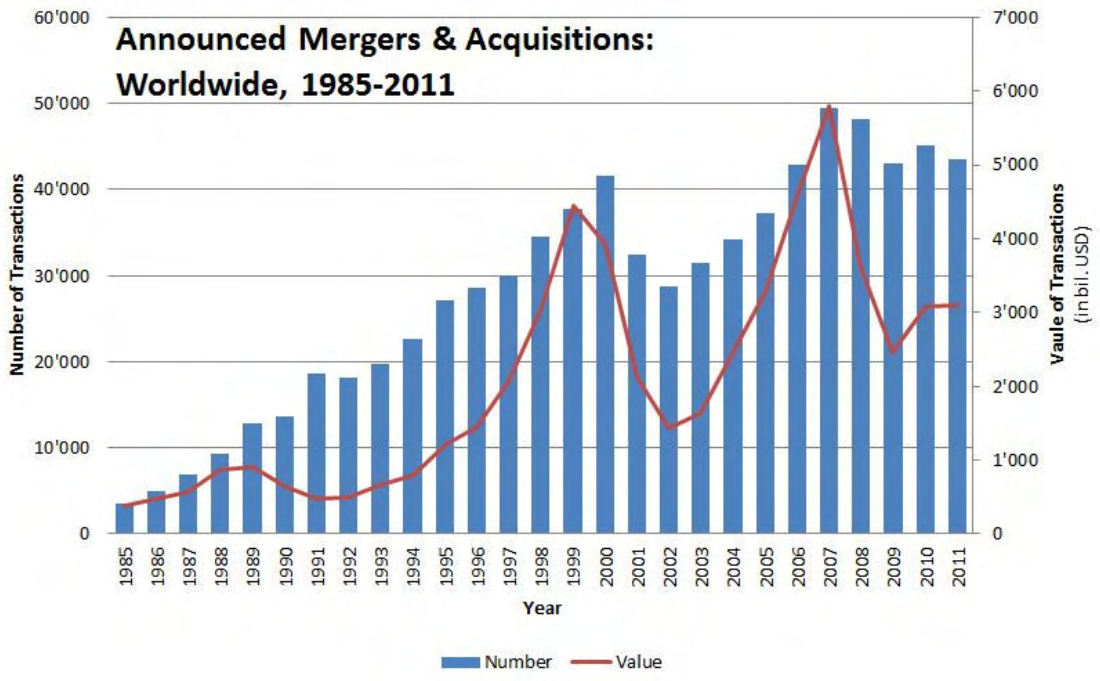
9. APPENDIX 74

CHAPTER 1: INTRODUCTION TO RESEARCH PROBLEM

1.1 Introduction

According to the statistics published by the Institute of Mergers, Acquisitions and Alliances, the total value of merger and acquisition transactions announced in 2011 amount to just over USD 3 trillion, falling sharply from 2007, when announced transactions peaked at USD 6 trillion and transaction volumes fell just short of 50,000. Using Figure 1-1 to observe M&A activity over a longer period of time, we observe a cyclical trend for both the deal value and deal frequency statistic. While this assertion is nothing more than a guess, it does beg the question as to what are the determinants driving these period of merger activity.

Figure 1-1: Global Announced M&A deals from 1985 to 2011 (value in USD)

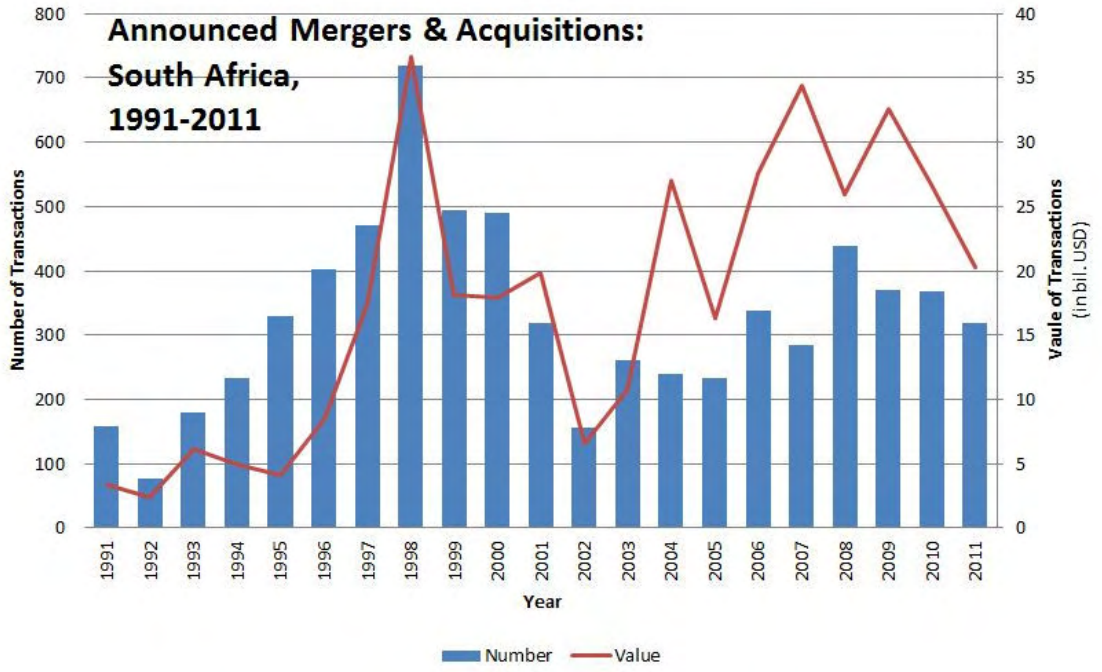


Source: Institute of Mergers, Acquisitions and Alliances (2012)

When we consider the total M&A activity for South Africa in 2011, we see aggregate deal value amount to USD 20 billion and roughly 16,000 transactions. Using Figure 1-2 to observe the trend of M&A activity in South Africa over the longer term, we again see a cyclical trend for both the deal value

and deal frequency statistic. We observe from Figure 1-2 that there has been a decoupling of deal frequency from deal value post-2002, suggesting that there has been a behavioural change to the way companies acquire. Our speculation is that this behaviour has largely been driven by the increasing regulatory oversight and public scrutiny of public companies.

Figure 1-2: Announced M&A deals for South Africa from 1985 to 2011 (value in USD)



Source: Institute of Mergers, Acquisitions and Alliances (2012)

Haleblian, Devers, McNamara, Carpenter, & Davison (2009) propose a number of reasons for why companies acquire, but it is clear that an integrated approach to analysing aggregate merger activity is required. Without discounting the complexity of an M&A process, this research report focuses on the macroeconomic and market factors that facilitate and drive aggregate merger activity.

1.2 Research Title

The determinants of aggregate domestic merger activity for companies listed on the Johannesburg Stock Exchange.

1.3 Research Problem and Purpose

The occurrence of merger waves over the over the last 100 years has been studied with a neoclassical, behavioural and managerial hypothesis lens on numerous occasions. Research findings relating to technology changes (Jovanovic & Rousseau, 2001), regulatory and economic shocks (Mitchell & Mulherin, 1996) and managerial motives (Shleifer & Vishny, 2003) are but a few of the themes which have emerged.

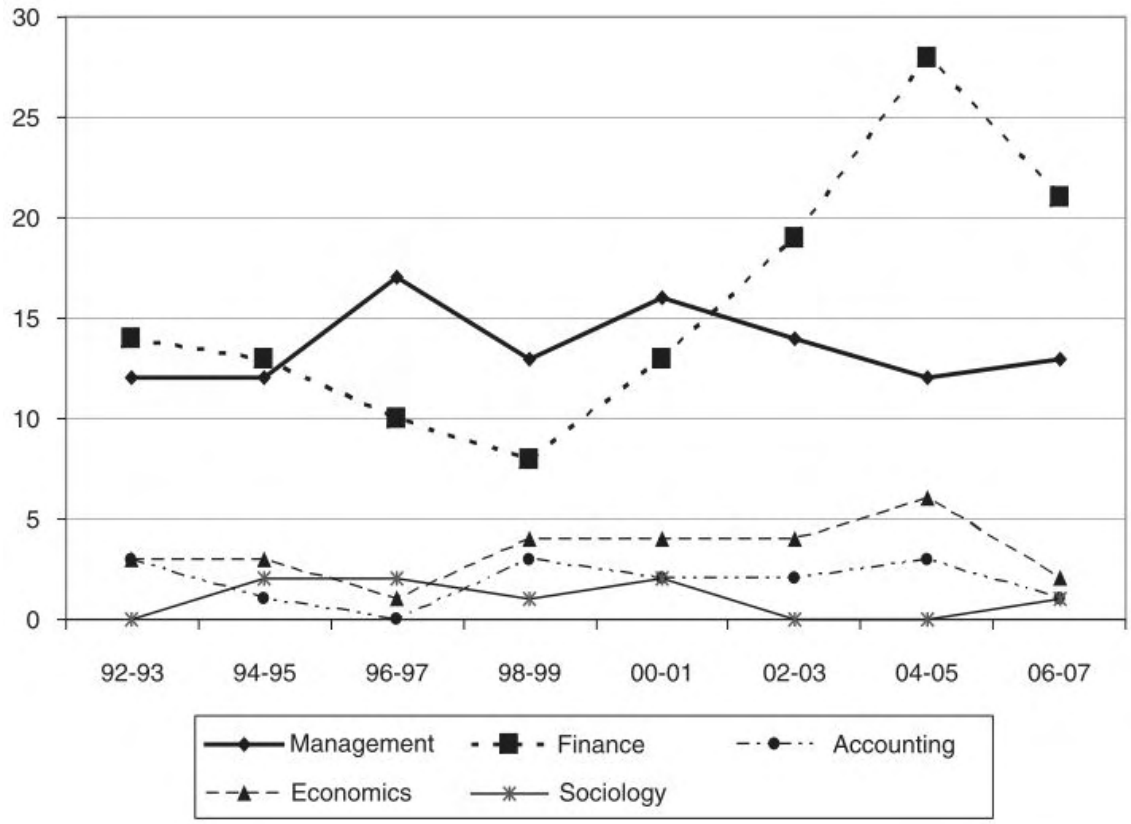
We set out to identify and analyse the macroeconomic and market determinants that impact aggregate domestic merger activity, for companies listed on the Johannesburg Stock Exchange. We have largely based our research approach on the work done by Choi & Jeon (2011) and Uddin & Boateng (2011), with a particular focus on the statistical methodology utilised.

The purpose is therefore to utilise a rigorous statistical approach, which has been refined by the research community to obtain statistically significant results relating to South African M&A activity. Through our analysis and results we hope to initiate a longer-term interest and discussion around the determinants of aggregate merger activity.

1.4 Research Motivation

The review conducted by Haleblian et al. (2009) on all research conduct on mergers and acquisitions, provides a clear indication of where research efforts have been focused to date.

Figure 1-3: (Haleblian et al., 2009)**Research trends in M&A – Number of articles by discipline**



It is interesting to note from Figure 1-3 that while the Finance and Management have enjoyed the most focus in terms of research efforts, the Economics, Sociology and Accounting disciplines have not attracted much attention.

To our knowledge, this research report represents the first effects on analysing the macroeconomic and market determinants of aggregate merger activity for domestic acquires listed on the Johannesburg Stock Exchange. In our review of the literature we found that much of the research efforts around the determinants of domestic aggregate merger activity were spearheaded by (Choi & Jeon, 2011), (Nieh, 2003) and (Yagil, 1996)focusing exclusively on the US economy. While the results have been encouraging there is a definitely inconsistency in the findings from these research efforts.

In contrast, we find a proportionately more literature covering cross-border aggregate merger activity, with a focus on country-specific challenges and the use of M&A as a mode of entry into new markets and territories. The work by

Uddin & Boateng (2011) on the determinant of cross-border M&A (CBM&A) in Latin America, is the most recent research effort to focus on a developing cluster of economies as opposed to developed economies. The extensive analysis conducted by Uddin & Boateng (2011), focused not only on macroeconomic variables, but also business-related variables and company specific considerations.

While the research efforts on domestic and cross-border M&A are encouraging, there is almost no mention of exploring a South African, and more broadly, African perspective on aggregate merger activity. Our motivation to do this research is motivated by the need to gain a better understanding of what drives merger and acquisitions in South Africa from a macroeconomic and market determinant perspective. With this we hope that to contribute to the growing focus to characterise M&A activity in a manner that allows for the generalisation of some of the key finding to date.

Due to the time constraints of the researcher, we intentionally did not investigate any deal or industry-specific characteristics, which may have impacted the observed dynamic relationship between the determinant and aggregate merger activity.

1.5 Research Aim

The aim of this research is to assess whether there is a dynamic relationship between aggregate domestic merger activity and selected macroeconomic and market factors. We define our measures for aggregate merger activity in terms of deal frequency, deal value and the ratio of the deal value over the average market capitalisation, all measure on a quarterly basis, from 2000 to 2011.

1.6 Research Objectives

1) To identify and review the relevant methodologies from previous research efforts to aid in analysing the dynamics relationship between selected macroeconomic and market factors, and aggregate merger activity measured in terms of:

a. The frequency of merger and acquisition transactions, aggregated on a quarterly basis

b. The value of merger and acquisition transactions, aggregated on a quarterly basis

c. The ratio of the deal value over the average annual market capitalisation of the Johannesburg Stock Exchange, aggregated on a quarterly basis

2) Apply specific data transformation and econometric methods to the selected sample, measuring the dynamic relationship between the metric above and the selected determinants.

3) Evaluate the results, compare the finding of the study to previous work conducted and conclude with the findings.

CHAPTER 2: LITERATURE REVIEW

2.1 Motives for Mergers and Acquisitions

While no generally accepted definition exists, mergers and acquisitions (M&A) in the broader sense include all transactions that lead to changes in ownership (Yesilyurt, 2012). Many research reports use the terms merger and acquisition interchangeably, but we take a moment here to draw a clear distinction between the two. A "merger" to a transaction where two companies combine their assets and liabilities into one entity, or when one company purchases another outright (Terjesen, 2007). These transactions are colloquially referred to as a merger of equals. The term "acquisition" simply refers to one company's purchase of another—as when a smaller target firm is bought and absorbed into a larger acquiring firm (Terjesen, 2007).

Mergers can be functionally classified as horizontal (between competing firms in the same industry), vertical (between firms in client-supplier or buyer-seller relationships), conglomerate (between companies in unrelated activities) or congeneric (between companies in the same general industry with no mutual/ buyer customer or supplier relationships). (Osae, 2010) Acquisitions are functionally classified by Osae (2010) as the type where the buyer buys the shares and therefore control of the target company or the situation where the buyer buys the assets of the target company, leaving the target company as an empty shell.

Despite the implementation challenges associated with M&A's, they still represent a key way in which companies get bigger and in turn contribute to the growth of the global economy (Ragozzino & Reuer, 2007). Analysis conducted by Andrade & Stafford (2004) takes this one step further by concluding that M&A's play a dual economic role. Their research shows that M&A's act as either internal investments, which allow companies to increase their capital base in response to good growth prospects, or they facilitate industry rationalisation and asset reallocation resulting in improved efficiencies (Andrade & Stafford, 2004).

The heterogeneous model proposed by Ali-Yrkkö (2002) on the causes of M&A aggregate M&A activity suggests that there are macro-level, industry-level and firm-level factors affecting the decisions around M&A's. (Haleblian et al., 2009) conducted a meta-study that summarises the principal reasons driving acquisitions. While the list of antecedents are exhaustive, they do temper their findings by saying that it remains unclear which antecedents are primary, secondary, or tertiary triggers, whether independently or jointly, operating on acquisition behaviour.

Table 2-1: Haleblian et al. (2009) **Acquisition Antecedents: Why Do Firms Acquire?**

Categories	Acquisition Antecedents
Value Creation	• *Market Power* – The idea that having fewer firms in an industry increases firm-level pricing power. • *Efficiency* – To reduce the cost side of value creation, motivated by the desire to increase efficiency. • *Resource Deployment* – Horizontal acquisitions as a means of facilitating redeployment of assets and competency transfers to generate economies of scope. • *Market Discipline* – Suggests that acquisitions may be value enhancing when they are used to discipline ineffective managers, implying that firms managed by ineffective and overcompensated top managers become the target of takeovers made with the intention of corporate turnaround.
Managerial Self-Interest	• *Compensation* – Demonstrates the links between upper echelon compensation and ownership and acquisitive behaviour. • *Managerial Hubris* – In addition to compensation, other work has shown that managerial confidence and ego gratification may also increase acquisition behaviour. • *Target Defense Tactics* – Discusses the implications of

Categories	Acquisition Antecedents
	defense tactics on acquisition likelihood.
Environmental Factors	• *Environmental Uncertainty and Regulation* – Explores the fit between environment and firm strategy motivates acquisition behaviour, with some evidence that environmental uncertainty affects whether firms select to acquire or opt for other cooperative means. • *Imitation and Resource Dependence* – Extending inter-organisational imitation theory to explore inter-industry mergers, research found that fringe actors initiated innovations that enabled them to execute mergers and, as these actors became increasingly successful, others, in turn, imitated their innovations. • *Network Ties* – Network ties as a driver of acquisition behavior, with research finding that managers imitated the acquisition activities of firms to which they were tied through interlocking directorships.
Firm Characteristics	• *Acquisition experience* – The influence of experience as an acquisition motivator. • *Firm strategy and position* – Suggests that firms' strategic positions and intentions may have strong influences on acquisition behaviour.

The meta-study of Haleblian et al. (2009) further discusses the specific situations that allow the minority of acquirers to unlock value from their M&A transactions. They found that the moderators of acquisition performance were based on four levels of analysis: deal characteristics, managerial effects, firm characteristics, and environmental factors. Of the environmental factors discussed by Haleblian et al. (2009) we see that historically research has focused on the occurrences of merger waves and changes in regulations influencing the attractiveness of acquiring. The lack of focus on a macro-economic framework to explain aggregate merger activity is further underlined by the fact that over the 15-year period of review, out of the 167 empirical

articles, just less than 30 of these were classified as "economic" related research. (Haleblian et al., 2009)

2.2 Measuring the Success of Mergers and Acquisitions

While the topic of merger and acquisition success is well understood, we take some time to discuss the ways in value is evaluated and how profitability is measured. This meander serves to underline the way management and finance fields have dominated the field of acquisition research (Haleblian et al., 2009). Bruner (2004) states that the evaluation of value creation requires the consideration of the economic consequences of M&A's, which are measured through:

- **Event Studies –** Which examines the abnormal return to shareholders in the period surrounding the announcement of an M&A transaction
- **Accounting Studies –** Which analyse reported financial results of acquiring companies before and after acquisitions against comparable companies that did not make acquisitions
- **Surveys of Executives –** Which seeks to understand the determinants of M&A profitability gleaned from cross-sectional research studies
- **Clinical Studies –** Which underscores the importance of context and company specific circumstances that can affect buyers and/ or sellers.

Using investor's required return as the benchmark, Bruner (2004) proposes three possible outcomes exist when we consider the profitability of M&A transactions:

- **Value destroyed:** The investment returns were less than those required by investors. In this case investors could have done better investing in another opportunity of similar risk;
- **Value created:** The investment returns exceed the required returns. The investor got more than what was expected;

- **Value conserved:** The investment returns equal the required rate of returns. Economically speaking the investor got the returns that were expected (i.e. normal returns)

The success of M&A transactions can be defined in many ways, but profitability from an economic standpoint is the most rigorous and measureable definition, with Bruner (2004) offering the following three classes of profitability measures:

- **Weak Form** – Are shareholders better off after the deal than they were before. While this comparison is widespread, it fails to control for factors unrelated to the deal that may have triggered a price change.

- **Semi-Strong Form** – Are shareholders better off compared to the return on a comparable investment (e.g. benchmarking against return on an index or return on a matched sample of peers). While benchmarks are imperfect, this kind of test is more reliable because it controls for the possibility that the observed returns were actually driven by factors in the industry or entire economy.

- **Strong Form** – Are shareholders better off after the deal than they would have been had the deal not occurred. This is the true test of lost opportunity cost and presents the economists' "gold standard" of comparison

While the value and profitability considerations listed above are indeed robust and well understood, they do lack a macroeconomic perspective on the relative success of M&A transactions. Anecdotal evidence of this is the relative failure (when using management and finance measure of success) of M&A transactions concluded pre-2007, just before the credit crisis.

2.3 Merger Waves

Merger activity tends to take place in waves, represented by a time of increased activity followed by a period of relatively few acquisitions. Town (1992) offers a more precise definition stating that *"…a series is said to behave in waves if it*

experiences epochs marked by large, discrete, and unsustainable increases in the expected value of the series conditional on being in a wave epoch." (p. 84)

There have been six merger and acquisition 'waves' over the past century between the periods of 1895 to 2007. Each wave has been stimulated by events outside the merger world, but which have had a significant impact on the level of merger activity Moeller & Brady (2007) cited in Osae (2010). Bruner (2004) gives the reasons for the first four merger waves, starting with the first wave (from 1895 – 1904) which was characterised by horizontal mergers; the second wave (from 1925 – 1929) which was dominated vertical mergers; the third wave (from 1965 – 1970) which was characterised by conglomerate mergers; and the fourth wave (from 1981 – 1989) which consisted of multiple hostile takeovers enabled by the development of the high yield bond market.

Moeller & Brady (2007) cited in Osae (2010) continues in this vein and summarises the fifth wave (from 1994 – 2000) as a period characterised by the consolidation of industries and globalisation. The dot.com boom and bust also occurred during this wave. The sixth wave began in 2003 and was characterised by a period of horizontal and cross-border merger activity. This merger wave was heavy influenced by laws and regulation passed in response to corporate scandal (most notably Sarbanes-Oxley Act in the United States) and showed a rise in activity by financial buyers (hedge funds, private equity funds, venture capital funds).

2.3.1 Neoclassical Hypothesis for Merger Waves

The existence of merger waves relies on the adoption of either a neoclassical hypothesis or a behavioural hypothesis to explain the process and mechanics of this phenomenon. Harford (2005) summarises the neoclassical hypothesis as *"…once a technological, regulatory, or economic shock to an industry's environment occurs, the collective reaction of firms inside and outside the industry is such that industry assets are reallocated through mergers and partial-firm acquisitions."* (p. 533). Because the neoclassical hypothesis predicts that capital will be reallocated as quickly and as efficiently as possible,

we would expect to see a clustering of M&A activity over a short period of time as firms compete for the optimal combination of assets.

The research conducted by Mitchell & Mulherin (1996) argues that merger waves are a result of shocks to the economic, technological or regulatory environment of an industry. The study by Harford (2005) takes the work of Mitchell & Mulherin (1996) further by asking whether the clustering of merger waves, at an aggregate level is due to a combination of industry shocks, or whether such clustering is due to market timing. Jovanovic & Rousseau (2001) analyse mergers with an emphasis on technological changes. Their research found that merger waves are shorter when technological change are more dramatic, when the capital of other firms are less costly to transfer, and when entry and exit are a smooth reallocation mechanism.

Jovanovic and Rousseau later refined their observations by using q-theory to explain how mergers are a channel through which capital flows to better projects and better management. (Jovanovic & Rousseau, 2002). As explained by Gugler, Mueller, & Weichselbaumer (2012), the q-theory of investment shows that when a firm's return on its capital stock exceeds its cost of capital, **q > 1**, it expands its capital stock. Extending this theory to mergers implies that firms with **qs > 1** can profitably expand by acquiring assets either in the form of capital investment or other firms.

Toxvaerd (2008) cited in Gärtner & Halbheer (2009) proposes an alternative explanation for merger waves by employing a dynamic model which utilizes the relative scarcity of potential desirable targets, the options value in waiting to acquire a target and that imperfect competition for targets as factors for the model. Toxvaerd (2008) used this model to demonstrate how the value of being merged is subject to random fluctuations in the exogenous economic environment (reflecting for instance technology or demand shocks). Another key feature of the model was that it encompassed the dependence of the merger decision on both macroeconomic variables and strategic considerations.

2.3.2 Behavioural Hypothesis for Merger Waves

Harford (2005) again serves as our point of reference by asserting that the behavioural hypothesis for aggregate merger activity happens when managers use overvalued stock to buy the assets of firms that are relatively lower in value. Based on the explanation offered by Gort (1969) we take these discrepancies in valuation to come from the differences in expectations about income streams from income-producing assets, and the risks associated with these expected income. Harford (2005) goes on to discuss the predictions made by the behavioural hypothesis, which includes:

- Merger waves will occur following periods of abnormally high stock returns or market-to-book ratios, especially when dispersion in those returns or ratios is large;
- Industries undergoing waves will experience abnormally poor returns following the height of the wave;
- As there is no economic driver to the wave, identifiable economic or regulatory shocks will not systematically precede the wave;
- The method of payment in a wave should be overwhelmingly that of stock, such that cash mergers should not increase in frequency during waves; and, as a corollary,
- Because the wave is being driven by the acquisition of real assets with overvalued stock, partial-firm (divisional) transactions for cash should not be common and they should be especially rare by firms that are bidding for other firms with stock.

Rhodes-Kropf & Viswanathan (2004) supports the behaviour hypothesis by showing that merger waves can occur solely due to valuation issues. Their work showed that market overvaluation increases the chances of mergers occurring, regardless of whether there is an underlying reason for the mergers. Rhodes-Kropf & Viswanathan (2004) further note that misvaluation affects the medium of exchange – where waves of cash and stock purchases can be driven by period of overvaluation and undervalution of the stock market. Taking

mispricing as a given, Shleifer & Vishny (2003) support this idea by stating that firms are incentivised to get their equity overvalued, so that they can make acquisitions with stock rather than cash.

When considered in a more general manner, Shleifer & Vishny (2003) conclude that firms with overvalued equity might be able to make acquisitions, survive, and grow, while firms with undervalued, or relatively less overvalued, equity become takeover targets themselves. Gorton, Kahl, & Rosen (2009) add yet another dimension to the behavioural hypothesis by arguing that managerial defensive motives are important for explaining mergers and merger waves. They assume that when managers prefer their firm to remain independent, they can reduce their chance of being acquired by acquiring another firm.

Shleifer & Vishny (2003) suggests that merger activity can be explained by considering the relative valuations of the combining firms and the synergies that the market perceives in the merger. Their theory helps explain who acquires whom, the choice of the medium of payment, the valuation consequences of mergers, and merger waves. Town (1992) found that aggregate merger activity is well described by a nonlinear, Markov switching-regime model and appears to be an endogenous phenomenon. The study by Town (1992) also suggests that the dynamics of aggregate merger behaviour are complex and requires the development of a sound theory for aggregate merger activity that accounts for switching dynamics.

The work by Gort (1969) links the behavioural and neoclassical hypotheses on merger activity by his argument that economic disturbances generate discrepancies in valuation of the type needed to produce mergers. Gort (1969) further states that while there are a wide variety of economic shocks that alter the structure of expectations, the most common are rapid changes in technology and movements in security prices.

2.3.3 Managerial Discretion Hypothesis for Merger Waves

Gugler et al. (2012) explain that under the managerial discretion hypothesis for merger waves, managers get value from the growth of their firms'. This is either due to the fact that their incomes are tied to growth of the firm, or they believe the intangible benefits of managing a larger firm will exceed the utilitarian value derived from the acquisition. (Gugler et al., 2012) Using the principal-agent theory, Ali-Yrkkö (2002) explains that "*…managers build their own empire in order to obtain personal benefits such as managers' compensation, power and prestige.*" (p. 17). He expands his argument by saying that these benefits are often positively correlated to a bigger company size and the rate at which sales grow.

Using the managerial discretion hypothesis as our frame of reference, merger waves are seen to occur during stock market booms, since the optimism prevailing in the market allows managers who are seeking growth opportunities to undertake more wealth-destroying mergers than what is safely possible under normal market conditions. (Gugler et al., 2012) Another potential benefit to managers of big companies is that they have better opportunities to obtain position in other companies' boards. (Ali-Yrkkö, 2002) While mergers and acquisitions do often provide a faster means to grow than pursuing an internal expansion strategy, Gugler et al. (2012) found that the managerial discretion hypothesis did not hold for non-listed firms. They argue that temporary stock market booms do not affect the takeover constraints and/or the monitoring intensity by the owners of private companies

2.4 Determinants of Aggregate Merger Activity

There have been a number of studies that attempt to better understand the relationship between merger activity and macroeconomic variables. In applying a neoclassical approach to explaining aggregate merger activity, we accept the presumption that external factors are able to drive the decision making process within firms and, in certain instances, even override internal concerns. (Owen, 2006) We also accept that the neoclassical theory of mergers has considerable explanatory power, but is by no means complete. (Shleifer & Vishny, 2003)

Through our review of the relevant literature, and by applying the relevant statistical techniques to our selected determinants of aggregate merger activity, we hope to contribute towards the understanding of what drives aggregate merger activity in the South Africa business environment.

Analysing the pattern of Japanese M&A from 1988 to 2002, Nakamura (2004) focused on the influence of selected macroeconomic and financial variables on the pattern of Japanese M&A's to see whether economic activity can explain the most recent wave of M&A's. While the study by Nakamura (2004) did not yield any significant empirical insight, it did highlight potential pitfalls. Amongst these, a longer-term time series, division of the data into subcategories based on firm size (considering factor such as the terms of capital, turnover and then number of personnel), payment size or payment type as potential improvements for further research in this field.

Liu (2004) focused on the macroeconomic determinants of corporate failures in the UK and found that nominal interest rates, real profits, real credit, price and corporate birth rates determine the short-run and long-run failure rates of corporates. The research conducted by Bhattacharjee, Higson, Holly, & Kattuman (2009) extends the work done my Liu (2004) by investigating the impact of macroeconomic conditions on firm failures and acquisitions. They found that the long-term real interest rate had a significant impact on acquisitions, and that the US economy is a better predictor of UK bankruptcies and acquisitions than the business cycle in the United Kingdom itself.

Bhattacharjee et al. (2009) found that economic uncertainty in the form of sharp increases in inflation and sharp depreciation of the foreign exchange rate increased that likelihood of bankruptcy for newly listed firms adversely during these unstable years. Acquisition activity was also subdued during these unstable years. In an era of globalisation, the results of the study conducted by Bhattacharjee et al. (2009) underscores the importance of smooth macroeconomic management for the corporate sector. It also points to the role that might be played by business cycles in other economic regions in the determination of corporate failures and acquisitions.

The studies by Yagil (1996) and Choi & Jeon (2011) investigated the dynamics between macroeconomic fundamentals and aggregate merger activity. Their work assessed aggregate merger activity on a frequency and value basis for both absolute and relative measures. While both studies focused on merger activity in the US economy, Yagil (1996) differentiated between both horizontal and vertical non-conglomerate types of mergers, pure conglomerate mergers. and between cash and securities funded mergers. In both studies it was found that there is a long-run equilibrium relationship between a set of macroeconomic variables and various alternative measures of aggregate merger activity in the US economy.

Choi & Jeon (2011) identified GDP, the stock market, monetary policy, the bond market and corporate liquidity as playing an important role in determining aggregate merger activity in the US economy. Yagil (1996) found that the interest rate and the investment level best explained the variation in merger activity over time. In his work to understand the cross-sectional and time series variation in M&A activity, Ali-Yrkkö (2002) GDP, market capitalisation and the number of listed firms are significant in explaining these variations for the Finnish market.

The latest contribution to the body of research on the determinants of aggregate domestic merger activity comes from. (Gugler et al., 2012) Their study investigated the evidence of merger waves at the end of the 20th century in the USA, UK and Continental Europe. By analysing merger activity for both listed and unlisted acquirer, Gugler et al. (2012) were able to discriminate between the real changes in the economy and pure stock market phenomenon. While (Gugler et al., 2012) do not identify macroeconomic variables driving merger activity, they do provide empirical insight into the explanatory power of the various hypotheses used to explain merger waves.

Focusing on merger activity in the US economy, Nieh (2003) found that their is a common trend between macroeconomic fundamentals and aggregate M&A activity in the long run. In the short-run movement, the strongest explanatory relationship exists between GDP and M&A activity. This was followed by stock

price, which plays the second most important role in describing the dynamic relationship with M&A activity. While our review has not been exhaustive, we include a summary of the research on the determinants of merger activity, as summarised by Choi & Jeon (2011) Table 2-2 below.

Table 2-2: (Choi & Jeon, 2011) **A summary of literature on the determinants of merger activity**

Level	Literatures	Dependent variable	Independent variable
Stock market-level	Nelson (1959), Gort (1969), Guerard (1989), Verter (2002), Dong *et al.* (2006), Ang and Cheng (2006), Shleifer and Vishny (2003), Rhodes-Kropf and Viswanathan (2004)	Deal frequency, deal value	Stock price, volatility of the stock market, stock market behaviour
Industry-level	Mitchell and Mulherin (1996), Schlingemann *et al.* (2002), Harford (2005), Miyazaki (2009)	Deal frequency, deal value	Economic, technological or regulatory shocks, capital liquidity, R&D
Firm-level	Jensen (1986), Harford (1999), Jovanovic and Rousseau (2002), Jensen (2003), Shleifer and Vishny (2003), Granier (2008)	Deal frequency, deal value	Free cash flows, cash reserve, firm's heterogeneity, firm performance, Tobin's Q
Macroeconomic-level	Steiner (1975), Melicher *et al.* (1983), Shughart and Tollison (1984), Becketti (1986), Clark *et al.* (1988), Andrade *et al.* (2001), Town (1992), Golbe and White (1993), Mulherin and Boone (2000), Jovanovic and Rousseau (2001), Harford (2005)	Deal frequency, deal value, deal value/total asset	GNP, GDP, interest rate, the economic cycle

While our literature review focus on a behavioural vs. neoclassical explanation for aggregate merger activity, the table presented by (Choi & Jeon, 2011) above provides segments their research by the level at which the analysis was conducted. We however do note that our finding across the studies reviewed outside of the work by Choi & Jeon (2011) consistently identify GDP/ GNP interest rates, the economic cycle or level of economic investment as the key macroeconomic variables that explain merger activity, at a domestic level, in the short- and long-run.

2.5 Statistical Techniques

The selection of statistical techniques utilised to understand the dynamic relationship between aggregate merger activity and macroeconomic variables have improved over time to meet the demands for more generalised observations on the interaction between variables. We review the key statistical techniques utilised in the literature we reviewed to support our choice of the most suitable statistical method for this research report.

Melicher, Ledolter, & D'Antonio (1983) utilised autoregressive integrated moving average (ARIMA) models to study the post-World War II (1947 – 1977) merger wave. Logarithmic transformations of the original data and the first differencing of the transformed data where use to stabilise the variance of each series and to cater for non-stationary series. By removing the cross-correlation of a series with itself, Melicher et al. (1983) were able to study the lead-lag relationships among the time series models created for production levels, business failures, stock prices, bond yields and merger activity.

In an innovative approach to modelling merger activity, Golbe & White (1993) test the wave hypothesis of merger activity in the US market by fitting a series of sine curves to the time series data. Golbe & White (1993) however do not use logarithmically transformed data, as this tends to flatten the peaks and troughs in the time series, ultimately reducing the chances of detecting cyclical or wave components. As a direct test for the wave characterisation of mergers, Golbe & White (1993) conclude that more complex wave forms would provide an even better fit to the time series data.

Town (1992) utilises a two-state, Markov switching-regime model to capture the wave structure potentially present in aggregate merger activity, arguing that linear and nonlinear diagnostics tests show that the switching regime model fits the data better than ARIMA models. While several traditional methods exist for the analysis of time series phenomena, new time series methodologies have been developed and combined to improve the robustness of the analysis conducted. Nieh (2003) highlights co-integration test, Vector Autoregression

(VAR) and Vector Error Correction (VECM) models, Granger causality, impulse response function and variance decomposition as a more suitable way to fully investigate the long-run equilibrium and short-run statistical relationships between aggregate M&A activity and macroeconomic variables.

The approaches utilised by Choi & Jeon (2011) and Uddin & Boateng (2011) show that by combining some of the techniques discussed by Nieh (2003) above improves the rigour of the econometric analysis undertaken. To test whether the variables used in a time series regression are stationary or non-stationary, both Choi & Jeon (2011) and Uddin & Boateng (2011) carried out Augmented Dickey-Fuller (ADF) tests on the logarithms of data series for each the variables utilised in order to overcome this problem. Choi & Jeon (2011) carried out Philips–Perron tests to confirm the same result.

The reason for the almost fanatical focus on these tests is discussed by Uddin & Boateng (2011) citing Koop (2009) who pointed out that *"…if the variables of a time series regression are non-stationary or have unit root, then all the usual regression results might be incorrect or misleading due to spurious regression problem."* (p. 551)

To ascertain the long-run relationship among selected macroeconomic and aggregate merger activity variables, both studies utilised the Engle– Granger (1987) co-integration test. By utilising this test, we are able to ascertain whether any of the macroeconomic variables Granger-causes aggregate merger activity using the standard *F*-test. (Choi & Jeon, 2011) Taking this one step further, Uddin & Boateng (2011) included a check for multicollinearity and an Error Correction Model (ECM), which was the one period lag of the residuals calculated from the OLS regression using the data series in level. With the use of a multi-variable VAR model, Choi & Jeon (2011) were able the examine the impact of various macroeconomic shocks, in the short term on aggregate merger activity (measure in terms of both deal frequency and transaction value).

This research built on the work done by Choi & Jeon (2011) and Uddin & Boateng (2011) and investigated the dynamic relationship between selected

determinants (macroeconomic or otherwise) and aggregate merger activity in South Africa over the period 2000 – 2011.

CHAPTER 3: RESEARCH HYPOTHESES

The proposed hypotheses were designed to study the impact of changes in the macroeconomic environment on M&A activity, in South Africa from 2000 to 2011, through the use of the appropriate time series econometric tools.

3.1 Propositions

Based on the literature reviewed, we considered the various research questions by focusing on the following propositions:

- There is a relationship between aggregate M&A activity, measured as the frequency of transactions per quarter, and selected macroeconomic and market variables
- There is a relationship between aggregate M&A activity, measured as the cumulative deal value per quarter, and selected macroeconomic and market variables
- There is a relationship between the relative measure of aggregate M&A activity, measured as the Transaction Value divided by the JSE All Share Index, and selected macroeconomic and market variables

3.2 Hypothesis 1

The null hypothesis (**$H1_0$**) states that there is no dynamic relationship between various macroeconomic and market variables (as discussed in Chapter 4) and the aggregate merger activity in South Africa, when measured in terms of deal frequency on a quarterly basis.

The alternative hypothesis (**$H1_A$**) states that there is a dynamic relationship between various macroeconomic and market variables (as identified and discussed in Chapter 4) and aggregate merger activity in South Africa, when measured in terms of deal frequency on a quarterly basis.

3.3 Hypothesis 2

The null hypothesis (**$H2_0$**) states that there is no dynamic relationship between various macroeconomic and market variables (as identified and discussed in Chapter 4) and aggregate merger activity in South Africa, when measured in terms of transaction values summed on a quarterly basis.

The alternative hypothesis (**$H2_A$**) states that there is a dynamic relationship between various macroeconomic and market variables (as identified and discussed in Chapter 4) and aggregate merger activity in South Africa, when measured in terms of transaction values summed on a quarterly basis.

3.4 Hypothesis 3

The null hypothesis (**$H3_0$**) states that there is no dynamic relationship between various macroeconomic and market variables (as identified and discussed in Chapter 4) and aggregate merger activity in South Africa, when using the relative measure of the ratio of the transaction value (summed on a quarterly basis) over the JSE All Share Index.

The null hypothesis (**$H3_A$**) states that there is a dynamic relationship between various macroeconomic and market variables (as identified and discussed in Chapter 4) and aggregate merger activity in South Africa, when using the relative measure of the ratio of the transaction value (summed on a quarterly basis) over the JSE All Share Index.

These hypotheses were tested for M&A transactions where the acquiring entity is listed on the JSE, over the period 2000 to 2011. We did not differentiate for cash- versus share-funded transactions and the hypotheses were not tested for cross-border transactions. Significance testing was at the 5% error level using two-tailed t-tests.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Research Design

This research study aimed to understand the dynamic relationship between selected macroeconomic and market factors, which were statistically analysed against various measures of aggregate merger activity. We measured aggregate merger activity on both an absolute and relative basis. Out absolute measures included the frequency of M&A transactions and the value of M&A transactions, aggregated on a quarterly basis, and concluded in South Africa over the period 2000 – 2011. The general research design for this research report, leverages the research efforts of Choi & Jeon (2011), Uddin & Boateng (2011) and Pablo (2009), which explores the impact of macroeconomic factors on aggregate domestic merger activity in the US, UK and Latin America respectively.

4.2 Unit of Analysis

The selected unit of analysis included all M&A transactions concluded over the period 2000 - 2011, for entities listed on the Johannesburg Stock Exchange. We referenced the announcement date of the transaction to ensure that the M&A transactions was negotiated and consummated over the period of observation.

4.3 Sampling Methodology and Size

The population was defined as all mergers and acquisitions that occurred between 2000 and 2011, as obtained from the DealMakers Online database of M&A activity in South Africa. The overall number of transactions included in the unfiltered data set totalled 6272 transactions, with a total transaction value of ZAR 3,72 trillion. After applying the appropriate filters discussed in Section 4.4, we obtain a final sample size of 1987 M&A transactions, with a total transaction value of roughly ZAR 835 billion.

The research conducted by Halfar (2011) proposed the exclusion of transactions that did not exceed 5% of the acquirer's market capitalisation at

the time of the transaction announcement. While this approach is more suited to a small sample size, we leveraged off this thinking to apply an additional quantitative filter to our data set, after applying the initial filtering criteria. For this reason, we only included transaction that exceeded 5% of the averaged annual market capitalisation, calculated individually for each of the years from 2000 to 2011. This resulted in the final sample size totalling 429 observations with a total transaction value of As discussed in Choi & Jeon (2011) the M&A activity data was aggregated on a quarterly basis to allow for statistical analysis against the selected macroeconomic variables.

4.4 Population of Relevance

The methodology for determining the population of relevance utilized a set of filtering criteria that provided a statistically significant and representative sample for both the frequency and deal size measure for aggregate merger activity. The population of relevance was obtained from the database of M&A transactions compiled by DealMakers for their review of merger activity in South Africa from 2000 to 2011. For the purposes of comparability, we excluded all transactions in the DealMakers Online database for the period Q1 – Q3 2012.

We utilized a combination of criteria specified by Halfar (2011) and Smit (2005) to select, from the DealMakers Online database, a population of relevance that excluded the following:

- Transactions concluded as part of a private equity deal were excluded from the population of relevance;
- Transactions concluded by unlisted, cash companies or foreign acquiring firms were excluded from the population of relevance;
- Broad Based Black Economic Empowerment transactions were excluded to remove the effect of transaction volumes that are primary driven by the South African legislative environment;
- All foreign and cross-border M&A transactions were excluded, as we expect these transaction not to be influenced by the macroeconomic

environment of South Africa;

- All transactions smaller than five million rand were excluded from the population of relevance.

We utilised the World Federation of Exchanges to source the data relating to the total market capitalisation at year-end and the total number of companies listed on the JSE at year-end. The average annual market capitalisation, calculated as the total market capitalisation at year-end divided by the total number of companies listed on the JSE at year-end. All M&A transactions that do not exceed the 5% average annual market capitalisation were excluded to leave a final sample size of 429 M&A transactions, valued at ZAR 719 billion. By applying this quantitative filter, we aimed to remove transactions that would normally be considered as opportunistic and counter-cyclical.

4.5 Data Collection Process

The data collection process for this research report utilised two primary sources of information. The aggregate merger activity data for entities listed on the JSE, namely, merger frequency and merger value, we sourced from the DealMakers Online database. All data related to the macroeconomic variables and JSE trading volumes were sourced from the i-Net Bridge online database. Data related to the overall market capitalisation and number of companies listed on the JSE, was sourced from the World Federation of Exchanges website.

4.6 Data Analysis Approach

4.6.1 Aggregate Merger Activity

As discussed in (Choi & Jeon, 2011), we utilised deal frequency and transaction value indicators to measure aggregate merger activity over the period of observation. This approach allowed for the investigation of information contained in the different measures of merger activity and enabled the analyses of robustness checks on the relationship between macroeconomic fundamentals and M&A activity. As proposed by Choi & Jeon (2011), we included a relative measure of aggregate merger activity, namely,

$Transaction\ Value\ /\ JSE\ All\ Share\ Trading\ Volumes$ to accommodate for a boom or crash in the stock market. Our view was that this relative measure would help differentiate the pre- and post- 2007 period marking the global liquidity crisis.

4.6.2 Macroeconomic Factors

We selected our macroeconomic factors based on a review of the research conducted by Choi & Jeon (2011) and Uddin & Boateng (2011) and included the following variables to conduct our analysis:

- *Gross Domestic Product* – GDP growth rate measured on a quarterly basis and expressed as a percentage;
- *Repurchase Rate* – As mandated by the South African Reserve Bank and expressed as a percentage;
- *Consumer Price Index* – Represents the CPI, aggregated on a quarterly basis, using 1981 as the base year;
- *Produced Price Index* - Producer Price Index for domestic output of South African industry groups, aggregate on a quarterly basis, utilising 2000 as the base year;
- *JSE All Share Index* – Based on the average closing value of the J203 (JSE All Share Index), aggregate on a quarterly basis;
- *All Bond Index (ALBI)* – Measured on a total return basis, on a quarterly basis, assuming that all distributions are reinvested
- *Currency Exchange Rate* – As tracked by the USD/ZAR exchange rate over the period 2000 – 2011;

4.6.3 Statistical Analysis

Intuitively and conceptually, the propositions and hypotheses of this research report are not difficult to appreciate. We however take a moment to discuss the rigour applied to the statistical methodology to ensure that the results obtained

from our analysis are reliable and robust. In this vein, we explore the mathematical intuition behind the unit root, ordinary least squares, cointegration and vector autoregressive tests conducted.

4.6.3.1 Unit Root Test

To determine whether or not two or more variables are cointegrated, it is necessary to first verify the order of integration of each variable by performing unit root tests. Choi & Jeon (2011) and Uddin & Boateng (2011) carried out the Augmented Dickey-Fuller (ADF) tests using the logarithms of the data series for each of the variables to ensure that the variables of a time series regression were non-stationary. The key challenge with non-stationary data being that it is unpredictable, cannot be modeled or forecasted and may spuriously indicate a relationship between two variables where one does not exist. (Koop, 2009)

We are able in most instances to transform the non-stationary data into stationary data, through the use of techniques such as logging, de-trending or differencing. These stationary processes have the favourable characteristics of constant long-term mean reversion and have constant variance independent of time. ((Koop, 2009). The variables used in our analysis applied the methodology utilised by Ho, Wei, & Wong (2005) to examine the stationary properties of the variables, by estimating the following equations for each of the variables:

$$\Delta X_t = \alpha_0 + \alpha_1 t + \beta_0 X_{t-1} + \sum_{i=1}^{k} \beta_i \Delta X_{t-i} + \eta_t$$

where **Δ** is the first difference operator, ***t*** is the time trend, ***k*** denotes the number of lags used and **η** is the error term; **α**'s and **β**'s are parameters. The null hypothesis that series X_t is non-stationary can be rejected if β_0 is statistically significant with negative sign. The optimal lag ***k*** was chosen carefully by using the Akaike Information Criterion (AIC).

4.6.3.2 Cointegration Tests

To analyse the hypothesised relationship between our selected macroeconomic variables and our aggregate merger activity measures we employed co-integration tests, Choi & Jeon (2011), Uddin & Boateng (2011) and Ho et al. (2005) to identify long-term equilibrium relations. We therefore conducted Granger causality tests to investigate the bivariate relationships between each of the macroeconomic variables and each of the alternate measures of merger activity. Koop (2009) shows that when estimating the regression model between two time series, ***X*** & ***Y***, which are assumed to have unit roots, the errors in the regression model given by $e_t = Y_t - \alpha - \beta X_t$. Koop (2009) further highlights the possibility that the unit roots in ***X*** & ***Y*** cancel each other out, making the resulting error term stationary.

According to Engle & Granger (1987), if two time series variables, $\mathbf{p_t}$ and $\mathbf{q_t}$, are both non-stationary in levels but stationary in first-differences, i.e., both are ***I*(1)**, then there could be a linear combination of $\mathbf{p_t}$ and $\mathbf{q_t}$, which is stationary, i.e., the linear combination of the two variables is ***I*(0)**. The two time series variables that satisfy this requirement are deemed to be co-integrated. The existence of co-integration implies that the two co-integrated time series variables must be drifting together at roughly the same rate (i.e., they are linked in a common long-run equilibrium). Ordinary Least Squares (OLS) estimations as specified by Choi & Jeon (2011) and Uddin & Boateng (2011) were utilised to identify structural changes in the macroeconomic environment and their impact on the stability of the regression coefficients.

4.7 Research Limitations

4.6.1 Aggregate Merger Activity Data

The 2000 to 2012 period of observation for the population (and ultimately the sample) is relatively short when compared with similar studies. While this time period was sufficient for understanding the short-term dynamic relationship between selected macro-economic variables and aggregate merger activity, we were not able to make inferences about long-term equilibrium relationships that

potentially could be present. This research did not distinguish between acquiring firm industry differences, since acquisitions in certain sectors may be value creating, whilst in other sectors be value-destroying.

By only utilising firms listed in the DealMakers Online database we are subject to the limitations in the completeness and accuracy of data presented in the database. This research did not investigate other characteristics of M&A transactions, ignored the differences between acquisitions aimed at horizontal diversification, vertical integration and deal specific characteristics (e.g. cash vs. share funded transactions). We also accepted the deal size information in the DealMakers Online database as being correct and did not cross-reference this with an independent source.

4.6.2 Determinants of Aggregate Merger Activity

This study is not exhaustive in its analysis of macroeconomic and market factors that may impact aggregate merger activity, resulting in a research outcome and conclusion that was limited by the metric definitions utilised. We have also limited this study to largely domestic factors and have not considered the impact of the international economy on aggregate merger activity in South Africa. A pertinent example of this would be to consider the amount of foreign direct investment flowing into South Africa over a period of time. While the quarterly data point for the macroeconomic variables are accepted, we could have applied a more sophisticated method, such as geometric means or weighted averages to aggregate the market data on a quarterly basis.

4.6.3 Statistical Techniques

In terms of the statistical methods utilised we felt we could have extended the unit root tests to include the Phillips–Perron unit root test in conjunction with the Augmented Dickey-Fuller (ADF) unit root test. The main advantage here being that the Phillips-Perron unit root test is non-parametric and does require you to select the level of serial correlation as with the ADF unit root test. (Koop, 2009) With the liquidity crisis in 2007, we could have utilised a statistical method as the Zivot-Andrew test to test for structural breaks in the data. (Koop, 2009)

In terms of the co-integration tests, we could have utilized additional methods such as the Johansen test, which allows for more than one cointegrating relationship, unlike the Engle-Granger method. (Koop, 2009) Further to this, tests such as the Phillips-Ouliaris cointegration test, allow for multicointegration, which not only extends the cointegration technique beyond two variables, but in certain instances allows for variables to be integrated at different orders. (Koop, 2009)

CHAPTER 5: DATA PRESENTATION

5.1 Description of Sample

The population consisted of all merger and acquisition transactions listed in the DealMakers Online database, for the period 2000 to 2011, totalling 6272 transactions to the value of ZAR 3,72 trillion. The final sample of 429 M&A transactions, with a value of ZAR 719 billion, was chosen after the application of qualitative and quantitative selection criteria as stated in Chapter 4, section 4.4. The selection criteria utilised was aimed at excluding all transactions where (1) the acquisition is considered as speculative or opportunistic in nature; (2) the acquirer was unlisted and (3) cross-border transactions that would not be impacted by the domestic macro-economic environment.

The total sample of 429 transactions were utilised in the investigation of each of the three hypotheses presented in Chapter 3. This was done to ensure that results obtained were not only statistically representative of the population, but also comparable across the three hypotheses being investigated. Table 5-1 provides a descriptive summary of the total sample selected for aggregate merger activity. Section 5.2 provides a detailed explanation of the descriptive statistics of the sample as they relate to aggregate merger activity and the hypotheses being tested.

Table 5-1: Summary of descriptive statistics for the selected sample

Statistic	Observed Value	Statistic	Observed Value
Population Size (#)	6272	**Sample Transaction Classification (#)**	
Population Value (R'm)	3 721 915	Acquisition by	389
		Merger of	10
Population Start Date	2000	Sale by	30
Population End Date	2011		
		Top Asset Type Acquired	
Sample Size (#)	429	Unlisted Entities (#)	169
Sample Value (R'm)	719 050	Value of Transactions (R'm)	194 909

5.2 Measures of Aggregate Merger Activity

5.2.1 Quarterly Deal Frequency

Taking a closer look at the frequency data for aggregate merger activity of the sample data, we present Table 5-2 as a summary of the frequency data over 2000 – 2011, aggregated on a quarterly basis.

Table 5-2: Summary of the quarterly frequency measure of merger activity

Quarterly M&A Transaction Frequency (2000 - 2011)										
Year	Quarter 1		Quarter 2		Quarter 3		Quarter 4		Total	
2000	17	22%	20	26%	21	27%	20	26%	78	18%
2001	10	14%	19	27%	20	28%	22	31%	71	17%
2002	8	14%	12	21%	24	41%	14	24%	58	14%
2003	6	14%	8	19%	11	26%	17	40%	42	10%
2004	5	22%	3	13%	4	17%	11	48%	23	5%
2005	3	17%	4	22%	4	22%	7	39%	18	4%
2006	5	19%	6	22%	6	22%	10	37%	27	6%
2007	8	27%	7	23%	8	27%	7	23%	30	7%
2008	9	36%	8	32%	5	20%	3	12%	25	6%
2009	6	33%	5	28%	3	17%	4	22%	18	4%
2010	2	14%	2	14%	3	21%	7	50%	14	3%
2011	10	40%	4	16%	6	24%	5	20%	25	6%
Total	89	21%	98	23%	115	27%	127	30%	429	100%

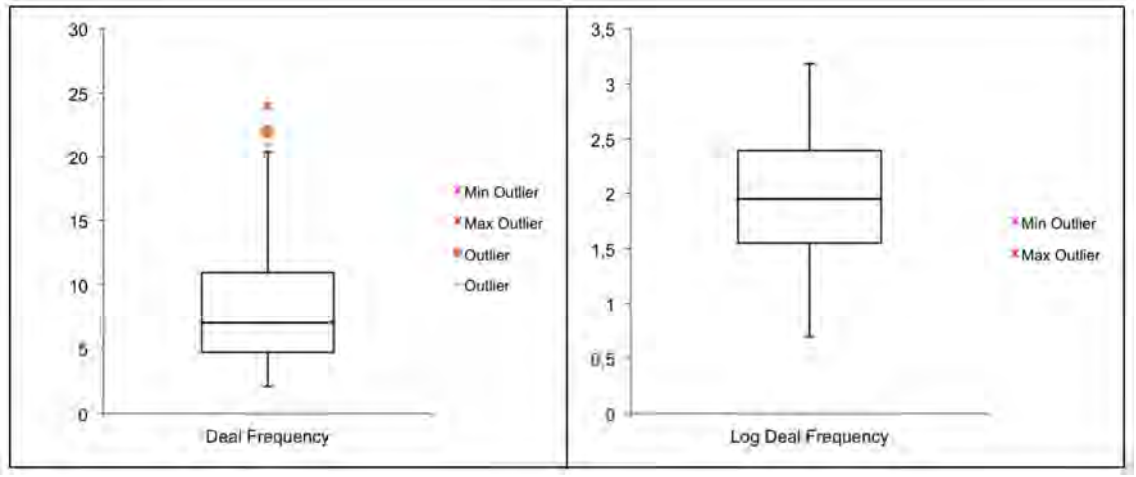
From Table 5-2 above we can see that 59% of M&A transactions occurred over the period 2000 to 2003, representing a total of 249 transactions. We also observe that the highest number of transactions was concluded in Q3 (27%) and Q4 (30%), representing a total of 242 transactions.

Table 5-3: Summary of descriptive statistics for the deal frequency measure for merger activity

Statistic	Observed Value	Statistic	Observed Value
Count	47	Range	22
Mean	8,77	Median	23
Maximum	24	Standard Deviation	6,001
Minimum	2		

In Table 5-3 above we summarise the key descriptive statistics for the deal frequency measure of aggregate merger activity. We note the large range of the data points, with the mean being 2,6 times smaller than the median.

Figure 5-1: Box and whisker plot - Quarterly deal frequency and the Log of quarterly deal frequency



In Figure 5-1, we observe three outliers in the box plot for quarterly deal frequency. Visual inspect of the deal frequency box plot and the standard deviation given in Table 5-3 confirms the low dispersion of data points. The box plot of the deal frequency data also confirms the positive skewness of the data due to the outliers. By taking the natural logarithm of the quarterly frequency data points, we "dampen" the influence of the outliers and effectively transform the data points so that they are more symmetrically distributed about the mean.

5.2.2 Quarterly Deal Value

A more summary of the deal value data over the period 2000 – 2011 has been represented in Table 5-4 below. An inspection of the data reveals that the sum of the deal values peaked over the period 2006 to 2007 and 2010 to 2011. On a percentage basis, this represented 51% of the total transactions or ZAR 371 billion in value, over the period 2000 to 2011. We also observe that the highest number of transactions was concluded in Q3 (27%) and Q4 (27%), representing a total transaction value of approximately ZAR 391 billion.

Table 5-4: Summary of the quarterly deal value measure of merger activity

Quarterly M&A Transaction Values (2000 - 2011)										
Year	Q 1 (R'm)		Q 2 (R'm)		Q 3 (R'm)		Q 4 (R'm)		Total (R'm)	
2000	9 599	18%	9 773	19%	12 118	23%	20 845	40%	52 335	7%
2001	2 568	9%	7 279	26%	10 640	37%	8 043	28%	28 531	4%
2002	20 865	43%	11 835	24%	11 247	23%	4 768	10%	48 715	7%
2003	2 696	7%	13 107	35%	3 343	9%	18 268	49%	37 414	5%
2004	3 858	17%	3 208	14%	1 999	9%	13 629	60%	22 695	3%
2005	3 893	7%	5 290	9%	41 541	72%	6 888	12%	57 613	8%
2006	6 951	7%	53 318	55%	21 737	22%	15 105	16%	97 111	14%
2007	17 351	19%	8 593	10%	42 257	47%	21 168	24%	89 369	12%
2008	7 965	14%	19 819	35%	25 371	45%	3 037	5%	56 192	8%
2009	25 452	57%	9 847	22%	5 373	12%	4 013	9%	44 685	6%
2010	30 211	41%	3 299	4%	9 748	13%	30 425	41%	73 684	10%
2011	43 363	39%	8 265	7%	11 700	11%	47 377	43%	110 706	15%
Total	**174 773**	**24%**	**153 634**	**21%**	**197 075**	**27%**	**193 567**	**27%**	**719 050**	100%

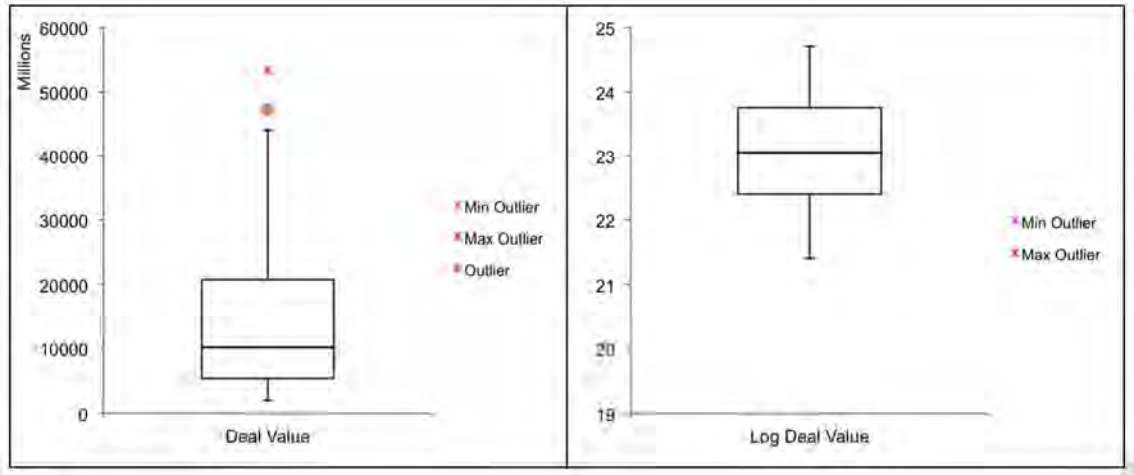
The key descriptive statistics for the deal value measure of merger activity is summarised in Table 5-5 below. A review of the table highlights the effect of relatively larger deals on the sample. This is further evidenced by the mean being 2,6 times bigger than the median and the fact that the 10 biggest deals represent 31% (or ZAR 221 billion) of the total value of deal in the sample.

Table 5-5: Summary of descriptive statistics for the deal value measure for merger activity

Statistic	Observed Value (R'm)	Statistic	Observed Value (R'm)
Largest Deal	40 057	Median	645
Smallest Deal	84	Range	39 973
Mean	1 676	Standard Deviation	3 959

In Figure 5-2 below we present the box and whisker plots for the quarterly deal value and the natural logarithm of the quarterly deal value. We observe two outliers in the quarterly deal value box plot and note the positively skewed distribution of the data points due to the large deal value. By way of example we see that 50% of the deal value is represented by only 28 deals. Taking the natural logarithm of the deal values, "dampen" the impact of the outliers and the resultant data points are more symmetrically distributed about the mean.

Figure 5-2: Box and whisker plot - Quarterly deal value and the Log of quarterly deal value



5.2.3 Relative Transaction Value

Lastly, we measure merger activity as the ratio of the quarterly deal value over the JSE All Share Index at the end of the same quarter. We present the summary of the data in Table 5-6 below.

Table 5-6: Summary of the quarterly relative deal value measure of merger activity

Quarterly M&A Transactions - Relative Deal Value (2000 - 2011)										
Year	**Q 1 (R'm)**		**Q 2 (R'm)**		**Q 3 (R'm)**		**Q 4 (R'm)**		**Total (R'm)**	
2000	1,17	18%	1,33	20%	1,51	23%	2,60	39%	6,61	16%
2001	0,29	9%	0,81	25%	1,25	39%	0,88	27%	3,24	8%
2002	1,93	42%	1,05	23%	1,16	25%	0,50	11%	4,64	11%
2003	0,31	7%	1,60	39%	0,37	9%	1,88	45%	4,16	10%
2004	0,36	18%	0,31	16%	0,19	9%	1,12	57%	1,98	5%
2005	0,30	8%	0,39	10%	2,68	71%	0,41	11%	3,78	9%
2006	0,36	8%	2,59	56%	1,02	22%	0,64	14%	4,61	11%
2007	0,67	21%	0,30	10%	1,48	47%	0,70	22%	3,16	7%
2008	0,28	14%	0,63	31%	0,95	47%	0,15	7%	2,00	5%
2009	1,25	60%	0,45	22%	0,22	11%	0,15	7%	2,08	5%
2010	1,10	43%	0,12	5%	0,35	14%	0,98	39%	2,55	6%
2011	1,35	39%	0,26	7%	0,38	11%	1,49	43%	3,49	8%
Total	**9,37**	**22%**	**9,85**	**23%**	**11,56**	**27%**	**11,50**	**27%**	**42,29**	100%

We observe from Table 5-6 above that the transaction values peaked in 2000, followed by period 2002 to 2003 and lastly 2005 to 2006. These periods, combined, represent 57% of the total transactions over the period 2000 to 2011. It is interesting to observe how the relative deal value measure has shifted the periods of aggregate merger activity represented in Table 5-4 and this will be discussed further in Section 5.5 below.

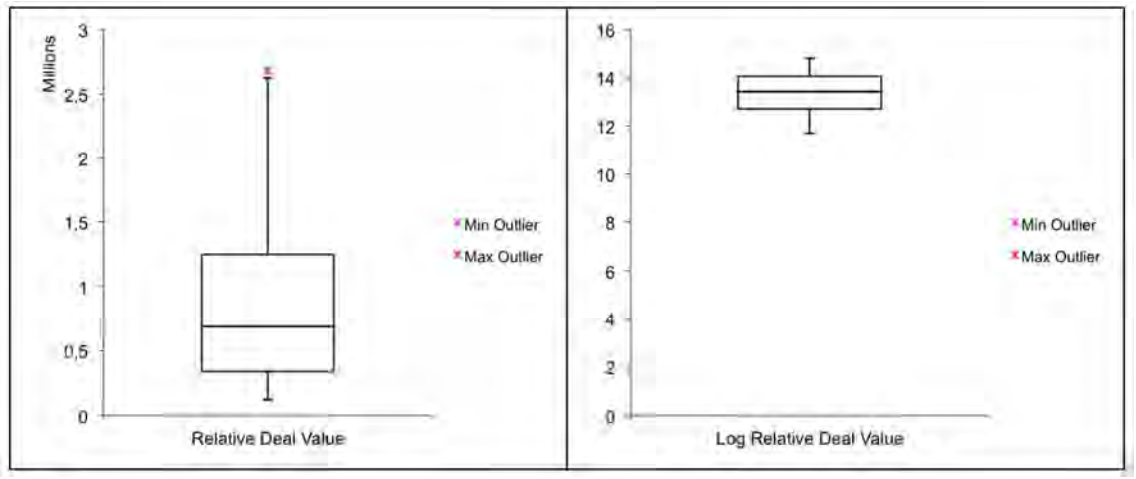
The key descriptive statistics are presented in Table 5-7 and we observe the range between the largest and smallest relative deal sizes. We do also note that the transformed data is much less impacted by the large deals discussed in Table 5-5. The transformed data is also more evenly distributed across the time series, with a 58% to 42% split in transactions in the first- and last- half of the period 2000 to 2011 respectively.

Table 5-7: Summary of descriptive statistics for the relative deal value measure for merger activity

Statistic	Observed Value (R'000)	Statistic	Observed Value (R'000)
Largest Deal	2 682,51	Median	675
Smallest Deal	118,70	Range	2 564
Mean	875,01	Standard Deviation	678

A review of the box plots for the relative deal value measure in Figure 5-3 shows the occurrence of one outlier, which has resulted in the data points being positively skewed. By taking the natural logarithm of the relative deal value measure again allows us to “dampen” the effective of the outlier and significantly reduces the standard deviation of the transformed data. The split of transactions across the two halves of the time series, namely, from 2000 to 2005 and from 2006 to 2011, has also improved to a ratio of 51% 49% respectively.

Figure 5-3: Box and whisker plot - Quarterly relative deal value and the Log of quarterly relative deal value



5.2.4 Time Series Observations

We plot the data points for the deal frequency and deal value measures of merger activity in Figure 5-4 below to graphically represent the structure of the time series for both variables. Using the credit crisis on 2007 as a point of reference, we observe that pre-2007, the frequency of M&A transactions were relatively higher than those post-2007. We also observe that pre-2007 the quarterly transaction values were relatively smaller than aggregate transaction values post-2007.

Combining these two observations, we see that pre-2007 was characterised by relatively smaller deals with high deal frequency, while post-2007 was characterised by relatively larger deals with lower deal frequency. In the post-2007 economic climate, anecdotal evidence suggest that this structural change could have been driven by factors such as liquidity constraints, regulatory scrutiny and the decline of managerial hubris.

In Figure 5-5 we utilise take the ratio of quarterly deal value over the closing value of the JSE All Share Index for the same quarter. For the relative transaction value measure we observe that pre-2007 transaction values were relatively larger than what they were post-2007. As before, our observation for the quarterly transaction value pre- and post- 2007 remains the same.

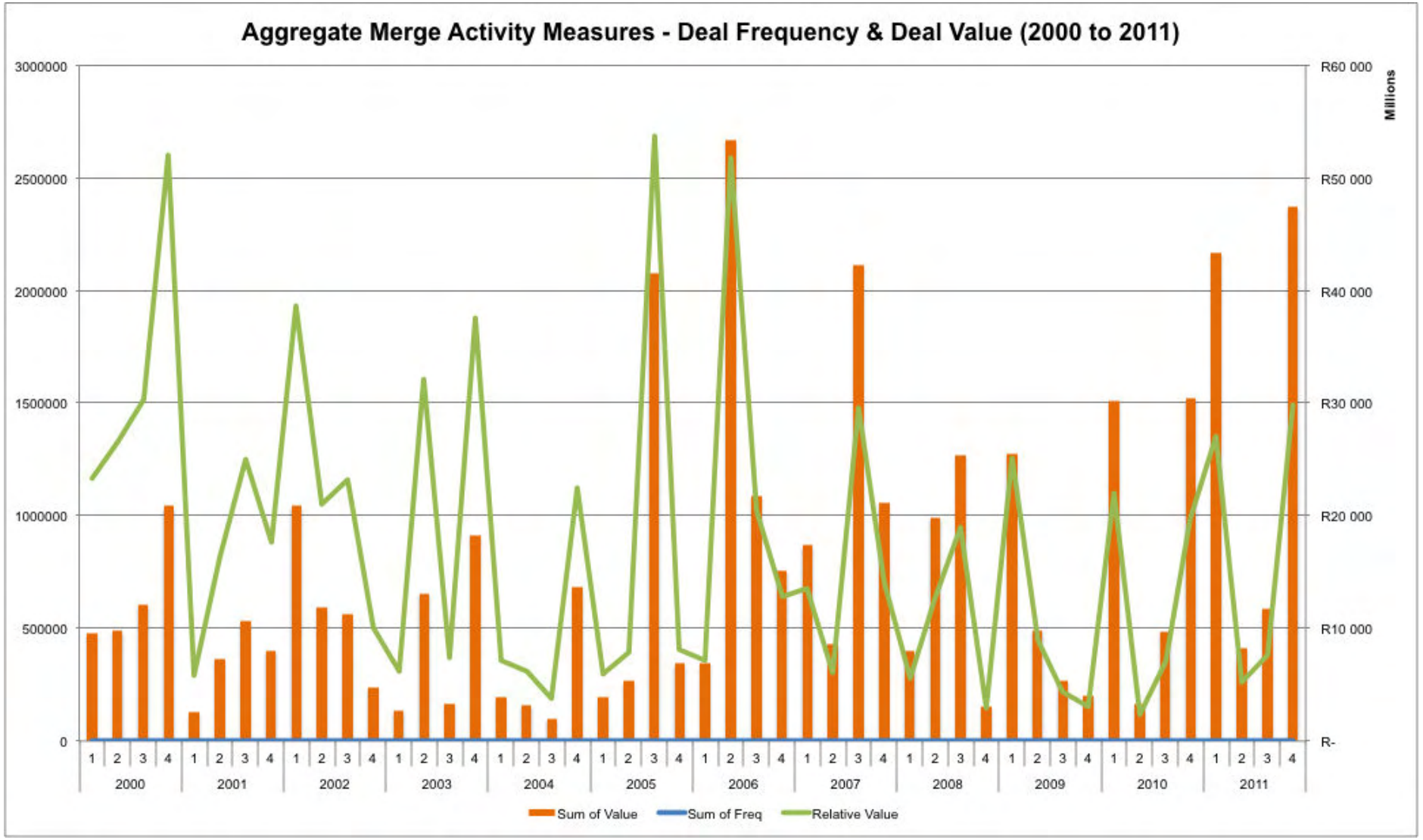


Figure 5-4: Quarterly Deal Frequency and Quarterly Deal Value over the period 2000 to 2011

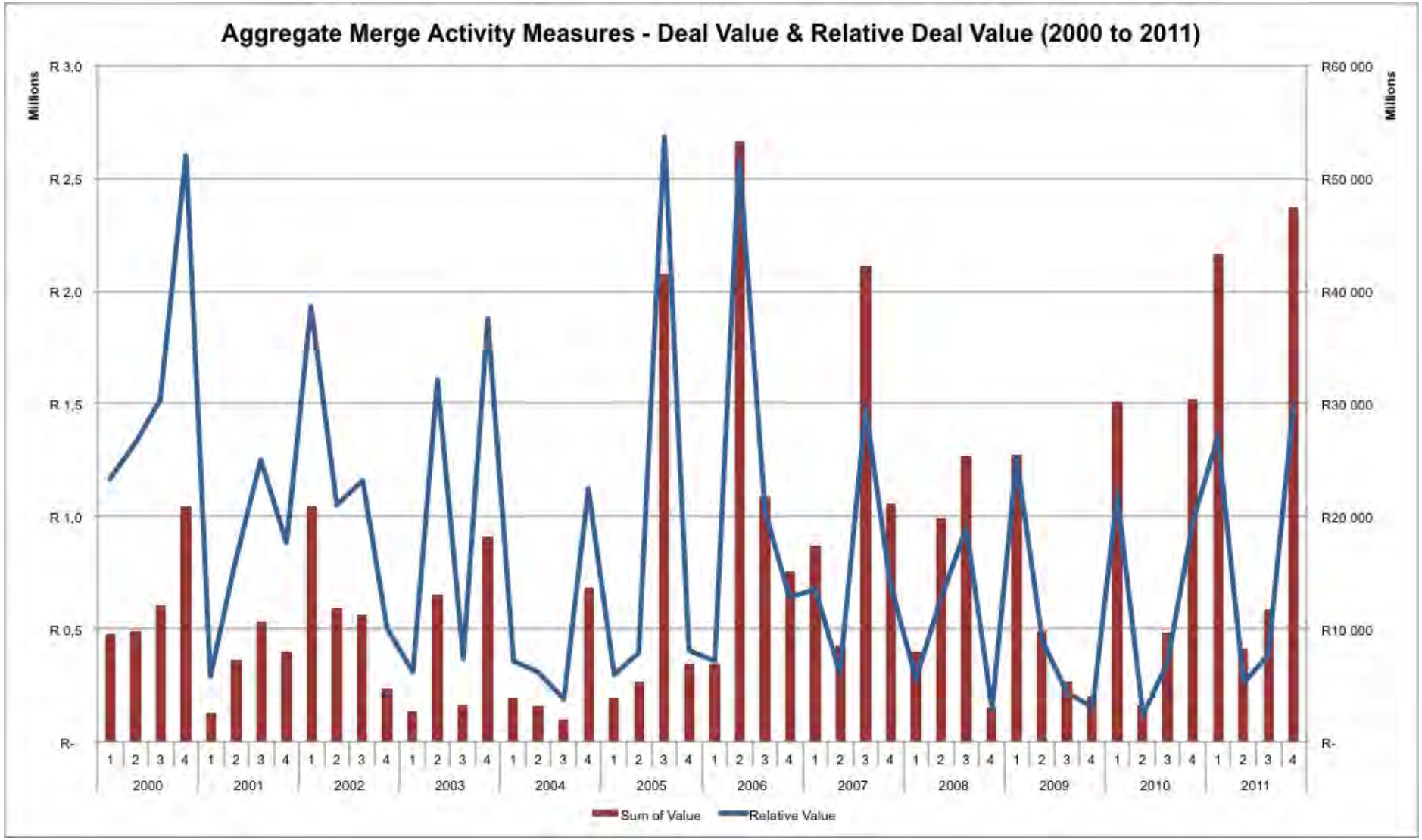


Figure 5-5: Quarterly Deal Value and Quarterly Relative Deal Value over the period 2000 to 2011

Combining these observations allows us to appreciate the normalising effect of the relative measure that catered for the boom and bust cycles pre- and post-2007 respectively.

5.3 Determinants of Aggregate Merger Activity

5.3.1 Macroeconomic Factors

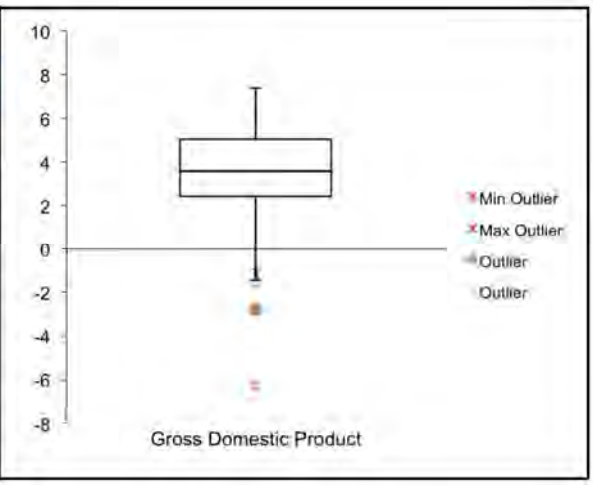
The macroeconomic factors selected for our analysis is informed by the work of Choi & Jeon (2011) and Uddin & Boateng (2011), but in certain instances had to be customised to our domestic South African economy. Example of this include substituting the S&P 500 Index, effective Fed fund rate and the 10-year Treasury bond rate, for their equivalent counterpart in South Africa. In this section we presented the summarised data and descriptive statistics for the macroeconomic factors we have utilised.

5.3.1.1 Gross Domestic Product (GDP)

The South African Reserve Bank (SARB) defines GDP as *"…the total value of all final goods and services produced within the boundaries of a country in a particular period. this definition has four important elements: "total value", "final goods and services", "within the boundaries of the country" and "in a particular period"."*

Figure 5-6: Descriptive statistics and box plot – Quarterly gross domestic product

Quarterly Gross Domestic Product Data	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	3,51
Mode	3,10
Median	3,60
Upper Limit	7,40
Lower Limit	-6,30
Range	13,70
Standard Deviation	2,52



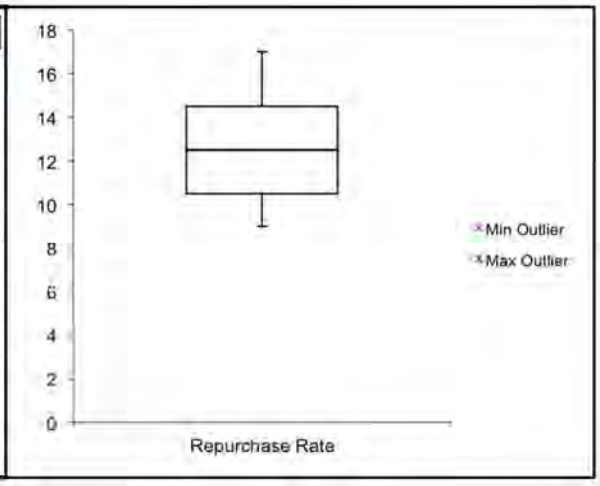
The three outliers observed in the box plot of Figure 5-6, corresponds to the period Q1 to Q3 2009 when the South African economy was in recession after recording two consecutive periods of negative growth.

5.3.1.2 Repurchase Rate

The SARB defines the repurchase rate as *"…The repo rate, the price at which the central bank lends cash to the banking system"*. We present the descriptive statistics and box plot for the repurchase rate macroeconomic factor in Figure 5-7 below. With no outliers present in the data, we also observe that the data is symmetrically distributed about the mean.

Figure 5-7: Descriptive statistics and box plot – Quarterly repurchase rate

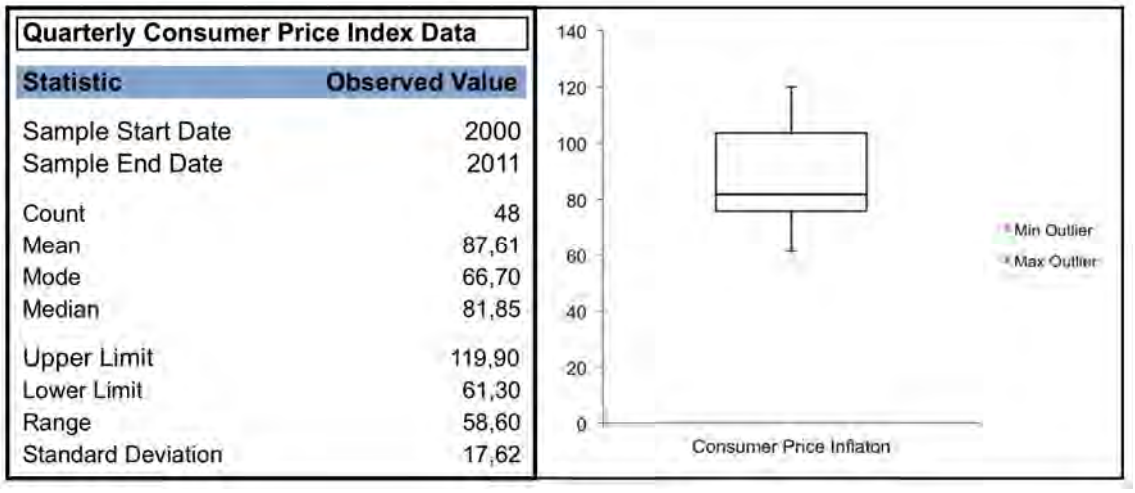
Quarterly Repurchase Rate Data	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	12,53
Mode	14,50
Median	12,50
Upper Limit	17,00
Lower Limit	9,00
Range	8,00
Standard Deviation	2,38



5.3.1.3 Consumer Price Index (CPI)

Statistics SA defines CPI as a measure that *"…reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals"*. Figure 5-8 provides a summary of the descriptive statistics and box plot for the consumer price index macroeconomic factor. As evidenced in the box plot, no outliers were observed from this set of data.

Figure 5-8: Descriptive statistics and box plot – Quarterly consumer price index

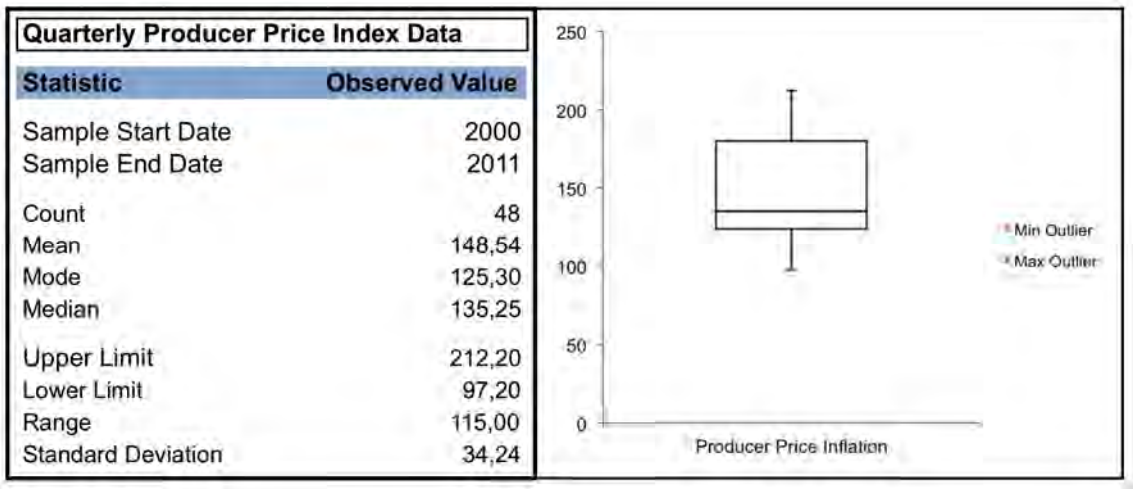


Quarterly Consumer Price Index Data	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	87,61
Mode	66,70
Median	81,85
Upper Limit	119,90
Lower Limit	61,30
Range	58,60
Standard Deviation	17,62

5.3.1.4 Producer Price Index (PPI)

Statistics SA defines PPI as *"…the cost of a 'shopping basket' of goods of a typical South African producer of commodities."* Figure 5-9 proves a summary of the descriptive statistics and box plot for the producer price index macroeconomic factor. No outliers were observed, but we do note the similarity in the distribution of the data for CPI and PPI. We also note that no additional transformation of the data for CPI and PPI are required.

Figure 5-9: Descriptive statistics and box plot – Quarterly producer price index



Quarterly Producer Price Index Data	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	148,54
Mode	125,30
Median	135,25
Upper Limit	212,20
Lower Limit	97,20
Range	115,00
Standard Deviation	34,24

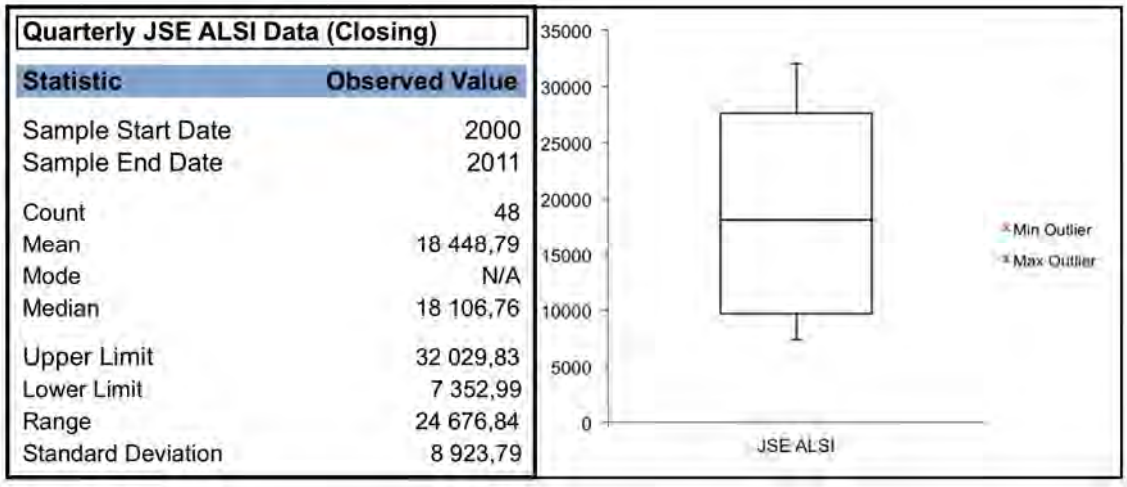
5.3.2 Market Factors

A common thread through the literature we have reviewed on the determinants for aggregate merger activity highlights the need to look beyond macroeconomic variables to better understand the potential drivers of this activity. Melicher, Ledolter, & D'Antonio (1983), Nieh (2003) and Bhattacharjee et al. (2009) all found that market factors such as share prices, indices and bond yields played a significant role in understanding aggregate merger activity across various geographies. While our list of market factors is not exhaustive, we have chosen factors that will be representative of market conditions at a point in time.

5.3.2.1 JSE All Share Index (ALSI)

The Johannesburg Stock Exchange defines their All Share Index as "…the weighted average rate of return of all the shares listed on the JSE." An interesting observation on the makeup of the index is that it is skewed in favour of stocks in the mining and commodity sectors as this equates to roughly 40% of the market cap of the JSE. We present the descriptive statistics and box plot for the JSE All Share Index data in Figure 5-10. The recorded data points represent the closing value of the index on the last business day of the quarter over the period 2000 to 2011.

Figure 5-10: Descriptive statistics and box plot – Quarterly JSE All Share Index



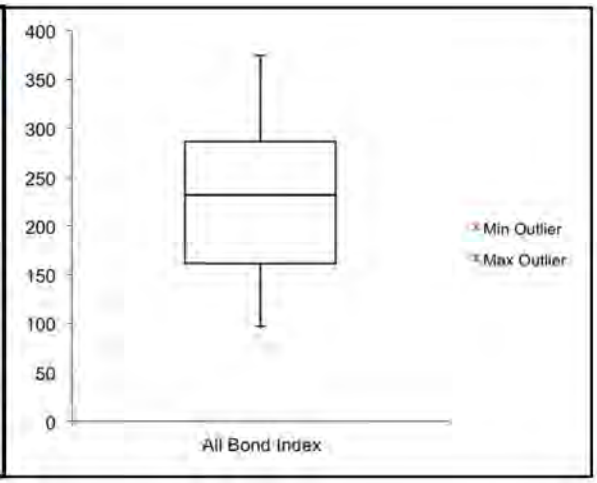
Quarterly JSE ALSI Data (Closing)	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	18 448,79
Mode	N/A
Median	18 106,76
Upper Limit	32 029,83
Lower Limit	7 352,99
Range	24 676,84
Standard Deviation	8 923,79

5.3.2.2 All Bond Index (ALBI)

The All Bond Index, or ALBI, consisting of the top 20 listed bonds, ranked by market capitalization and liquidity. As with the JSE ALSI data, we take the value of the ALBI on the last business day of respective quarter. Based on the descriptive statistics and box plot in Figure 5-11 we can see that no outliers were observed and the data is symmetrically distributed, requiring no further transformations.

Figure 5-11: Descriptive statistics and box plot – Quarterly All Bond Index

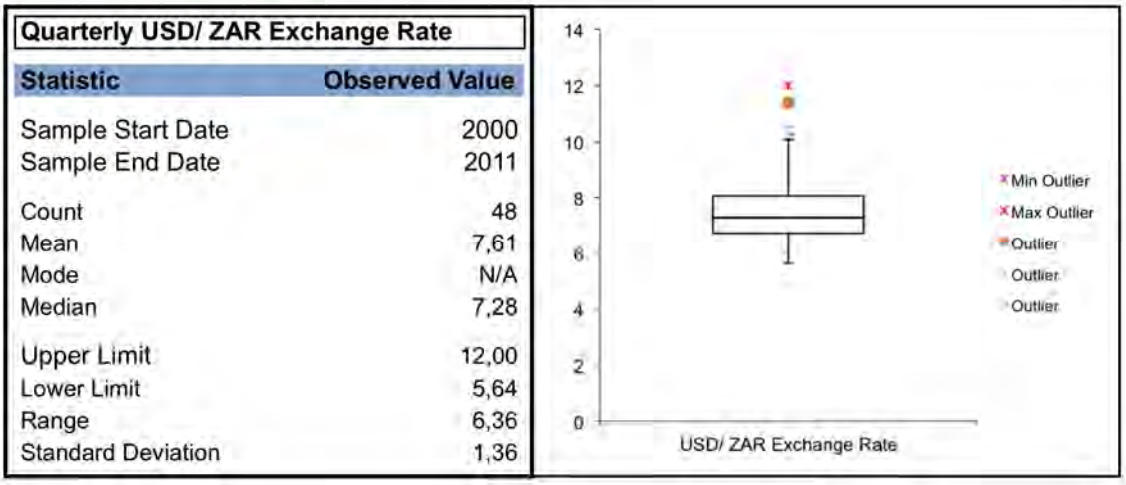
Quarterly All Bond Index Data (Closing)	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	225,30
Mode	N/A
Median	232,31
Upper Limit	374,07
Lower Limit	97,00
Range	277,07
Standard Deviation	77,40



5.3.2.3 USD/ ZAR Foreign Exchange Rate

Our final market factor analysed in this research report is the USD/ ZAR foreign exchange rate. All data points represent the exchange rate on the final business day of the quarter being measured. We present the descriptive statistics and box plot in Figure 5-12 below, noting a number of outliers for this data set. Further analysis of the data reveals that these outliers fall in the period Q4 2001 to Q3 2002. This period corresponds with the 2001 ZAR currency crisis, which some say were caused by the lloosening of restrictions on capital movements by residents and foreigners.

Figure 5-12: Descriptive statistics and box plot – Quarterly USD/ ZAR Exchange Rate



Quarterly USD/ ZAR Exchange Rate	
Statistic	**Observed Value**
Sample Start Date	2000
Sample End Date	2011
Count	48
Mean	7,61
Mode	N/A
Median	7,28
Upper Limit	12,00
Lower Limit	5,64
Range	6,36
Standard Deviation	1,36

5.4 Determinants of Aggregate Merger Activity – Time Series Graphs

We use Figures 5-13 and 5-14 to graphically represent the time series for our macroeconomic and market factors over the period 2000 to 2011. Whilst the linear correlation amongst our chosen factors will be discussed in more detail in Section 5.5, we use this opportunity to visually inspect and comment on the observed relationship between the factors.

Our first observation from Figure 3-13 is that CPI and PPI track each other, on average, along a parallel path. We note however that since 2006, PPI has shown more variation than CPI and seems to be sloping upwards, away from the CPI line, indicating a higher than usual increase in cost of manufactured goods and services. We speculate that this could be caused by increases in the cost of energy and higher wage demands by employees. While there is no observable trend between CPI/ PPI and GDP or the Repo Rate, we will discuss the correlation coefficients in more detail in Section 5-5.

Reviewing the time series plots for GDP and the Repo Rate in Figure 5-14, we observe that in periods were the GDP is relatively high; the Repo Rate is relatively low. The opposite is also true, and is sharply depicted in Q4 2002 and Q4 2008. While this relationship may be countercyclical, we strongly suspect

that it is more related to the Repo Rate being used as a monetary policy control measure and it's lagged effect on GDP.

Figure 5-14 shows the time series of quarterly data plots for the JSE All Share Index and the All Bond Index over the period 2000 to 2011. Both time series graphs look to be trending upwards over time. We do however note that while the All Bond Index has followed a steady trend upwards, with very little volatility (as measured by the standard deviation), the JSE All Share Index has experienced relatively more variation and was adversely impacted by the credit crisis in 2007/ 2008.

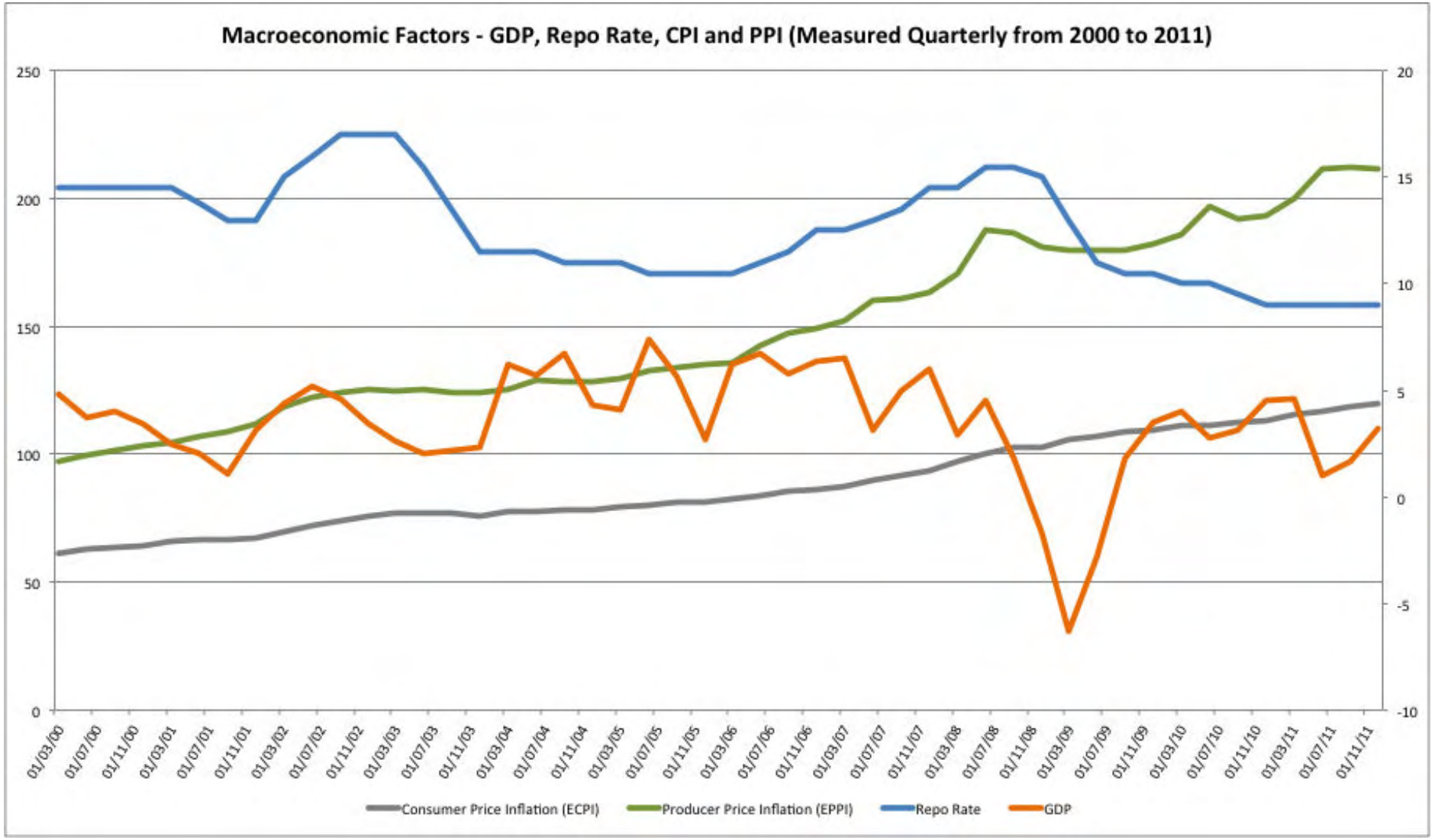


Figure 5-13: Macroeconomic Factors – Quarterly GDP, CPI, PPI and Repo Rate Data (2000 to 2011)

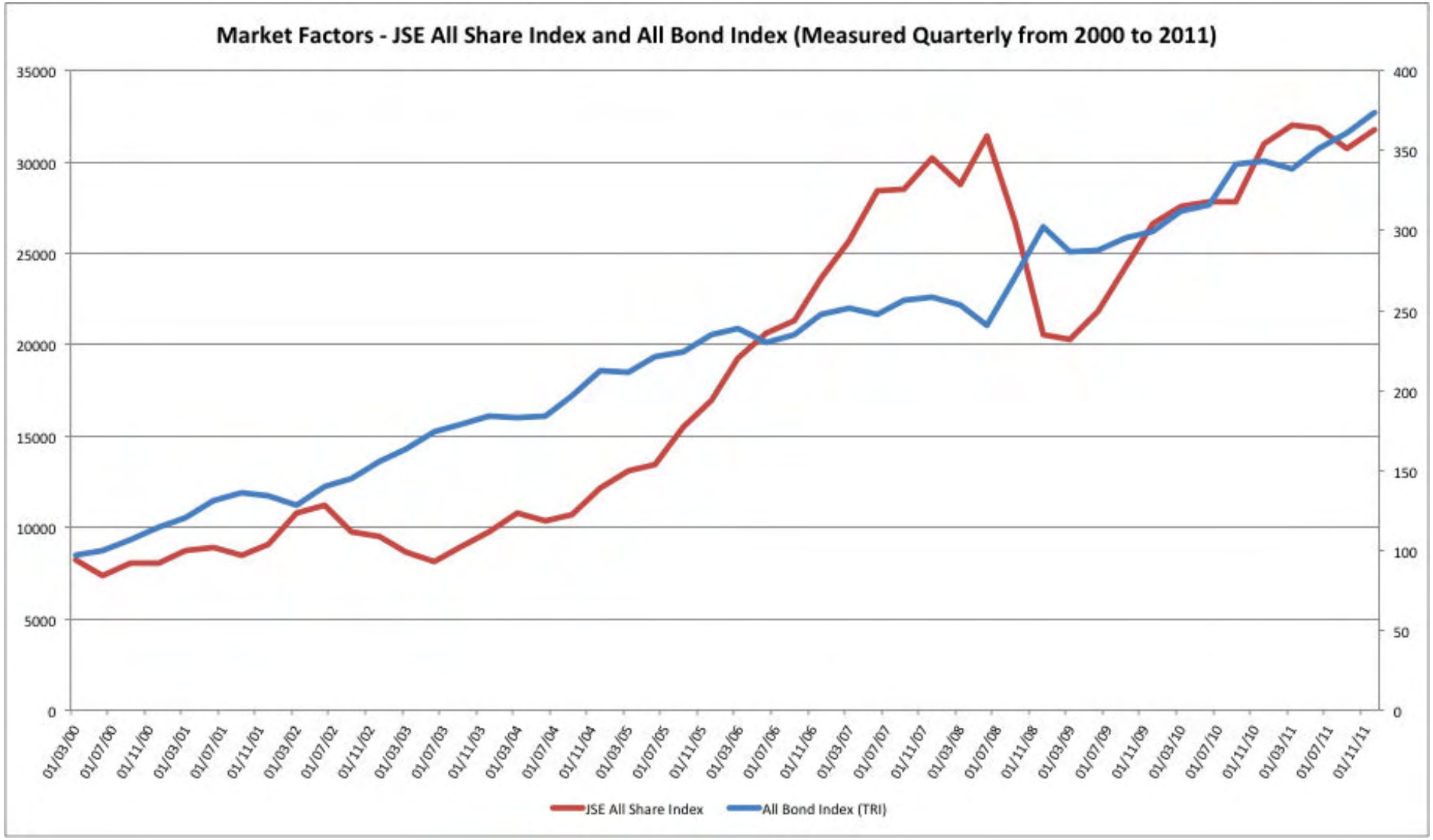


Figure 5-14: Market Factors – Quarterly JSE All Share Index and All Bond Index (2000 to 2011)

5.5 Determinants of Aggregate Merger Activity – Pearson Correlation Coefficients

We conducted the Pearson Correlation test to calculate the correlation coefficients between our macroeconomic and market factors. Our key assumption in utilising this test is that we have parametric data, which is normally distributed about a mean. (Koop, 2009) Our choice in using this assumption is informed by the analysis of, and where applicable, transformations on the underlying data presented in Chapter 5. We also acknowledge that the use of the Pearson Correlation test exclusively limits us to understanding the strength of the linear relationship between our selected factors.

We present the complete list of correlation coefficients conducted on the macroeconomic and market factor in Table 5-8 below, and highlight some of the significantly correlated factors. As observed in Section 5.4 the highest positive correlation value of *0,9913* is if for the CPI and PPI factors. More significantly, we see that the macroeconomic factor of CPI and PPI have a strong positive correlation to the JSE All Share Index and the All Bond Index. We note that CPI has a strongest positive correlation to the All Bond Index, with a value of *0,97201*, implying that for every one unit movement in CPI, there is a *0,97201* movement, in the All Bond Index. We observe that PPI has a strongest positive correlation to the JSE All Share Index, with a value of *0,92437*, implying that for every one unit move in PPI, there is a *0,92437* movement in the JSE All Share Index.

GDP as a macroeconomic factor generally show to have a negative, weakly correlated relationship with most of the chosen factors. This result is counter to the finding presented by Choi & Jeon (2011), who found GDP to be positive, weekly correlated to the selected macroeconomic and M&A activity measures. We also note that the Repo Rate is negative correlated to CPI and PPI, with values of *-0,56385* and *-0,51248* respectively, but shows a positive correlation to the USD/ZAR foreign exchange rate factor, with a reported value of *0,47887*.

From a market factor perspective we see that the JSE All Share Index and All Bond Index have a positive correlation value of *0,89797*, which was expected based on the time series graph presented in Figure 5-14. The strongest negative correlation is between the All Bond Index and the Repo Rate with a value of *-0,66608*.

		USD/ZAR Exchange Rate	*All Bond Index (TRI)*	*JSE All Share Index*	*Repo Rate*	*Consumer Price Inflation (ECPI)*	*Producer Price Inflation (EPPI)*	*GDP*
USD/ZAR Exchange Rate	**Pearson Correlation Coefficient**	*1,000*						
	R Standard Error							
	t							
	p-value							
	H0 (2%)							
All Bond Index (TRI)	**Pearson Correlation Coefficient**	*-0,215*	*1,000*					
	R Standard Error	*0,021*						
	t	*-1,494*						
	p-value	*0,142*						
	H0 (2%)	*accepted*						
JSE All Share Index	**Pearson Correlation Coefficient**	*-0,158*	*0,898*	*1,000*				
	R Standard Error	*0,021*	*0,004*					
	t	*-1,087*	*13,840*					
	p-value	*0,283*	*0,000*					
	H0 (2%)	*accepted*	*rejected*					
Repo Rate	**Pearson Correlation Coefficient**	*0,479*	*-0,666*	*-0,475*	*1,000*			
	R Standard Error	*0,017*	*0,012*	*0,017*				
	t	*3,700*	*-6,057*	*-3,662*				
	p-value	*0,001*	*0,000*	*0,001*				
	H0 (2%)	*rejected*	*rejected*	*rejected*				
Consumer Price Inflation (ECPI)	**Pearson Correlation Coefficient**	*-0,105*	*0,972*	*0,898*	*-0,564*	*1,000*		
	R Standard Error	*0,021*	*0,001*	*0,004*	*0,015*			
	t	*-0,719*	*28,062*	*13,816*	*-4,631*			
	p-value	*0,476*	*0,000*	*0,000*	*0,000*			
	H0 (2%)	*accepted*	*rejected*	*rejected*	*rejected*			
Producer Price Inflation (EPPI)	**Pearson Correlation Coefficient**	*-0,067*	*0,962*	*0,924*	*-0,512*	*0,991*	*1,000*	
	R Standard Error	*0,022*	*0,002*	*0,003*	*0,016*	*0,000*		
	t	*-0,459*	*23,972*	*16,433*	*-4,048*	*51,067*		
	p-value	*0,649*	*0,000*	*0,000*	*0,000*	*0,000*		
	H0 (2%)	*accepted*	*rejected*	*rejected*	*rejected*	*rejected*		
GDP	**Pearson Correlation Coefficient**	*-0,344*	*-0,201*	*-0,054*	*-0,084*	*-0,295*	*-0,275*	*1,000*
	R Standard Error	*0,019*	*0,021*	*0,022*	*0,022*	*0,020*	*0,020*	
	t	*-2,487*	*-1,390*	*-0,368*	*-0,573*	*-2,097*	*-1,941*	
	p-value	*0,017*	*0,171*	*0,715*	*0,569*	*0,042*	*0,058*	
	H0 (2%)	*rejected*	*accepted*	*accepted*	*accepted*	*accepted*	*accepted*	

Table 5-8: Pearson Correlation Co-Efficients – Determinants of Aggregate Merger Activity

CHAPTER 6: DISCUSSION OF RESULTS

In this Chapter we apply the statistical techniques utilised by Choi & Jeon (2011) and Uddin & Boateng (2011) to examine the hypothesised relationship between our selected macroeconomic and market factors, and our measures of aggregate merger activity. For each of the hypothesis we discuss the results of the unit root tests, present the OLS regression model and conclude with the Granger Causality results for the relevant aggregate merger activity measure.

6.1 Augmented Dickey-Fuller unit root tests

We used the Augmented Dickey-Fuller (ADF) unit root test on all our variables to test for the stationarity. Through our review of the literature, we found that the ADF unit root test were utilised by Choi & Jeon (2011), Ho et al. (2005), Liu (2004), Nakamura (2004), Nieh (2003) and Uddin & Boateng (2011). We chose this rigorous approach to ensure we can apply the usual parametric assumptions to our analysis. With this in place we can that our time series' are stationary, and have the property that the mean, variance and autocorrelation structures do not change over time. Non-stationary data does not confirm to the above assumption, meaning that the results can be spurious. This implies that the t-tests or the F-test results obtained from the OLS may not give the true values.

Utilising the built-in Augmented Dickey-Fuller (ADF) test procedure of the eViews software tool, we test the $\mathbf{H_0}$ that there is unit root present in the data series. Under each unit root test table there are mainly two columns, showing the ADF test statistic (on the left of the table) and the, critical values at 1%, 5% and 10% respectively. In layman's terms, if the ADF test statistic is more negative than the critical value, we reject the null that there is unit root present in the data. On the other hand, if the ADF test statistic is less negative than the critical value, we cannot reject the null.

6.1.1 Aggregate Merger Activity

6.1.2.1 Quarterly Deal Frequency

We show unit root test output for the deal frequency measure and the first differenced frequency measure in Table 6-1 below. Interpreting the results of "FREQ" table we observer that the ADF test statistic is -3.21, which is less negative than the 1% critical value of -3.5778. We thus cannot reject the null, concluding that there is unit root present in the series.

We proceed to take the first difference of the series and present the results in the "DFREQ". For the first differenced series we see that the ADF statistic is -6.90, which is more negative than the 1% critical value -3.5814. We thus reject the null that there is unit root present in the series, concluding that the differenced frequency series is stationary.

Table 6-1: Quarterly Deal Frequency – Unit root test results

Augmented Dickey-Fuller Unit Root Test on FREQ			
ADF Test Statistic	-2.987637	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			

Augmented Dickey-Fuller Unit Root Test on D(FREQ)			
ADF Test Statistic	-8.376092	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.2.2 Quarterly Deal Value

The ADF results presented in Table 6-2 for shows the series are stationary for both the deal value measure and the log transformed deal value measure. in both instances the null hypothesis for the "SUM_OF_VALUE" and "LOG_SUMOFVALUE" is not accepted at the 1% level, we log transform the deal value data to linearize and stabilise the data. The log transformation also removes the effect of the outliers in the data series.

Table 6-2: Quarterly Deal Frequency – Unit root test results

Augmented Dickey-Fuller Unit Root Test on SUM_OF_VALUE			
ADF Test Statistic	-5.625918	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			

Augmented Dickey-Fuller Unit Root Test on LOG_SUMOFVALUE			
ADF Test Statistic	-5.526456	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.2.3 Quarterly Relative Deal Value

For the relative deal value measure, which is the ratio of the deal value over the quarterly closing value of JSE All Share Index, we present the ADF unit root test statistics in Table 6-3 below. As with the deal value measure, even though we do not accept the null hypothesis (at the 1% level) that there is unit root present, we log transform the relative deal value measure to linearize and stabilise the data. We also see from the box plot in Figure 5-3 that the data is distributed more symmetrically about it's mean.

Table 6-3: Quarterly Relative Deal Value – Unit root test results

Augmented Dickey-Fuller Unit Root Test on RELATIVEMEASURE			
ADF Test Statistic	-5.149676	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on LOGRELMEAS			
ADF Test Statistic	-4.925849	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.2 Macroeconomic Determinants

6.1.2.1 Quarterly Gross Domestic Product

We calculate the ADF unit root test statistic in Table 6-4, noting that the "GDP" data series cannot reject the null hypothesis at the 1% level that unit root is present. For this reason we take the first difference of the series and after calculating the ADF test statistic (see the "DGDP" table), we cannot accept the null hypothesis that a unit root is present in the data series.

Table 6-4: Gross Domestic Product – Unit root test results

Augmented Dickey-Fuller Unit Root Test on GDP			
ADF Test Statistic	-3.346630	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DGDP			
ADF Test Statistic	-6.043560	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.2.2 Quarterly Repurchase Rate

For the repurchase rate we calculate the ADF test statistic for the "REPO" and first differenced "DREPO" data series', and do not reject the null hypothesis that a unit root is present in these two data series. In this instances we therefore calculate the second differenced data series labelled "DDREPO" and successfully create a lagged series that does not have a unit root present.

Table 6-5: Repurchase Rate – Unit root test results

Augmented Dickey-Fuller Unit Root Test on REPO			
ADF Test Statistic	-2.273237	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DREPO			
ADF Test Statistic	-3.432283	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DDREPO			
ADF Test Statistic	-4.896595	1% Critical Value*	-3.5850
		5% Critical Value	-2.9286
		10% Critical Value	-2.6021
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.2.3 Consumer Price Index

As with the Repurchase Rate macroeconomic variable we have had to calculate the first and second differences series for the Consumer Price Index data. The results for the calculated ADF test statistics are presented in Table 6-7 below, showing that the existence of unit root for both the "ECPI" and the "DECPI" data series. By calculating the second differenced data series, labelled, DDEPI, we were able to produce a lagged data series that did not have unit root present.

Table 6-6: Consumer Price Index – Unit root test results

Augmented Dickey-Fuller Unit Root Test on ECPI			
ADF Test Statistic	1.087076	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DECPI			
ADF Test Statistic	-2.897969	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DDECPI			
ADF Test Statistic	-5.979415	1% Critical Value*	-3.5850
		5% Critical Value	-2.9286
		10% Critical Value	-2.6021
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.2.4 Quarterly Producer Price Index

We calculate the ADF test statistic for the PPI data series and the first differenced series (DEPPI), as we observe a unit root present in the "EPPI" data series. Our results are presented in Table 6-6 below.

Table 6-7: Consumer Price Index – Unit root test results

Augmented Dickey-Fuller Unit Root Test on EPPI			
ADF Test Statistic	0.163367	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DEPPI			
ADF Test Statistic	-5.721370	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.3 Market Determinants

6.1.3.1 Quarterly All Bond Index

We tested the All Bond Index market determinant utilising the ADF unit root test and could not reject the null hypothesis that unit root was present in the data series. For this reason we first differenced the All Bond Index data and found a lagged series that is stationary. The results are presented in the "SALLBONDINDEX" section of Table 6-8 below.

Table 6-8: All Bond Index (ALBI) – Unit root test results

Augmented Dickey-Fuller Unit Root Test on ALLBONDINDEX			
ADF Test Statistic	0.171446	1% Critical Value*	-3.5778
		5% Critical Value	-2.9256
		10% Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.			
Augmented Dickey-Fuller Unit Root Test on DALLBONDINDEX			
ADF Test Statistic	-7.552751	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.			

6.1.3.2 Quarterly USD/ ZAR Foreign Exchange Rate

For the USD/ZAR foreign exchange rate we again calculated the ADF unit root test statistic for the "EXCHANGERATE" and the first differenced data series "DEXCHANGERATE". By taking the first difference of the original data series, we created a lagged data series that is stationary, allowing us to apply all the necessary parametric statistical assumptions.

Table 6-9: USD/ ZAR Foreign Exchange Rate – Unit root test results

Augmented Dickey-Fuller Unit Root Test on EXCHANGERATE				
ADF Test Statistic	-2.407764	1%	Critical Value*	-3.5778
		5%	Critical Value	-2.9256
		10%	Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.				

Augmented Dickey-Fuller Unit Root Test on DEXCHANGERATE				
ADF Test Statistic	-4.834961	1%	Critical Value*	-3.5814
		5%	Critical Value	-2.9271
		10%	Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.				

6.1.3.3 Quarterly JSE All Share Index

For the JSE All Share Index factor we first calculate the ADF unit root test statistic for the "JSE_share_index" and could not reject the null hypothesis that unit root was present in the data series. Calculating the ADF test statistic for the first differenced data series "DJSE_share_index" we do not accept the null hypothesis and conclude that the data series is stationary.

Table 6-10: JSE All Share index – Unit root test results

Augmented Dickey-Fuller Unit Root Test on JSE_share_index				
ADF Test Statistic	-0.766601	1%	Critical Value*	-3.5778
		5%	Critical Value	-2.9256
		10%	Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.				

Augmented Dickey-Fuller Unit Root Test on DJSE_share_index				
ADF Test Statistic	-4.114857	1%	Critical Value*	-3.5814
		5%	Critical Value	-2.9271
		10%	Critical Value	-2.6013
*MacKinnon critical values for rejection of hypothesis of a unit root.				

6.2 Testing of Hypotheses

With the relevant unit root tests conducted, we proceed to test our hypotheses proposed in Chapter 3 through the use of an Ordinary Least Squares (OLS) regression model. Our choice in using this approach is informed by the work of Ali-Yrkkö (2002), Choi & Jeon (2011), Uddin & Boateng (2011), Yagil (1996) and (Harford, 2005). Our over-arching assumption is that of normality, since we have ensured that all our variables are stationary.

We present the OLS regression results for each of our hypotheses, selecting the aggregate merger activity measures as the dependent variable and the macroeconomic and market factors as our independent variables. We test the null hypothesis that the regression coefficients of the selected macroeconomic or market factors are equal to zero. The null hypothesis therefore helps us decide whether a change in the independent variable does not change the dependent variable. For each of the regression outputs we reference (Markovic, 2002) for explanation of the measures that provide an indication of the appropriate of the OLS results. These include:

- **Durbin-Watson Statistic (DW)** – measures the serial correlation in the residuals. Ranging in value from 0 to 4, a value near 2 indicates non-autocorrelation, while a value toward 0 indicates positive autocorrelation, and a value toward 4 indicates negative autocorrelation.

- **Akaike Information Criterion (AIC)** – which is measure of the relative goodness of fit for statistical model selection. When we have a set of possible models for the data, the preferred model is the one with the minimum AIC value.

- **Shwarz Criterion (SC)** – which is an alternative to the AIC measure that imposes a larger penalty for additional coefficients. Given any two estimated models, the model with the lower SC value is preferred

We conclude the testing of each hypothesis by discussing the Granger Causality to identify the existence of a long-term equilibrium relationship between aggregate merger activity and our selected macroeconomic and

market factors. We present the Vector Autoregression results in Appendix A to visually represent the long-term equilibrium relationship between the determinants and the aggregate merger measure.

6.2.1 Hypothesis 1 – Aggregate Merger Activity – Deal Frequency Measure

6.2.1.1 OLS Regression Results – Deal Frequency Measure

Based on the results of Table 6-10 we accept the null hypothesis that the coefficients are equal to zero for all factors, except for "DDREPO". The explain the relationship between DFREQ and DDREPO through the following equation:

$$\boldsymbol{DFREQ = 0.349261 - 2.673351 * DDREPO}$$

This says that for every one-unit change in the first differenced data series of the deal frequency measure (DFREQ), the second differenced data series of the independent variable Repurchase Rate (DDREPO) changes by -2,673551. The $\mathbf{R^2}$ value of 0.188754 indicated that the regression model only explains roughly 19% of the variation in the dependent variable.

Table 6-10: eViews OLS regression results – Deal Frequency Measure

Dependent Variable: DFREQ
Method: Least Squares
Sample(adjusted): 2000Q3 2011Q4
Included observations: 46 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEPPI	-0.112210	0.241547	-0.464549	0.6448
DDREPO	-2.673551	1.210420	-2.208780	0.0331
DEXCHANGERATE	0.837268	0.925435	0.904729	0.3712
DGDP	0.174287	0.416184	0.418774	0.6777
DALLBONDINDEX	-0.075968	0.112817	-0.673380	0.5047
DDECPI	-0.866923	0.753991	-1.149779	0.2572
C	0.349261	1.328089	0.262980	0.7940

R-squared	0.188754	Mean dependent var	-0.347826
Adjusted R-squared	0.063947	S.D. dependent var	5.147674
S.E. of regression	4.980365	Akaike info criterion	6.188152
Sum squared resid	967.3574	Schwarz criterion	6.466423
Log likelihood	-135.3275	F-statistic	1.512371
Durbin-Watson stat	2.442636	Prob(F-statistic)	0.199720

Table 6-10 also shows that there may be a small amount of autocorrelation present in the data series, while the goodness of fit measure reflects a reasonably similar result.

6.2.1.2 Granger Causality Results – Deal Frequency Measure

From the Granger Causality results presented in Table 6-11, and using a p-value of 0.05, we see that only the All Bond Index (ALLBONDINDEX) and Consumer Price Index (ECPI) Granger-cause aggregate merger activity measured as the quarterly deal frequency. The existence of the co-integration, as discussed by Engle & Granger (1987), implies that the co-integrated time series variables, FREQ and ALLBONDINDEX, and FREQ and ECPI, must be drifting together at roughly the same rate (i.e., they are linked in a common long-run equilibrium).

Table 6-11: eViews Granger Causality results – Deal Frequency Measure

Pairwise Granger Causality Tests (Deal Frequency) Sample: 2000Q1 2011Q4 Lags: 2		
Null Hypothesis:	F-Statistic	Probability
ALLBONDINDEX does not Granger Cause FREQ	5.33087	0.00875
REPO does not Granger Cause FREQ	1.41518	0.25450
ECPI does not Granger Cause FREQ	3.67911	0.03392
EPPI does not Granger Cause FREQ	2.79990	0.07248
EXCHANGERATE does not Granger Cause FREQ	0.52201	0.59721
GDP does not Granger Cause FREQ	0.11168	0.89460
JSE_SHARE_INDEX does not Granger Cause FREQ	1.63153	0.20807

In conclusion, we accept the null hypothesis that the is no dynamic relationship between various macroeconomic and market variables and the aggregate merger activity in South Africa, when measured in terms of deal frequency on a quarterly basis. We do however note the long-term equilibrium relationship between deal frequency and the All Bond Index and Consumer Price Index factors, which may suggest the need for further research in this area.

6.2.2 Hypothesis 2 – Aggregate Merger Activity – Deal Value Measure

6.2.2.1 OLS Regression Results – Deal Frequency Measure

Interpreting the regression coefficients in Table 6-12 below we see that at a 5% level we accept the null hypothesis that the coefficients are not statistically different to zero. With a $\mathbf{R^2}$ value of 0.107379, we conclude that the proposed regression model only explains roughly 11% of the variation in the dependent variable. While the Durbin-Watson statistics shows negligible negative autocorrelation, the Shwarz Criterion reports a higher value than the Akaike Information Criterion due to the lack of variables in the regression model.

Table 6-12: eViews OLS regression results – Deal Frequency Measure

Dependent Variable: LOG_SUMOFVALUE
Method: Least Squares
Date: 11/06/12 Time: 16:51
Sample(adjusted): 2000Q3 2011Q4
Included observations: 46 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEPPI	0.002873	0.047839	0.060048	0.9524
DDREPO	-0.196778	0.239729	-0.820835	0.4167
DEXCHANGERATE	-0.107085	0.183287	-0.584247	0.5624
DGDP	0.056815	0.082427	0.689280	0.4947
DALLBONDINDEX	-0.015295	0.022344	-0.684548	0.4977
DDECPI	0.185522	0.149331	1.242347	0.2215
C	23.07492	0.263034	87.72594	0.0000

R-squared	0.107379	Mean dependent var	22.98555
Adjusted R-squared	-0.029947	S.D. dependent var	0.971938
S.E. of regression	0.986384	Akaike info criterion	2.949727
Sum squared resid	37.94522	Schwarz criterion	3.227999
Log likelihood	-60.84372	F-statistic	0.781925
Durbin-Watson stat	2.028721	Prob(F-statistic)	0.589226

6.2.2.2 Granger Causality Results – Deal Value Measure

While the OLS regression results for the deal value measure of aggregate merger activity were not encouraging, we review the Granger Causality results in Table 6-13 to identify any long-term equilibrium relationships. At a p-value of

0.05, we do not accept the null hypothesis and establish that deal value measure is Granger-caused by the JSE All Share index factor. Based on the work by Engle & Granger (1987), the existence of the co-integration, implies that the co-integrated time series variables, SUM_OF_VALUE and JSE_SHARE_INDEX, must be drifting together at roughly the same rate (i.e., they are linked in a common long-run equilibrium).

Table 6-13: eViews Granger Causality results – Deal Value Measure

Pairwise Granger Causality Tests (Deal Value)
Sample: 2000Q1 2011Q4
Lags: 2

Null Hypothesis:	F-Statistic	Probability
ALLBONDINDEX does not Granger Cause SUM_OF_VALUE	2.30722	0.11232
ECPI does not Granger Cause SUM_OF_VALUE	1.11506	0.33763
EPPI does not Granger Cause SUM_OF_VALUE	1.53753	0.22705
EXCHANGERATE does not Granger Cause SUM_OF_VALUE	1.73284	0.18948
GDP does not Granger Cause SUM_OF_VALUE	0.87332	0.42518
JSE_SHARE_INDEX does not Granger Cause SUM_OF_VALUE	4.04298	0.02497
REPO does not Granger Cause SUM_OF_VALUE	2.63594	0.08377

Reflecting back on the hypothesis proposed in Chapter 3, we accept the null hypothesis that the is no dynamic relationship between various macroeconomic and market variables and the aggregate merger activity in South Africa, when measured in terms of deal value on a quarterly basis. We do however note the long-term equilibrium relationship between deal value and the JSE All Share Index factor.

6.2.3 Hypothesis 3 – Aggregate Merger Activity – Relative Deal Value Measure

6.2.3.1 OLS Regression Results – Relative Deal Value Measure

Interpreting the regression coefficients in Table 6-14 below we see that at a 5% level we accept the null hypothesis that the coefficients are not statistically different to zero. With a $\mathbf{R^2}$ value of 0.133594, we conclude that the proposed regression model only explains roughly 13% of the variation in the dependent variable. While the Durbin-Watson statistics shows positive autocorrelation, the Shwarz Criterion reports a higher value than the Akaike Information Criterion due to the lack of variables in the regression model.

Table 6-14: eViews OLS regression results – Relative Deal Value Measure

Dependent Variable: LOGRELMEAS
Method: Least Squares
Date: 11/06/12 Time: 16:51
Sample(adjusted): 2000Q3 2011Q4
Included observations: 46 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEPPI	-0.054599	0.047858	-1.140851	0.2609
DDREPO	-0.176750	0.239823	-0.737003	0.4655
DEXCHANGERATE	-0.099985	0.183358	-0.545297	0.5887
DGDP	0.042224	0.082459	0.512055	0.6115
DALLBONDINDEX	-0.032546	0.022353	-1.456049	0.1534
DDECPI	0.099902	0.149390	0.668734	0.5076
C	13.58924	0.263137	51.64331	0.0000

R-squared	0.133594	Mean dependent var	13.25801
Adjusted R-squared	0.000300	S.D. dependent var	0.986916
S.E. of regression	0.986768	Akaike info criterion	2.950505
Sum squared resid	37.97475	Schwarz criterion	3.228776
Log likelihood	-60.86161	F-statistic	1.002253
Durbin-Watson stat	1.950969	Prob(F-statistic)	0.437754

6.2.3.1 Granger Causality Results – Relative Deal Value Measure

As with Hypothesis 2 above we see that the OLS regression results for the relative deal value measure of aggregate merger activity were not encouraging. We review the Granger Causality results in Table 6-15 to identify any long-term equilibrium relationships. At a p-value of 0.05, we do not accept the null hypothesis and establish that relative deal value measure is Granger-caused, in separate instances by the All Bond Index (ALLBONDINDEX), Consumer Price Index (ECPI) and Producer Price Index (EPPI). As discussed by Engle & Granger (1987), the existence of the co-integration, implies that the co-integrated time series variables, must be drifting together at roughly the same rate (i.e., they are linked in a common long-run equilibrium).

Table 6-15: eViews Granger Causality results – Relative Deal Value Measure

Pairwise Granger Causality Tests (Relative Deal Value Measure) Sample: 2000Q1 2011Q4 Lags: 2		
Null Hypothesis:	F-Statistic	Probability
ALLBONDINDEX does not Granger Cause RELATIVEDEALVALUE	4.54739	0.01646
ECPI does not Granger Cause RELATIVEDEALVALUE	5.87765	0.00570
EPPI does not Granger Cause RELATIVEDEALVALUE	5.37803	0.00843
EXCHANGERATE does not Granger Cause RELATIVEDEALVALUE	1.73000	0.18997
GDP does not Granger Cause RELATIVEDEALVALUE	1.27728	0.28965
JSE_SHARE_INDEX does not Granger Cause RELATIVEDEALVALUE	3.12554	0.05453
REPO does not Granger Cause RELATIVEDEALVALUE	0.47651	0.62434

While the null hypothesis results for the relative deal value measure, shown in in Table 6-14, match those of the deal value measure, we obtain a slighter better result in terms of the number of cointegrated with the relative deal value measure.

CHAPTER 7: CONCLUSION

This research report set out to evaluate the dynamic relationship selected determinants and aggregate merger activity for acquiring firms listed on the JSE over the period 2000 to 2011. After applying the appropriate qualitative and quantitative filter criteria, we carried out the econometric analysis on a sample of 429 transactions, valued at ZAR 719 billion.

Utilising the definitions proposed by Choi & Jeon (2011), we expressed aggregate merger activity a deal frequency, deal value and relative deal value, all measured on a quarterly basis. Outliers in the data were handled by log transforming the data series. Augmented Dickey-Fuller (ADF) unit root tests were conducted on our merger activity measure as well as the determinants to ensure that none of the results obtained were spurious due to non-stationary variables. In most instances we needed to cater for existence of a unit root in the data series for the variables by taking the first and second differenced series. In this way we obtained a lagged series that was stationary, allowing us to apply all the parametric assumptions applicable to time series analysis.

Setting the aggregate merger activity measures as the dependent variables, we used Ordinary Least Squares regression to statistically test our hypothesized dynamic relationships with the selected macroeconomic and market factors. The results also showed that the coefficient for the second differenced time series of the Repurchase rate was the only factor that was significant in explaining the variation in the deal frequency measure. All other regression coefficients failed the null hypothesis that they were not statistically different to zero. We found that, on average the fitted regression models poorly explained the variation in the dependent variables.

While the statistical methodology applied was robust, the results of the hypothesis testing exercise suggest that more work is required identifying the macroeconomic and market factor that drive aggregate merger activity for acquiring firms listed on the JSE. Where Choi & Jeon (2011) and Nieh (2003) found that GDP, the stock market and the bond market played a role in

predicting aggregate merger activity in the US economy, the results we present in Chapter 6 do not support these finding in any way.

It was encouraging to note the existence of long-term equilibrium relationship between the aggregate merger activity measures and several of the determinants. Based on the results of the cointegration tests we found long-term equilibrium relationships between:

- Deal Frequency and All Bond Index
- Deal Frequency and Consumer Price Index (ECPI)
- Deal value and JSE All Share Index
- Relative Deal Value and All Bond Index (ALLBONDINDEX)
- Relative Deal Value and Consumer Price Index (ECPI)
- Relative Deal Value and Producer Price Index (EPPI)

Choi & Jeon (2011) found from their impulse response VAR models that GDP and corporate net cash flow played the most significant long-term equilibrium role in contributing to the variation in merger activity.

The research efforts in this area are from complete. Filtering for specific deal characteristics, such are method of payment and controlling for hostile versus friendly merger transactions could greatly improve on the results we have reports. A caveat here would be to ensure that the sample is statistically representative. Controlling for cross-border and non-listed acquiring firms, could also further enhance the research findings.

As discussed in Section 4.7, a larger sample size, coupled with more sophisticated statistical methodologies will go a long way to helping researchers make sense of this fertile area of research.

8. REFERENCES

Ali-Yrkkö, J. (2002). Mergers and acquisitions: Reason and results. Helsinki. Retrieved from http://www.econstor.eu/handle/10419/63797

Andrade, G., & Stafford, E. (2004). Investigating the economic role of mergers. *Journal of Corporate Finance*, *10*(1), 1–36. doi:10.1016/S0929-1199(02)00023-8

Bhattacharjee, A., Higson, C., Holly, S., & Kattuman, P. (2009). Macroeconomic Instability and Business Exit: Determinants of Failures and Acquisitions of UK Firms. *Economica*, *76*(301), 108–131. doi:10.1111/j.1468-0335.2007.00662.x

Bruner, R. F. (2004). *Applied Mergers and Acquisitions* (pp. 72–74). Hoboken, New Jersey: John Wiley & Sons, Inc.

Choi, S. H., & Jeon, B. N. (2011). The impact of the macroeconomic environment on merger activity: evidence from US time-series data. *Applied Financial Economics*, *21*(4), 233–249. doi:10.1080/09603107.2010.528365

Engle, R., & Granger, C. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: journal of the Econometric Society*, *55*(2), 251–276. Retrieved from http://www.jstor.org/stable/1913236

Golbe, D. L., & White, L. J. (1993). Catch a wave: The time series behavior of mergers. *The review of Economics and Statistics*, *75*(3), 493–499. Retrieved from http://www.jstor.org/stable/10.2307/2109463

Gort, M. (1969). An Economic Disturbance Theory of Mergers. *The Quarterly Journal of Economics*, *83*(4), 624. doi:10.2307/1885453

Gorton, G., Kahl, M., & Rosen, R. J. (2009). Eat or Be Eaten: A Theory of Mergers and Firm Size. *The Journal of Finance*, *64*(3), 1291–1344. doi:10.1111/j.1540-6261.2009.01465.x

Gugler, K., Mueller, D. C., & Weichselbaumer, M. (2012). The determinants of merger waves: An international perspective. *International Journal of Industrial Organization*, *30*(1), 1–15. doi:10.1016/j.ijindorg.2011.04.006

Gärtner, D. L., & Halbheer, D. (2009). Are there waves in merger activity after all? *International Journal of Industrial Organization*, *27*(6), 708–718. doi:10.1016/j.ijindorg.2009.03.003

Haleblian, J., Devers, C. E., McNamara, G., Carpenter, M. a., & Davison, R. B. (2009). Taking Stock of What We Know About Mergers and Acquisitions: A Review and Research Agenda. *Journal of Management*, *35*(3), 469–502. doi:10.1177/0149206308330554

Halfar, D. B. (2011). *The effect of mergers and acquisitions on long-run financial performance of acquiring companies*. Univeristy of Pretoria.

Harford, J. (2005). What drives merger waves? *Journal of Financial Economics*, *77*(3), 529–560. doi:10.1016/j.jfineco.2004.05.004

Ho, L. S., Wei, X., & Wong, W. C. (2005). The effect of outward processing trade on wage inequality: the Hong Kong case. *Journal of International Economics*, *67*(1), 241–257. doi:10.1016/j.jinteco.2004.09.005

Jovanovic, B., & Rousseau, P. (2001). Mergers and technological change: 1885-1998. *Unpublished working paper, Vanderbilt …*, (01). Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.194.8243&rep=rep1&type=pdf

Jovanovic, B., & Rousseau, P. (2002). The Q-theory of mergers. Cambridge. Retrieved from http://www.nber.org/papers/w8740

Koop, G. (2009). *Analysis of Economic Data* (3rd Editio., p. 250). Chichester, West Essex: John Wiley & Sons, Inc. Retrieved from http://www.amazon.com/Analysis-Economic-Data-Gary-Koop/dp/0470713895

Liu, J. (2004). Macroeconomic determinants of corporate failures: evidence from the UK. *Applied Economics*, *36*, 939–945. doi:10.1080/0003684042000233168

Markovic, D. (2002). *A guide to EViews*. *Institut für Statistik und Ökonometrie* (p. 19). Berlin. Retrieved from ftp://ekokat.lzuu.lt/rj/NEAKIVAIZDINIS_EKONOMETRIJA/LITERATURA/eviewsguide.pdf

Melicher, R., Ledolter, J., & D'Antonio, L. (1983). A Time Series of Aggregate Merger Activity. *The Review of Economics and …*, *65*(3), 423–430. Retrieved from http://www.jstor.org/stable/10.2307/1924187

Mitchell, M. L., & Mulherin, J. H. (1996). The impact of industry shocks on takeover and restructuring activity. *Journal of Financial Economics*, *41*(2), 193–229. doi:10.1016/0304-405X(95)00860-H

Nakamura, R. H. (2004). To Merge And Acquire When The Times Are Good? The Influence Of Macro Factors On The Japanese M&A Pattern. *EIJS Working Paper Series*, (197). Retrieved from http://ideas.repec.org/p/hhs/eijswp/0197.html

Nieh, C. (2003). The Relationship Between The Mergers and Acquisitions and Macroeconomic Fundamentals: The US Evidence. Taiwan.

Osae, W. K. (2010). *A Value Assessment of Mergers and Acquisitions in The South African Mining Industry*. University of Pretoria.

Owen, S. (2006). The history and mystery of merger waves: A UK and US perspective. Sydney, Australia. doi:10.1.1.163.4823

Pablo, E. (2009). Determinants of cross-border M&As in Latin America. *Journal of Business Research*, *62*(9), 861–867. doi:10.1016/j.jbusres.2008.10.004

Ragozzino, R., & Reuer, J. J. (2007). Mind the Information Gap: Putting New Selection Criteria and Deal Structures to Work in M&A. *Journal of Applied Corporate Finance*, *19*(3), 82–89. doi:10.1111/j.1745-6622.2007.00149.x

Rhodes-Kropf, M., & Viswanathan, S. (2004). Market Valuation and Merger Waves. *The Journal of Finance*, *59*(6), 2685–2718. doi:10.1111/j.1540-6261.2004.00713.x

Shleifer, A., & Vishny, R. W. (2003). Stock market driven acquisitions. *Journal of Financial Economics*, *70*(3), 295–311. doi:10.1016/S0304-405X(03)00211-3

Smit, C. (2005). *The impact of large acquisitions on the share price and operating financial performance of acquiring companies listed on the JSE*. University of Pretoria. Retrieved from http://www.iassa.co.za/images/file/IASJournals/articles/No 65 May 2007/0604SmitWard65No1-final.pdf

Terjesen, S. (2007). Mergers and Acquisitions: Patterns, Motives, and Strategic Fit. *qfinance.com*, 1–7. Retrieved from http://www.qfinance.com/contentFiles/QF02/g1xtn5q6/12/0/mergers-and-acquisitions-patterns-motives-and-strategic-fit.pdf

Town, R. J. (1992). Merger waves and the structure of merger and acquisition time-series. *Journal of Applied Econometrics*, *7*(S1), S83–S100. doi:10.1002/jae.3950070507

Toxvaerd, F. (2008). Strategic merger waves: A theory of musical chairs. *Journal of Economic Theory*, *140*(1), 1–26. doi:10.1016/j.jet.2007.05.003

Uddin, M., & Boateng, A. (2011). Explaining the trends in the UK cross-border mergers & acquisitions: An analysis of macro-economic factors. *International Business Review*, *20*(5), 547–556. doi:10.1016/j.ibusrev.2010.11.003

Yagil, J. (1996). Mergers and macro-economic factors. *Review of Financial Economics*, *5*(2), 181–190. doi:10.1016/S1058-3300(96)90014-2

Yesilyurt, O. (2012). *International Expansion Strategies: Are Cross-Border Mergers & Acquisitions Successful?* Aarhus University. Retrieved from http://pure.au.dk/portal-asb-student/files/41992555/Master_Thesis_OY.pdf

9. APPENDIX

Figure 9-1: Vector Autoregression – Impulse response function analysis for quarterly deal frequency

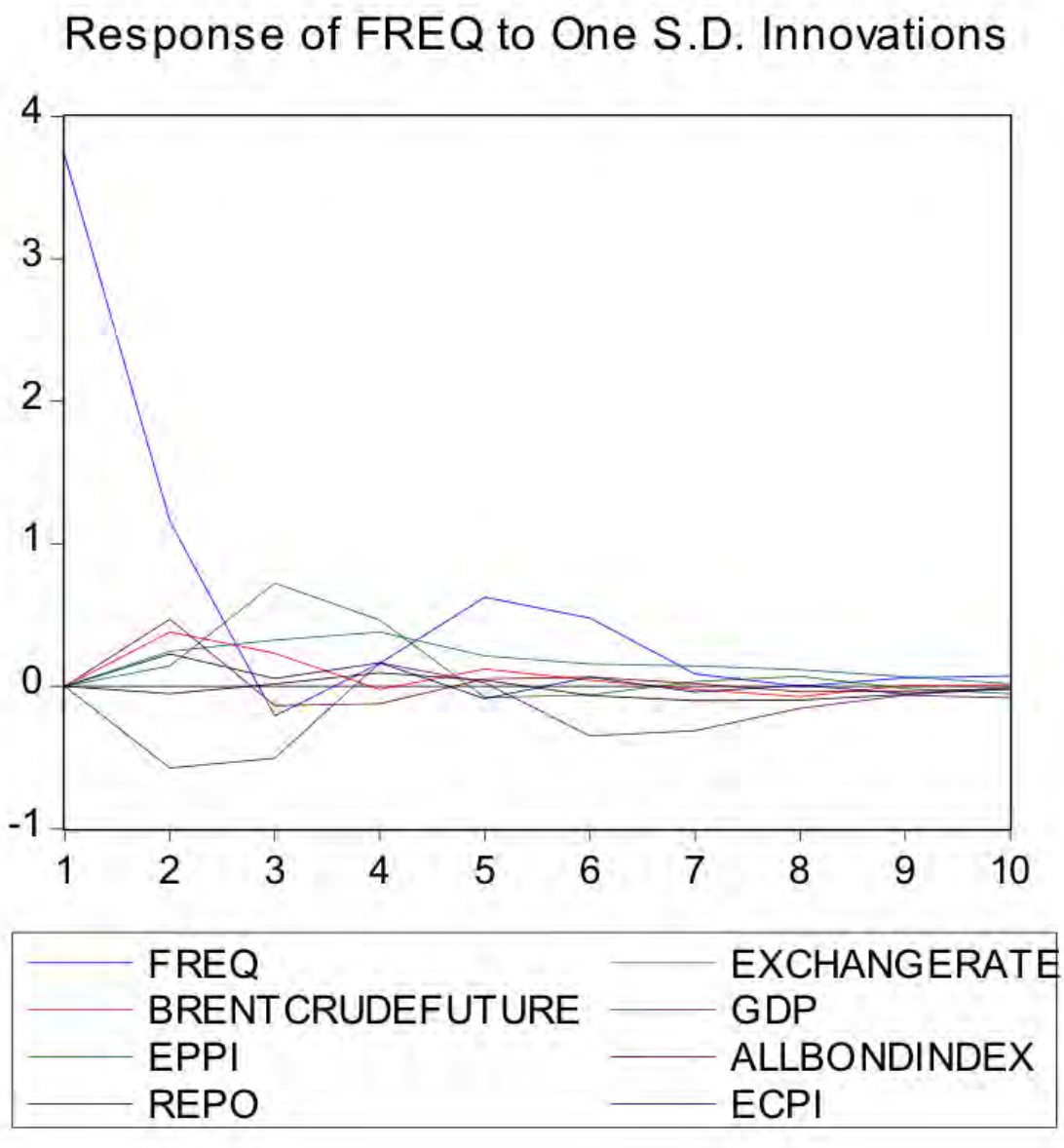


Figure 9-2: Vector Autoregression – Impulse response function analysis for quarterly deal value

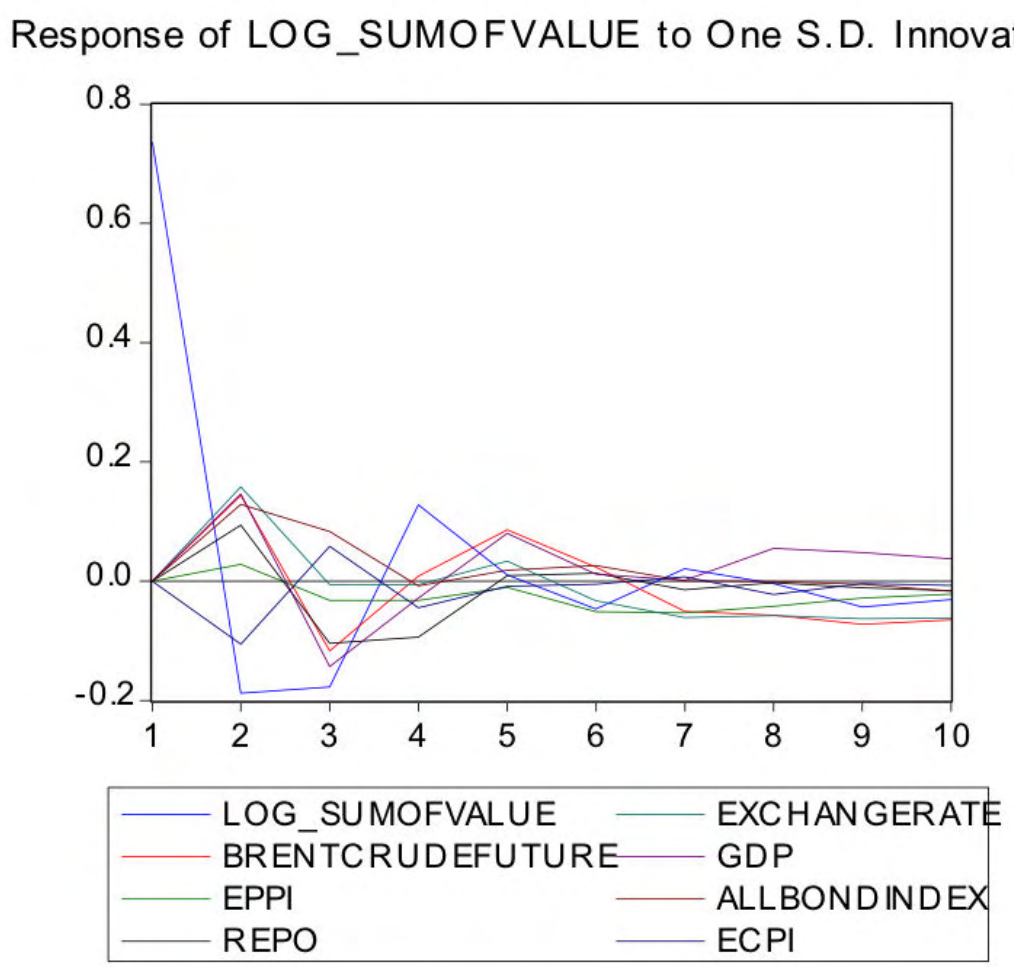


Figure 9-3: Vector Autoregression – Impulse response function analysis for quarterly relative deal value