Master of Management in Finance and Investments (MMFI)

Thesis

The Relationship Between Economic Activity and Stock Market Performance: Evidence From South Africa

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DECLARATION

I, Camngca Mda, declare that this research project is my own work. Where ideas of other individuals have been made reference to, citations have been made and a list of references is included in order acknowledge and identify all sources of use. It is submitted to complete the requirements of the Master in Management of Finance and Investment degree at the Wits business school (WBS). It has not been submitted before to any other institution or university for a similar qualification. I further declare that I was given authorization by a panel from the research committee of the WBS to carry out this research.

Signed:

February 2016

ABSTRACT

The relationship between real economic activity and stock market performance is one that has been extensively researched throughout many decades, across many economies. Many issues and debates have stemmed involving this relationship, with the major ones including those of the significance of the relationship, nature of the relationship as well as causality and direction of causality within the relationship. This research paper examines this relationship within the South African context, comparing the pre and post 2008 global financial crisis periods. Results both in support of and contrary to theory were found as real economic activity had an immediate postitive response to shocks imposed on the stock index, whilst the stock index had an immediate negative response to shocks imposed on real economic activity. Through the use of granger causality testing, no causality was found in either direction. Furthermore, no major differences were noted between the pre and post crisis periods.

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Firstly, I will take this opportunity to express my utmost gratitude to my mother, who has had great faith in me and has been my greatest provider and supporter through out all my studies. I also thank her sisters who have played a valuable role in helping to facilitate my academic career. I thank all my friends who offered me encouragment and moivation throughout this process. Finally, I thank my supervisor who has provided great supervision, support and shown an inspiring work ethic throughout the process.

LIST OF TABLES AND FIGURES

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This chapter shall provide an introduction concerning the aims of this paper. Section 1.2 presents the context of the study, whilst section 1.3 presents the research problem which this paper aims to deal with. Sections 1.4 and 1.5 shall present the research objectives and research questions respectively. Section 1.6 discusses the significance of the study, whilst section 1.7 presents the proposed structure of the thesis. Lastly, the chapter summary shall conclude this chapter.

1.2 Context

Predicting Stock Returns is a science, and perhaps an art, which could yield one great reward if they were to find a theory and method that accurately described how to go about the process. This science has therefore resulted in much research and study, with a primary focus on the relationship between macroeconomic activity and stock market performance. Theoretically, increased economic activity is associated with a boost in consumer savings and investor confidence, and thus an increase in the profitability and value of firms. Similarly, an organized and managed stock market stimulate investment opportunities by recognizing and financing productive projects that lead to economic activity, mobilize domestic savings, allocate capital proficiency, help to diversify risks, and facilitate exchange of goods and services (Caporale et al, 2004), thus stock markets are expected to facilitate economic growth. A significant and positive relationship would therefore be expected between economic growth and stock market performance. An issue present within existing literature is how this relationship can be best modelled. Methods that have been dominantly used in estimating this relationship are Ross´s(1976) arbitrage pricing theory (APT) and Engel and Granger´s(1987) cointegration analysis. Ross´s(1976) motivation behind formulating the APT

was to theoretically challenge the pitfalls of the Capital Asset Pricing Model(CAPM) introduced by Sharpe(1964), Linter(1965) and Mossin(1966). Chen et al.(1986) then supported Ross(1976) in this debate through empirically studying the validity of the APT. Many other studies(see Poon et al., 1991; Lervos and Zervine, 1998) employed this method, finding conflicting results with respect to its validity. Though this is the case, modelling stock returns using the APT can also be brought into question, as it ignores that economic data is non-stationary and ignores that stock-market returns can be serially correlated, thus meaning that lagged stock-market returns could hold predictive power(Chen et al., 1986). In order to deal with this issue of non-stationarity in time series data, Granger(1983) introduced cointegration analysis, which was then extend by Engel and Granger(1987) and refined by Johansen(1991). This study shall therefore be conducted using Johansen´s(1991) cointegration approach together with Granger(1969) causality, in order to determine causality and direction of causality.

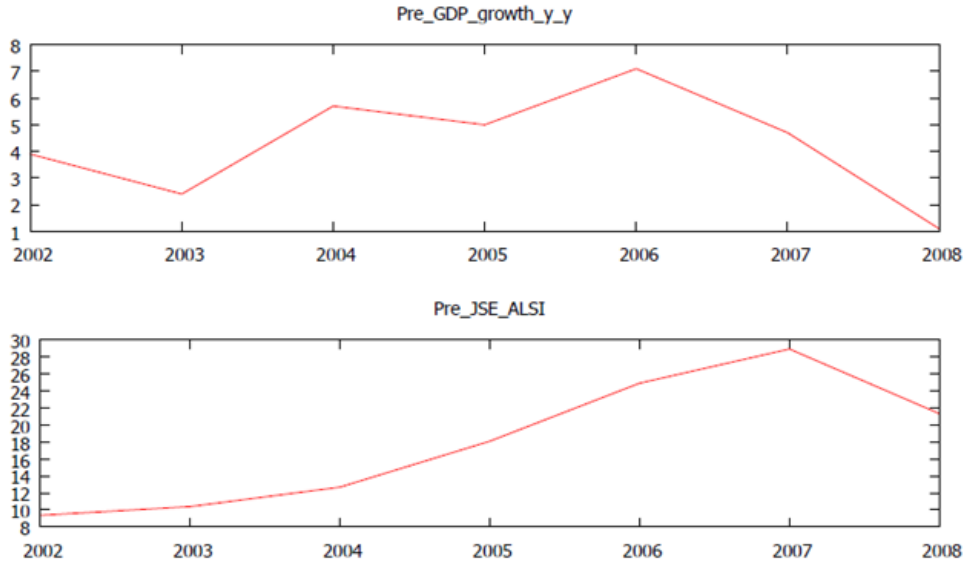
Another issue that has risen amongst conducted studies is that of the significance of the relationship between real economic activity and stock market performance. Dating back to over two decades ago, Chen et al. (1986) and Poon et al. (1988) conducted similar studies, using data sets from the US and UK respectively, and respectively found significant and insignificant relationships. The nature of the relationship between real economic activity and stock market performance has also been an area of great interest. Some have found positive relationships (see Chen et al., 1986; Levine and Zervos, 1996; Groenweld , 2004; Shabaz et al., 2008; Al-Jarafi, 2011) whilst others have found negative relationships (see Barra, 2010; Brahmasrene and Jiranyakul, 2007).

Where significance and the nature of the relationship have been found, causality and the direction of causality have been areas of further study. Some studies have found causality in the direction of real economic activity to stock prices (see Groenewold, 2004; Du Toit and Moolman, 2005; Shabbaz, 2008; Al-Jarafi, 2008). Others have found causality in the direction of the stock market to economic growth (see Jefferis and Okeahalam, 2000;

Caporale, 2004; Groenewold, 2004; Shabbaz, 2008; Al-Jarafi et al., 2011). Others have found no causality at all (see Nyasha and Odhiambo, 2014).

Different periods of time can capture different responses of stock prices to varying levels of macroeconomic activity as policy makers become more prudent in exercising monetary policy in times of crisis (Brahmasrene and Jiranyakul, 2007). Though this relationship has been studied extensively, literature on whether crisis times introduce structural breaks and thus changing the significance, nature, causality and direction of causality within the relationship is limited.

Figure 1.1: Economic & Financial Indicators, Pre-crisis



Data Source: Bloomberg

Figure 1 above displays South African(SA) year on year GDP growth and the year on year FSTE/JSE All Share Index from 2002 to 2008. During this pre-crisis period, economic growth had a general increasing trend from 2002 to 2006 and the FTSE/JSE All Share Index followed suite. This thus suggests that a positive relationship existed between the two during the given period. Significant declines were experienced post 2007 as the effects of the global financial crisis filtered in.

Figure 1.2: Economic & Financial Indicators, Post-crisis

Data Source: Bloomberg

Figure 2 above displays South African(SA) year on year GDP growth and the year on year FSTE/JSE All Share Index from 2009 to 2014. During this post crisis period, economic growth seemed to be improving as most economies experienced real activity recoveries and the SA GDP growth increasing from below 0% to the 3.5% mark between 2009 and 2011. This came to an end during the period from 2011 to 2014 as GDP growth declined to below the 1.5% mark. Though this is the case, the JSE-ALSI exhibited an increasing year on year trend, reaching record highs of above the ZAR54 mark in June 2014. This suggests that a positive relationship could have existed between the two during 2009 and 2011 whilst a negative one could have come into being during 2011 and 2014. South African studies focusing on the relationship between Gross Domestic Production(GDP) growth and the Johannesburg Stock Exchange(JSE) All Share Index(FTSE/JSE ALSI) are limited, with those studying relationships between a broad numbers of macroeconomic variables and the stock market being varied in approach and methodology. Some academics (see Jefferis and Okeahalam, 2000; Moolman and du Toit, 2004) have used Johanssen(1991) cointegration and Granger(1969) causality to study the relationship between the South African macro economy and Johannesburg Stock Exchange(JSE) returns, but none have studied this

relationship evaluating and making comparisons between the pre and post 2008 global financial crisis periods.

This study shall therefore add to literature by examining the relationship between real economic activity(using GDP growth as a proxy) and stock market performance(measured using the FTSE/JSE ALSI) in South Africa pre and post the 2008 global financial crisis. The aims shall be to determine whether a significant relationship existed between the real economy and stock market during the given periods, determine whether the relationship was positive or negative, assess whether causality in either direction can be inferred and lastly determine whether changes were observed across the two different periods.

Theoretically, the value of an asset or investment can be determined through discounting expected future cash flows. As per the Dividend Discount Model(Gordon and Shapiro, 1959), in the case of firm value these cash flows can be measured through the use of expected future dividends. Stock prices can thus be determined through discounting expected future dividends, using the required rate of return. Chen et al.(1986) therefore stated that in studying the relationship between the macro economy, variables can be chosen based on their hypothesized effect on cash flows and required rate of return. Further variables in this study shall therefore be chosen according to this frame work. These will include the interest rate, inflation rate, exchange rate and money supply.

1.3 Research Problem

The relationship between real economic activity and stock market performance is one that has brought about extensive research and examination in many economies, spanning across many decades. Much debate and conflict has been centered around the significance of the relationship, the nature of the relationship, causality and direction of causality within the relationship as well as how this relationship can be best modelled. Though this relationship has been studied extensively, literature on whether crisis times introduce structural breaks and thus changing the significance, nature, causality and direction of causality within the

relationship is limited. A number of South African studies concerning this relationship have been conducted, varying in methodology and findings, but none have been conducted comparing the relationship pre and post crisis times. South African data suggests that this relationship could have been different pre and post the 2008 global financial crisis. This study shall therefore bridge this gap by studying the relationship between Real Economic Activity and Stock Market Performance, in South Africa, pre and post the 2008 financial crisis, in order to examine whether crisis times change the significance, nature and causality in this relationship.

1.4 Research Objectives

This paper aims to:

i) Empirically estimate an econometric model determining the relationship between real economic activity and stock market performance, in South Africa, pre and post the 2008 global crisis.

ii) Determine the effect of other macroeconomic variables on stock market performance and contrasting their significance to that of real economic activity

1.5 Research Questions

The purpose of this study is to examine the relationship between real economic activity and stock market performance in South Africa pre and post the 2008 global financial crisis. The study shall therefore attempt to answer the following questions:

i) Does a significant relationship exist between real economic activity and stock market performance?

ii) Is the nature of this relationship positive or negative?

iii) Can causation and the direction of causation be inferred?

iv) Are there differences pre and post crisis?

1.6 Significance Of The Study

The relationship between economic activity and stock market performance is one that is of great interest both to investors and government. Single Factor Models, Multi-Factor models, Dividend Discount Models, Price to Earnings ratios and other Price multiple ratios are amongst many theories and methods that have been used in the quest to best model stock returns. Theoretically, increased economic activity has been linked to growth in company profits. This then leads to an increase in the earnings and value of companies, and therefore pushing up stock prices. Empirically, if indeed a significant causal relationship is found in the direction of economic growth to stock market performance(whether positive or negative), this would provide valuable information to investors as economic activity would be of predictive power when it comes to stock returns and asset pricing.

Much debate exists in theory and literature with respect to the relevance of financial intermediation in promoting economic growth. The growing importance of stock markets around the world has opened a new avenue of research into the relationship between financial development and economic growth, which focuses on the effects of stock market development (Demetriades and Luintel, 2001). Existing debates have argued that well-functioning stock markets provide services that boost economic growth (Levine and Zervos, 1998). If a significant and causal relationship is indeed found in the direction of stock market performance to economic activity, this would mean that the financial sector influences macroeconomic outcomes. If this causal relationship is found to be positive, this would therefore suggest that financial intermediation in the form of the stock market based system is valuable in growing an economy. If negative, this would suggest that monetary and fiscal policy should be implemented in such a way that private sector activity is regulated in order to regulate economic output, as the private sector would have an influence in contributing to economic inefficiencies.

Existing literature has mainly focused on studying the validity of the theories mentioned above. Brahmasrene and Jiranyakul (2007) argue that different periods of time can capture different responses of stock prices to varying levels of macroeconomic activity, as policy makers become more prudent in exercising monetary policy in times of crisis. If this is the case this would provide valuable information to both investors and policy makers, as it would be evident that crisis times provide structural breaks-thus meaning that decisions need to be revisited when presented with such times. This research shall therefore provide valuable information for both market investors and government policy formulation, as it will look into the given issues, in the case of South Africa.

1.7 Structure of Thesis

This paper is divided into five chapters. Chapter 1 has given an introduction into the topic and the reasons for conducting this research. Chapter 2 shall review, contrast and compare past literature that has been conducted on this topic. Chapter 3 shall present the data and econometric methodology used to conduct this research. Chapter 4 shall present the model estimation and evaluation and results. Lastly, Chapter 5 shall discuss the findings and conclusions of this study.

Chapter Summary

This chapter has laid down the foundations and motivations behind conducting this study. The methodology which has been previously used to model the relationship between economic activity and stock returns was briefly discussed, and it was decided that Johansen(1991) cointegration followed by Granger causality(1969) would be the methodology employed to conduct this study. Empirical studies that have found differences in the significance, nature, causality and direction of causality, within different economies, were briefly discussed as they gave context to the reasons for this study. The fact that literature which has studied this relationship pre and post crisis times is limited, and does not

exist in the South African context gave background into the research problem. The above mentioned, therefore lead to the research objectives and research questions which this paper aims to address. Lastly, this study will be of great significance to both investors and policy makers as it will provide information on whether crisis times influence the relationship under investigation.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The purpose of this section is to review, compare and contrast past literature which has studied the relationship under investigation. The aim of the review is to reflect on and draw from conclusions reached from different studies, determine how to best move forward in conducting the proposed study, as well as to display the gaps in literature and how this study shall add to literature. Section 2.2 shall analyse studies that have examined the relationship between economic activity and financial sector with particular focus on how the relationship has been modelled, and the issues of interest and debate that have risen within this literature. Section 2.3 shall review South African studies whilst 2.4 shall examine results that have been found with respect to the relationships between other macroeconomic variables and the stock market. Lastly, the chapter summary shall give conclusions found within each section of this chapter.

2.2 Relationship Between Economic Activity And Financial Sector

2.2.1 Modelling The Relationship

Theoretically, increased economic activity is associated with a boost in consumer savings and investor confidence, and thus an increase in the profitability and value of firms. Similarly, an organized and managed stock market stimulates investment opportunities by recognizing and financing productive projects that lead to economic activity, mobilize domestic savings, allocate capital proficiency, help to diversify risks, and facilitate exchange of goods and services (Caporale et al, 2004), thus stock markets are expected to facilitate economic growth. A significant and positive relationship would therefore be expected between economic growth and stock market performance.

Dating back to 1986, Chen et al.(1986) tested whether innovations in macroeconomic variables were risks that were rewarded in the stock market. The motivation behind this study was to challenge the pitfalls of the Capital Asset Pricing Model(CAPM) introduced by Sharpe(1964), Linter(1965) and Mossin(1966). CAPM states that stock returns are merely rewards earned due to assets exposure to systematic or market risk, and no reward can be earned by bearing what is said to be diversifiable or company specific risk. The idea of challenging this was first introduced by Stephen A. Ross(1976), who challenged CAPM on a theoretical basis. Ross(1976) argued that on theoretical grounds, it is difficult to justify the assumption of normality in returns, made by CAPM, thus formulating the arbitrage pricing theory(APT) , which models stock market returns as a linear function of given macro-economic factors. Chen et al.(1986) then criticized CAPM on the basis that it fails to mention which market events are likely to influence all assets. The authors therefore empirically employed Ross´s(1976) APT together with United States(US) data for the period 1958-1984, to study the relationship between the macro economy and stock market. The study found that the relationship between stock market returns and industrial production was not only significant but also positive.

Motivated by Chen et al.(1986), Poon and Taylor(1991) conducted a similar study using United Kingdom(UK) data. The objectives of the study were to reconsider and investigate whether the results found by Chen et al.(1986) were applicable to UK stocks. The authors criticized Chen et al.´s(1986) study as they found that the results found by the given authors did not apply to UK stocks, because the relationship between industrial production and the stock market was in fact insignificant. Part of their criticism was that this could have been due to the fact that other macro-economic factors were at work, or the methodology employed by Chen at al.(1986) was inadequate for detecting such pricing relations, or even both explanations.

Later studies using the APT[1], in both developed and developing nations, include that of Levine and Zervos(1998). The authors found that plenty of theoretical literature studied the links between stock markets and long-run economic growth, but there was very little empirical evidence that supported these theories. The study therefore examined whether a strong empirical association existed between stock market development and long-run economic growth within 41 countries(both developed and developing), during the period 1976 to 1993. Through Cross Country Regressions, their finding was that stock market development was significantly positively associated with economic growth. These results were consistent with views that financial markets provide important services for growth (Levine & Zervos, 1998).

Though the above studies have found results that are both in support and contrary to theory, the empirical methodology-i.e. the APT- used to conduct them can be brought into questioning. Chen et al.(1986) pointed out that problems of misspecification could be present in using the APT as it ignores that economic data is non-stationary and ignores that stock-market returns can be serially correlated, thus meaning that lagged stock-market returns could hold predictive power. "'Classical' econometric theory assumes that observed data come from a stationary process, where means and variances are constant over time"(Hendry & Juselius, 2000). Hendry & Juselius(2000) conducted a study which displayed the importance of stationarity in econometric modelling. The authors found that graphs of economic time series, and historical records of economic forecasting, revealed that assuming stationarity in time series data was invalid. The APT is therefore not the best method in modelling stock-returns as it ignores non-stationarity. To deal with this issue, time series methods have been used as they provide methods in which the problem of stationarity can

[1] Other Studies that have used the APT methodology include Chen and Jordan (1993), Beenstock and Chan (1988), Clare and Thomas (1994) and Cheng (1996) all of whom analysed UK data, Ariff and Johnson (1990) using data for Singapore, Martikainen (1991) for Finland and Groenewold and Fraser (1997) for Australia (Groenewold, 2004).

be dealt with. Vector Autoregressive(VAR)[2] models are some of the famously used time series methods in modelling the relationship of interest. One such method is cointegration analysis, which was suggested first by Granger(1983) and was then extended by Engel and Granger(1987). This method assists in finding whether long run or short run relationships exist between variables, if they are ´´integrated of order one´´[3] and their linear combination is found to be stationary. In the study mentioned above, Hendry and Juselius(2000) used Monte Carlo simulations[4] and empirical examples and found that series can be transformed by means of differencing and cointegratiion combinations so that stationarity becomes a reasonable assumption. If cointegragtion is found between the set of given variables, a vector error correction model(VECM) can then be estimated followed by the Granger(1969) causality test in order to determine causality and direction of causality. Academic debates with respect to this method have been centred around the best way of identifying and estimating cointergration vectors. Strachan(2003) noted that two methods have been commonly used in identifying cointegration vectors, namely linear restrictions and the nonlinear method of Johansen's(1991) maximum likelihood procedure. Many studies have found that the linear method can produce invalid estimates whilst the Johansen(1991) approach always produces valid estimates (Strachan, 2003). The method that shall be employed to conduct this study shall therefore be the Johansen(1991) cointergration approach followed by Granger(1969) causality approach, in order to determine causality and direction of causality.

[2] A Vector Autoregressive model is a multivariate time series specification where lagged values of all the variables appear on the right hand side in all the equations of the unrestricted model.(Brooks, 2014)

[3] Integrated of order one is a property that occurs if the first difference of a non-stationary series is found to be stationary.

[4] Monte Carlo simulation is a numerical experimentation technique to obtain the statistics of the output variables of a system computational values of the input random variables are sampled based on their distributions, and the output variables are calculates using the computational model(Mahadevan, 1997)

2.2.2 Issues Concerning The Relationship

The studies that shall be reviewed next will be those that employed variations of VAR modelling. Amongst these studies issues that have been raised, with respect to the relationship between economic growth and stock market, have not only surrounded the significance and nature(positive or negative) of the relationship but also causality and direction of causality within the relationship. As mentioned earlier, theoretically, increased economic activity is associated with a boost in consumer savings and investor confidence, and thus an increase in the profitability and value of firms. Similarly, an organized and managed stock market stimulate investment opportunities by recognizing and financing productive projects that lead to economic activity, mobilize domestic savings, allocate capital proficiency, help to diversify risks, and facilitate exchange of goods and services (Caporale et al, 2004), thus stock markets are expected to facilitate economic growth. A significant and positive relationship would therefore be expected between economic growth and stock market performance. Some have found positive relationships (see Chen et al., 1986; Levine and Zervos, 1996; Groenweld, 2004; Shabaz et al., 2008; Al-Jarafi, 2011) whilst others have found negative relationships (see Brahmasrene and Jiranyakul, 2007). No satisfactory theory would argue that the relationship between financial markets and the macroeconomy is entirely in one direction(Chen et al. 1986). Some have found causality in the direction of economic growth to stock prices (see Groenewold, 2004; Du Toit and Moolman, 2005; Al-Jarafi, 2008; Shabbaz, 2008). Others have found causality in the direction of the stock market to economic growth (see Jefferis and Okeahalam, 2000; Caporale, 2004; Groenewold, 2004; Al-Jarafi et al., 2008; Shabbaz, 2008). Others have found no causality at all (see Nyasha and Odhiambo, 2014).

Demetriades and Luintel(2001) and Caporale et al.(2004) are amongst the authors who have used cointegration[5] methodology in order to study the relationship between stock market development and economic growth. Motivations behind such studies have been due to the fact that previous studies, such as those of Levine and Zervos(1998) and Atje and Jovanivic(1993), that had studied this relationship had conducted cross country regressions-using the APT- and thus gave a broad-brush picture of the relationship. Furthermore, results from these studies were viewed with caution because of the presence of issues such as endogeneity of variables, which weakened the effect of stock-market indicators, and therefore leading to robust results. Cointegration was thus used as it offered advantages of dealing with endogeneity and causality. Demitriades and Luintel(2001) found results that supported the view that stock markets are able to promote economic growth. A limitation faced in this study arose from the fact that long-time series of stock market development needed to be obtained, which narrowed down the focus of the analysis of five developed economies inclusive of Germany, The United States, Japan, France and The United Kingdom-, for the period 1972 to 1998. Absence of less-developed economies from the sample meant that no direct inferences could be made about the contribution of stock markets at early stages of economic development. Similar to Demitriades and Luintel(2001), Caporale(2004) also faced the same problems such that their chosen countries were due to data limitations. The countries studied included Argentina, Chile, Greece, Korea, Malaysia, Philippines and Portugal and data was for for the period 1977 to 1998. The study also showed that a well-developed stock market fostered economic growth in the long-run. In the light of the pitfalls experienced in the above studies Shabbaz et al. (2008) Al-Jafari et al.(2011) conducted studies inclusive of developing countries. Shabbaz et al.(2008) investigated whether there existed a long-run relationship between stock market development and economic growth-for the period 1971-2006- in Pakistan. The author stated

[5] Studies that have also used the cointegration method include Mukherjee and Naka (1995), Cheung and Ng (1998), Kwon and Shin(1999), Maysami and Koh (2000), Nasseh and Strauss (2000), McMillan (2001), Wongbangpo and Sharma (2001), Ibrahim and Aziz (2003), Karamustafa and Kucukkale (2003), Gunsekaraage et al. (2004), Chaudhuri and Smiles (2004), Gan et al. (2006) and Humpe and MacMillan (2009).

that though this relationship had been studied extensively in developed economies, testing this hypothesis was rare for developing economies. The study employed cointegration and found that a very strong positive relationship existed between stock market development and economic growth. Engle-Granger-Causality estimation confirmed a bi-directional causality between stock markets development and economic growth in the long-run. Al-Jafari et al. (2011), used cointegration to examine the links between macroeconomic variables and stock prices, during the period of January 2002 to December 2008, for 16 developed and 16 emerging markets. Empirical results showed that a significant causal relationship not only existed from the direction of real economic activity to stock prices, but also from stock prices to real economic activity for both developed and emerging markets. A positive long-run relationship between stock prices and the real economic activity was also found in developed markets, whilst this was not found for emerging markets. On the other hand, a positive short short-run relationship between stock prices and real economic activity was discovered for both developed and emerging markets. Al-Jarafi et al.´s study did however also suffer from short-time series data availability.

In this study the issue faced by some of the studies above, with respect to the need of long-time series data, will also be faced as it has only been 7 years since the crisis occurred. This therefore means that limited data points can be used to compare the pre and post crisis periods. This will be dealt with through the fact that only 4 other variables- in addition to economic growth- that are postulated to affect stock returns, shall be used in the regression and therefore limiting the robustness caused by losses in degrees of freedom. Furthermore, the issue of not being able to make inferences about the contribution of stock markets at early stages of economic development, due to the absence of less-developed economies shall not be faced as this study´s primary focus is on South Africa, which is a developing economy.

Brahmasrene and Jiranyakul (2007) examined the relationship between the stock market index and selected macroeconomic variables in Thailand, pre and post the 1997 financial

crisis, using cointegration analysis. As per the authors, the Thailand Stock exchange, which was inaugurated in 1975, was subject to international trading restrictions until its liberalization in 1992. The financial liberalization included lifting capital control measures, together with the Thai government urging capital inflows in both portfolio and foreign direct investment. This resulted in a substantial increase in the volume of stock trading. Under the fixed exchange rate regime prior to the financial crisis in 1997, Thailand saw large capital inflows, especially in terms of portfolio investment which nearly offset the huge current account deficits. The large capital inflows caused domestic financial institutions to lend a large number of loans to both firms and individual borrowers, whilst private investment also grew. The high rate of loans and increased private investment showed that domestic borrowers relied more on foreign capital inflows than domestic savings. The domestic interest rate then rose and caused a wide gap between domestic and foreign interest rates, inducing large capital inflows, dominantly in portfolio investment. This further induced capital inflows, mostly in portfolio investment. The 1997 financial crisis then had a devastating impact on the economy and a significant effect was noted due to exchange rate risk under the floating exchange rate regime which began in July 1997. The authors then suggested that different periods of time could capture different responses of stock prices to varying levels of macroeconomic activity as policy makers become more prudent in exercising monetary policy in times of crisis. The main objective of the study was to therefore investigate the effects of macroeconomic variables on stock market index/returns in Thailand during the post financial liberalization prior to the financial crisis (January 1992-June 1997) and after the financial crisis (July 1997-December 2003). Results were such that prior to the financial crisis in Thailand, the industrial production index negatively affected stock market index. This was therefore contradictory to the belief that there is a positive linkage between real activities and stock market. Post the financial crisis, no cointegration relationship was found. This therefore indicates that the crisis caused a structural break which changed the relationship between the stock market index and real economic activity. This study can also be criticized on the basis that the time periods under investigation were relatively short, and thus only offering narrow data points.

The authors ostudied the effect of only 6 variables on stock returns, therefore limiting robustness resulting from losses in degrees of freedom. Furthermore the study added to literature as no existing research had studied this relationship in Thailand using a unit root test and cointegration test during a period that contains a structural break.

Similar to Brahmasrene and Jiranyakul´s (2007) study, this research paper shall also add to literature as no existing research exists studying this relationship in South Africa, during a period that may contain a structural break.

2.3 South African Economic Activity And The Financial Sector

In South African literature a number of studies-though fairly limited- examining the relationship between economic activity and the stock market have been conducted using varied methods. These methods are inclusive of General Autoregressive Conditional Heteroskedasicity(GARCH) modelling (see Hsing, 2011; Mangani, 2008a), Smooth Transition Regression(STR) (see Bonga-Bonga and Makakabule, 2010), and Cointergration (see Enisan and Olufisayo, 2009; Du Toit and Moolman, 2005; Jefferis and Okeahalam, 2000).

Motivated by a shortage of studies that existed in studying African stock markets, and the interest to find out if stock markets were economically efficient and made a significant contribution to economic development-as they were considered to be illiquid in Africa- authors such as Jefferis and Okeahalam(2000), Du Toit and Moolman(2005), Enisan and Olufisayo(2009), Hsing(2011) and Nyasha and Odhiambo(2014), have used cointegration analysis in order to study the relationship between real economic activity and stock returns in Africa. Jefferis and Okeahalam(2000) studied the impact of both domestic and foreign economic factors on real stock market returns in South Africa, Zimbabwe and Botswana from 1985-1995. In the South African case, it was found that both short-run and long-run stock market returns were influenced by domestic GDP in a positive way. Du Toit and Moolman(2005) studied the relationship between the South African macro economy and

stock market, for the period between 1978 to 2000. Cointegration was found between variables such that an increase in gross domestic production(GDP) was found to cause an increase in the long-term level of stock returns. Enisan and Olufisayo(2009) examined the long run and causal relationship between stock market development and economic growth for seven countries in sub-Saharan Africa, for the period 1980-2004. Using the autoregressive distributed lag(ARDL) bounds test, the authors found that South African Stock Market Development was cointegrated with economic growth, finding that the stock market had a significant positive long-run impact on economic growth. Granger causality tests based on the Vector Error Correction(VECM) model, further showed that stock market development caused economic growth in South Africa, in the short-run. Hsing(2011) examined the effects of selected macroeconomic variables on the stock market index in South Africa for the period 1980-2010. Results were such that South Africa's stock market index was found to be positively influenced by the growth rate of real GDP. An ARDL bounds testing approach was also employed by Nyasha and Odhiambo(2014) in order to examine the impact of stock market development on economic growth in South Africa, for the period 1980-2012. The results failed to find any relationship between market-based development and economic growth. These results applied irrespective of whether the regression analysis was conducted for the short-run or long-run.

The above studies addressed some of the issues faced by the international studies above in that their primary focus was on South Africa, which is a developing economy. The South African Stock Market also happens to be the biggest stock market in Africa and was established in 1887. Data availability in conducting these studies was therefore not of great availability when compared to other developing economies. All these studies, with the exception of Olufisayo(2009), have found significant, positive and causal relationships between the real economic activity and the stock market, both in the long-run and short-run. None have studied this relationship in order to determine whether crisis times could introduce structural breaks. This study shall therefore add to this literature by determining whether

views consistent with the above studies held pre and post the 2008 global crisis, and also study whether the crisis introduced a structural break.

2.4 Other Macro Variables and the Financial Sector

An even wider variety of literature has focused on the relationship between a given number of macroeconomic variables and the stock market. Based on the theory that stock prices can be determined through discounting expected future cash flows of firms, Chen et al.(1986) were some of the very first academics to choose macroeconomic variables-which could influence stock value- based on their expected theoretical influence on firm cash flows and risk-adjusted discount rate. Much literature has then followed from this view, resulting in studies examining the relationship between the stock market and variables such as the exchange rate, inflation, money supply and interest rates.

Theoretically, inflation would be linked a rise in the production costs of firms or rise in revenues of firms. This would therefore lead to either a decrease or increase in future cash flows. Rising inflation would also ultimately lead to tighter monetary policy, which would therefore increase the required rate of return. If cash flows are depressed and discount rate increased due to increased Inflation a negative relationship would therefore be expected to exist between inflation and stock returns. If the effect on cash flows is such that they are increased, and this effect is greater than the increased discount rate effect, a positive relationship can then be expected. Amongst the APT studies reviewed above, Chen et al.(1986) found that stock market returns had a negative relationship with both unanticipated and expected inflation, but support against the zero null hypothesis of these results was weak. Similarly, Levine and Zervos(1998) found a negative relationship, but this was not consistent over the sample period. Contrary to the above and to theory, Poon et at.(1988) found insignificant contemporaneous relationships for both unanticipated and expected inflation. Reviewed international studies, which made use of cointegration analysis, that included inflation in their research are those of Aljarafi et al.(2011) and Brahmasrene and

Jiranyakul(2007). Aljarafi et al.(2011) found no long-run relationship between inflation and the stock market, whilst finding a two-way short-run relationship for both developed and emerging markets. Brahmasrene and Jiranyakul(2007) found that long-run and short-run relationships existed only during the pre-crisis period, whilst there was no cointegration relationship post the crisis. Amongst the South African studies, Hsing(2011) included inflation in his cointegration study. The author found that negative long and short-run relationships existed, stating that this was contrary to results found by authors such as Alagidede and Panagiotidis(2011), who suggested that stocks could be used as inflation hedges.

Theoretically, interest rates directly change the discount rate in the asset valuation model. An increase in the interest rate is linked to an increase in the discount rate, which in turn depresses the value of an asset. Furthermore, the opportunity cost associated with holding equities, when the interest rate increases, also increases as other asset classes would offer better returns than equities. This therefore leads to purchases being shifted away from equities and to other asset classes. A negative relationship would therefore be expected between the interest rate and stock prices. International cointegration studies that included interest rates are inclusive of those of Al Jarafi et al(2011) and Brahmasrene and Jiranyakul(2007); Brahamasrene and Jiranyakul(2007) found no long or short run relationship between the stock index and nominal interest rate, both pre and post the financial crisis. Though this is the case, unidirectional causality was found between the two variables. Al Jarafi et al.(2011) found a short-run negative causal relationship from the direction of stock prices to the real interest rate for both developed and emerging markets. In the case of South Africa, negative short-run and long-run causal relationships were found by Jefereis and Okeahalam(2011), Du Toit and Moolman(2005) and Hsing(2011). Causality was in the direction from interest rate to the stock index in the case of Jefferis and Okeahalam(2000) and Du Toit and Moolman(2005), whilst it was in the reverse direction in the case of Hsing(2011)

A depreciation of the local currency makes exporting goods cheaper and may lead to an increase in export sales and thus causing the profits of domestic export companies to increase, resulting in higher stock market value. In contrast to this, import costs increase with a currency depreciation. Therefore for importing firms, changes in the exchange rate will have opposite effects. An appreciation (depreciation) of the local currency leads to an increase (decrease) in the firm value of importing firms. The exchange rate could therefore have a negative or positive relationship with stock returns. In the international cointergration studies reviewed above, Brahamasrene and Jiranyakul(2007) found a negative long-run causal relationship from the direction of the nominal exchange rate to stock prices, pre-financial crisis, whilst no relationship was found post financial crisis. Al Jarafi et al.(2011), found that a significant short-run, negative causal relationship existed from the direction of the exchange rate to stock prices in both developed and emerging markets. With respect to South African studies, Jefferis and Okeahalam´s(2000) and Du Toit and Moolman´s(2005) found that short-term dynamics of the stock market were explained by the exchange rate in a positive way whilst Hsing(2011) found that the stock market index negatively affected the nominal effective exchange rate.

The role of money supply may have either a positive or negative effect on stock prices. When monetary policy is relaxed, this may lead to increased inflation. Depending on whether the inflationary effect is greater on revenues or production costs, this could result in an increase or decrease in stock value. An increase in money supply could also create an excess in the supply of money and thus an excess in the demand for equity through portfolio allocation, which would result in an increase in stock prices. In the international studies reviewed above, Brahmasrene and Jiranyakul(2007) and Al Jarafi(2011) were again, the authors that included money supply in their studies. Brahmasrene and Jiranyakul (2007) study showed that pre-financial crisis, money supply had a positive impact on the short and long-run level of the stock market index. Post-financial crisis cointegration existed such that money supply again was the only variable that affected the stock market index positively. Al-Jafari et al. (2011)

found that a significant positive causal relationship existed in the direction of stock prices to money supply. In the South African case, Hsing´s(2011) found that the stock market index was positively influenced by the ratio of the money supply to GDP.

This section of the review analysed the relationships between other macroeconomic variables and the stock index in the studies reviewed in the previous sections. Theoretically, positive or negative relationships would be expected between the stock index and inflation, exchange rate and money supply, whilst a negative relationship would be expected between the stock index and nominal interest rate. The studies above found results that are representative and contrary to theory, and this study shall draw from this literature by comparing results found to these studies, with particular emphasis on previous results found in South Africa.

Chapter Summary

This chapter has reviewed studies which have examined the relationship between real economic activity and stock market. Firstly, studies that employed a famously used method, the APT, were reviewed. These studies found results that were contrary and in support of the theory behind the given relationship. It was noted that the given method was formulated by Ross(1976) in criticism of the capital asset pricing model, but this method has flaws of its own. One particular flaw being that it assumes stationarity of variables, which is not a convincing assumption. This issue was then dealt with through the formulation of time series methods, one particular method being Johansen(1991) cointegration. It was then concluded that this would be the method employed by this research paper. Studies that have used this method were then reviewed. These studies also found conflicting results, showing that matters that have been of great debate and great interest are those concerning the significance, nature, causality and direction of causality with in the relationship. Limitations that were noted within these studies were those concerning data limitations and lack of developing markets studies. This research paper shall encounter similar problems with

respect to data availability, as there have only been seven years post the global crisis. This issue shall be dealt with through the use on only 4 other explanatory variables, thus limiting losses in degrees of freedom. South Africa is a developing market, therefore this research shall add to the lack of developing market studies. One other issue that arose was that of limited studies that have studied this relationship pre and post crisis times, as authors such a Brahasmerene and Jiranyakul(2007) have found that crisis situations can cause structural breaks within the relationship. No South African studies have been conducted in analysing structural breaks that can be caused by crisis times. This study shall therefore further add to literature as it will not only investigate the issues mentioned above, but also study the relationship pre and post the 2008 global crisis. South African studies were then reviewed, and it was found that they have differed in methodology with those that used cointegration finding similar results, in that the relationship was positive, with the exception of Olufisayo(2014) who found a negative relationship. Finally the relationship between the stock market and other macroeconomic variables within this literature was reviewed. These variables included inflation, interest rate, exchange rate and money supply. Results within these studies were in support of and contrary to theory, and this research paper shall study these relationships in comparison to results found in the reviewed studies.

CHAPTER 3: DATA AND METHODOLOGY

3.1 Introduction

This chapter discusses the data and methodology that is used in conducting this study. Section 3.2 discusses what measures are used as proxies for the variables of interest, as well as where these variables are obtained. Section 3.3 gives a detailed description of the cointegration methodology that shall be employed in this study. Firstly, the augmented dickey fuller test is explained(ADF), then the information criterion that is employed are briefly explained, and lastly the cointegration methodology is explained.

3.2 Data and Data Source

This research study shall analyse the relationship between real economic activity and the stock market, pre and post the 2008 global financial crisis, within the South African context. Similar to the studies reviewed in chapter two above, South African GDP growth is used as a measure of real economic activity whilst the Johannesburg Stock Exchange All Share Index(FTSE/JSE ALSI) is used to measure stock market performance. Section 2.4 above discusses how other variables have been included in past literature, due to their theorised influence on cash flows and the discount rate, which in turn affect stock value. These variables have been inclusive of the rate of inflation, nominal interest rate, exchange rate and money supply. Some of these studies have found that significant causal relationships exist between these variables and stock returns. This study therefore analyse the relationship between these variables and stock market returns. Inflation is measured using the year on year Consumer Price Index(CPI) growth- which has been the measure used by the South African studies reviewed above. The interest rate is proxied by the South African repo rate- which is the nominal rate at which the South African Reserve Bank(SARB) repurchases government securities from commercial banks. This particular measure has been chosen as

a proxy on the basis that it influences all required rates charged on South African assets. Similar to the South African Studies conducted above, the exchange rate measure is the SA-RAND/US-DOLLAR exchange rate. Lastly money supply is proxied using the M3 money supply measure. This measure was chosen because it is a broad measure inclusive all that would be considered to be ´´money´´, regardless of liquidity, and also due to its ease of availability.

The Data is sourced from Bloomberg, a leading international provider of financial and economic market data. Due to the availability of some of the given variables, the data is analysed on a quarterly basis, from January 2002 to December 2014. The pre-financial crisis period is considered to be that running from January 2002 to December 2007 whilst the post crisis period is from January 2009 to December 2014.

3.3 Methodology

Due to the benefits mentioned in chapter 2 above, the method that is used to conduct this study will be the Johansen (1991) cointegration followed by Granger (1969) causality. The steps included in this methodology are detailed below.

3.3.1 Augmented Dickey Fuller, Phillpis Perron and KPSS Unit Root Tests

This method of estimation is used based on the condition that even though at level form, the variables are non-stationary, they are integrated of order one(that is I(1))[11]. The first step is therefore to test for stationarity and order of integration. This is done by using the Augmented Dickey-Fuller(ADF)(Fuller, 1976; Dickey and Fuller, 1979) and Phillips-Perron(Phillips and Perron, 1988) unit root tests to test each variable. The equation for these tests is given by:

$$\Delta y_t = \theta y_{t-1} + \sum_{i=1}^{p} \omega_i \Delta y_{t-i} + u_t \qquad (1)$$

[11] Integrated of order one means that when non-stationary variables are differenced once, they then become stationary.

Where y_t is the variable being tested, Δy_t is the first difference and u_t are the errors. The first difference is taken into account to allow for autocorrelated errors. The hypotheses behind this test are as follows:

$$H_0: \theta = 0$$

$$H_1: \theta < 0$$

Where the null hypothesis states that the series follows a unit root, and is therefore non-stationary, and the alternative states that it is stationary. Since these tests assume a null hypothesis of non-stationarity, in contrast to the usual t tests, Dickey-Fuller(DF) tests are also known as tau tests. They therefore have a different set of critical values for the given test statistics, provided in Dickey and Fuller´s(1981) study. Phillip and Perron(1988) tests are similar to DF tests, but they incorporate an automatic correction to the DF procedure to allow for autocorrelated residuals(Brooks, 2014). In order to test for the robustness of the above mentioned tests, the Kwiatkowski, Phillips, Schmidt and Shin(KPSS) test will be used. This test has a null hypothesis of stationarity which is opposite to those of the ADF and PP. Though it is not entirely different to the ADF and PP, the alternative way in which the null hypothesis is stated helps to strengthen the ADF and PP. Furthermore, when the autoregressive coefficient of the ADF is close to 1, the test frequently rejects the null which is not the case with the KPSS. Furthermore as per Dejong et al, 1992 & Harris, 2003, ADF and PP tests are not reliable for small sample data sets due to their size and power properties. For small sample data sets, these tests tend to over-reject the null hypotheses when it is true and accept it when it is false.

3.3.2 Lag Length

Once the order of integration has been determined, the lag length that is most appropriate to use for the Vector Autoregressive Model(VAR)[12] must be determined. A method that has been suggested to be made use of in this identification stage is through visual analysis of graphical plots such as the autocorrelation function(acf)[13] or partial auto correlation function(pacf)[14]. This however, has proven to be insufficient when ´messy´ real data is used, and it rarely exhibits simple patterns of figures(Brooks, 2014). Methods that have then been used in order to avoid this are information criteria such as the Akaike's(1974) information criterion (AIC), Schwarz´s(1978) Bayesian information criterion (SBIC) and the Hannan-Quinn criterion(HQIC). The information criteria embody two factors. The first being a term which is a function of the residual sum of squares(RSS)[15] and the second being a penalty for the loss of degrees of freedom from adding extra parameters(Brooks, 2014). Therefore adding a new variable or an additional lag to a model will have two competing effects on the information criteria such that the residual sum of squares will fall but the value of the penalty term will increase(Brooks, 2014). When using this criterion, the point is to choose the number of parameters which minimizes the value of the information criteria. In terms of which criteria is better, SBIC is strongly consistent but inefficient, whilst the AIC is inconsistent but generally more efficient, overall then, no criterion is superior to others(Brooks, 2014)[16].

[12] A Vector Autoregressive model is a multivariate time series specification where lagged values of all the variables appear on the right hand side in all the equations of the unrestricted model.(Brooks, 2014)

[13] The autocorrelation function is a set of estimated values showing the strength of association between a variable and its previous values as the lag length increases(Brooks, 2014).

[14] The partial autocorrelation function measures the correlation of a variable with its value k periods ago-eg. k=1, 2,…-, after removing the effects of observations at all intermediate lags.

[15] Residual Sum of Squares is the addition of all the squared values of the difference between the actual data points and the corresponding model fitted values.(Brooks, 2014)

[16] This means that SBIC will asymptotically deliver the correct model order whilst the AIC will deliver on average a model that is too large and on other hand, the average variation in selected model orders from different samples within a given population will be greater in the context of SBIC than AIC(Brooks, 2014)

3.3.3 Cointegration and Granger Causality

After unit root tests are conducted, cointegration analysis can be run if the variables are found to be I(1). This methodology was established first by Granger(1983), then extended by Engel and Granger(1987) and then further developed by Johansen(1991). Engle and Granger (1987) determined means for testing for cointegration in a single equation, whilst Johansen(1991) did so for multiple equations. The Johansen multivariate model shall therefore be applied in this study in order to determine whether long-run relationships exist amongst the given series. This model is based on the Vector Error Correction model(VECM) which determines an error correction term in order to correct for short-run disturbances. The multivariate equation is as follows:

$$\Delta Y_t = \forall_1 \Delta Y_{t-1} + \forall_2 \Delta Y_{t-2} + \cdots + \forall_{k-1} \Delta Y_{t-k+1} + \prod Y_{t-k} + \mu + \vartheta D_t + \epsilon_t \quad (2)$$

$$where\ \forall_i = -I + \prod_1 + \prod_2 + \ldots + \prod_i\ for\ i = 1,2,\ldots,k-1 \quad (3)$$

$$\prod = -I + \prod_1 + \prod_2 + \ldots + \prod_k\ I\ is\ an\ identity\ matrix \quad (4)$$

In the above equations, ΔY_t is the first difference of the time seriers variables. The matrix $\forall_i$ comprises the short term adjustment parameters, and matrix Π contains the long term equilibrium relationship information between the Y variables. The Π matrix can be decomposed into the product of two n by r matrices α and β so that Π = αβ where the β matrix contains r cointegration vectors and α represents the speed of adjustment parameters. The impact of matrix Π is therefore found as the coeffiecient of the lagged levels in a nonlinear least squares regression of ΔY_t on lagged differences and lagged levels.

Once relationships between the given series are found, granger causality tests can be conducted in order to determine whether one series affects another. The usefulness of this test depends on the stationarity of the system such that if the series is stationary, the null

hypothesis of no Granger(1969) causality can be test using the Wald test. The following equations can be used to test for Granger causality:

Causality from series Y to series X:

$$\Delta X_t = a_x + \sum \beta_{x,i} \Delta X_{t-i} + \sum w_{x,i} \Delta Y_{t-i} + \sigma_x ECT_{X,T-I} + \in_{x,t} \quad (5)$$

Causality from series X to series Y:

$$\Delta Y_t = a_x + \sum \beta_{y,i} \Delta X_{t-i} + \sum w_{y,i} \Delta X_{t-i} + \sigma_y ECT_{y,t-I} + \in_{y,t} \quad (6)$$

ΔX_t and ΔY_t are the first difference of time series variable. σ_x and σ_y are the parameters of the Error Correction Term(ECT) , which measure the error correction mechanism that drives the X_t andY_t back to their long run equilibrium relationship. This is tested using the F-test, under the null hypothesis of no causality.

Chapter Summary

This chapter discussed the data and methodology that shall be used in examining the proposed relationships. First the data that shall be used as proxies for the variables of interest was discussed. It was concluded that GDP growth will be used as a measure of real economic activity whilst the FTSE/JSE ALSI will be used as a measure of stock market performance. It was then decided that CPI growth would be used as a measure of inflation, SA repo rate as a measure of the nominal interest rate, Rand/Dollar exchange rate as a measure of the exchange rate and lastly, M3 money as a measure of money supply. The source of data was identified as Bloomberg, and because of the quarterly availability of some of the given variables, the data will be analysed on a quarterly basis. The pre-financial crisis period will be considered to be that running from January 2002 to December 2007 whilst the post crisis period will be that running from January 2009 to December 2014. The methodology that shall be employed was then discussed. Firstly Augmented Dickey-Fuller(1979) and Phillip-Perron(1988) tests were discussed and stated as the methods that

shall be used to test for stationarity. Secondly, the information criteria was discussed and proposed as the method that shall be used in order to determine the lag length. Lastly, cointegration- as defined by Johansen(1991)- together with causality- as defined by Granger(1969)- were discussed, showing how long-run and short-run relationships would be analysed as well as how causality would be analysed.

CHAPTER 4: MODEL ESTIMATION AND RESULTS

4.1 Introduction

In this chapter, the model estimation and evaluation are done. Section 4.2 conducts unit root tests on the variables of interest whilst section 4.3 conducts Vector Autoregressive models, for both the pre and post crisis periods. Section 4.4 includes diagnostic testing whilst section 4.5 conducts impulse response function and variance decomposition analysis. Lastly, section 4.6 conducts granger causality testing.

4.2 Unit Root Tests

Here, unit root tests are conducted in order to determine the order of integration of the variables of interest. The variables are first logged transformed in order to scale and smooth the series. During the post-crisis period, GDP contracted for certain quarters, therefore the post-crisis GDP series is inclusive of negative values. As log transformations of negative values are undefined, the log-modulus[27] transformation is used in this instance. As mentioned in chapter 3 above, the Augmented Dickey-Fuller (ADF) test is used in order test for stationarity. The Phillips-Perron test is also used in order to check the validity of the ADF results, as this test incorporates an automatic correction to the ADF procedure to allow for autocorrelated residuals. The KPSS test is then run in order to evaluate the robustness of the ADF and PP results. As mentioned in chapter 3, the KPSS has a null hypothesis of stationarity, which is opposite to those of the ADF and PP. Though it is not entirely different to the ADF and PP, the alternative way in which the null hypothesis is stated helps to strengthen the ADF and PP. Furthermore, when the autoregressive coefficient of the ADF is close to 1, the test frequently rejects the null, which is not the case with the KPSS.

[27] The log-moduls transformation is a technique that can be used to smooth data when variables have negative values, and the usual log transformation cannot be used. The transformation takes the logarithm of the absolute value of the variable plus 1.

Furthermore as per Dejong et al. (1992) & Harris(2003), ADF and PP tests are not reliable for small sample data sets due to their size and power properties. For small sample data sets, these tests tend to over-reject the null hypotheses when it is true and accept it when it is false. Results that are therefore chosen in moving forward with the analysis are those obtained from the KPSS, if they are found to be contradictory to the ADF and PP tests.

4.2.1 Pre-crisis Unit Root Tests

Table 4.1: Unit Root Tests: ADF and PP

Variable	**ADF Test**		**PP Test**		**Order of Integreation**
	Without Trend	With Trend	Without Trend	With Trend	
All Share Index	0.681 [0.99]	-3.28 [0.095]	0.447 [0.98]	-3.44 [0.071]	I(1)
Δ All Share Index	-3.58** [0.015]	-3.76** [0.039]	-3.53** [0.017]	-3.74** [0.041]	
GDP Growth	-1.56 [0.49]	-1.94 [0.6]	-1.55 [0.49]	-2.12 [0.50]	I(1)
Δ GDP Growth	-4.95*** [0.0007]	-4.85*** [0.0043]	-4.96*** [0.0007]	-4.85*** [0.0043]	
Interest Rate	-2.01 [0.28]	0.20 [0.996]	-1.24 [0.64]	-0.35 [0.98]	neither
Δ Interest Rate	-2.2 [0.21]	-5.36*** [0.0023]	-2.2 [0.21]	-2.86 [0.19]	
Inflation	-1.56 [0.48]	-1.55 [0.78]	-1.72 [0.4]	-1.69 [0.72]	I(1)
Δ Inflation	-3.85*** [0.0085]	-3.89** [0.03]	-3.84*** [0.0084]	3.86** [0.033]	
Exchange Rate	-3.02** [0.048]	-2.13 [0.5]	-3.22** [0.032]	-2.53 [0.31]	I(1) with trend
Δ Exchange	-4.81***	-5.48***	-4.81***	-5.57***	

Rate	[0.0010]	[0.0011]	[0.0010]	[0.0009]	
Money Supply	-1.47 [0.53]	-3.26 [0.1021]	-1.21 [0.65]	-2.17 [0.48]	I(1)
Δ Money Supply	-2.8 [0.0773]	-2.57 [0.30]	6.11*** [0.0001]	-6.39*** [0.0002]	

** indicates significance at the 5% level whilst *** indicates significance at the 1% level. The values in square brackets indicate the respective p-values.

Table 4.2: Unit Root Tests: KPSS

Variable	**KPSS Test**		**Order of Integreation**
	Without Trend	With Trend	
All Share Index	0.64**	0.15**	I(1)
Δ All Share Index	0.34	0.17**	
GDP Growth	0.49**	0.087	I(0) with trend stationarity
Δ GDP Growth	0.1	0.087	
Interest Rate	0.31	0.17**	I(0)
Δ Interest Rate	0.32	0.12	
Inflation	0.14	0.13	I(0)
Δ Inflation	0.14	0.067	
Exchange Rate	0.35	0.17	I(0)
Δ Exchange Rate	0.49**	0.13	
Money Supply	0.36	0.15	I(0)
Δ Money Supply	0.25	0.12	

** indicates significance at the 5% level whilst *** indicates significance at the 1% level.

Table 4.1 above reports results obtained from conducting ADF and PP unit root tests on the variables under study, whilst Table 4.2 reports results from the KPSS test-for the pre-crisis period-. As these results are sensitive to whether a trend term is included or not, the tests are conducted both with and without trend. Furthermore, results are sensitive to the lag legnth chosen, and therefore since this study makes use of quarterly data, a lag length of 4 is used

where needed. As per the ADF and PP, the pre-crisis ALSI is I(1) as both these tests do not reject the null hypothesis of non-stationarity at level form and yet do reject this hypothesis in differenced form, whether a trend term is included or not. This result is confirmed by the KPSS as the null hyposthesis of stationarity is rejected at level form but not rejected in differenced form. GDP growth is I(1) under the ADF and PP hypothesis whether a trend term is included or not, whilst it is I(1) in the test without trend or I(0) with trend stationarity under the KPSS. Since the trend term is significant in the KPSS test with trend, it is therefore concluded that pre-crisis GDP growth is I(0) with trend stationarity. The interest rate is I(1) only when a trend term is included in the ADF test, but as mentioned in chapter 3 the PP is marginally superior to the ADF as it allows for autocorrelated risiduals, and under this test the interest rate is neither I(0) nor I(1), regardless of whether a trend term is added or not. The KPSS test does however contradict this result as the KPSS test without trend shows that the interests rate is I(0), whilst that with trend shows that the variable is I(1). The trend term in the KPSS in this instance is significant, therefore when this variable is detrended it can be concluded that the pre-crisis interest rate is I(1). Inflation and money supply are I(1) under the ADF and PP tests, with or without trend. The KPSS contradicts these results as they are I(0) with or without trend included in the tests. As per ADF and PP, the exchange rate is I(0) without trend, but I(1) when a trend term is included. This result is contradicted by the KPSS as it is I(0) with or without trend imcluded in the test. During this period, it appears as though the ALSI was the only I(1) variable, whilst all the others were I(0) or I(0) with trend stationarity.

4.2.2 Post-crisis ADF and Phillips-Perron Unit Root Tests

Table 4.3: Unit Root Tests: ADF and PP

Variable	**ADF Test**		**PP Test**		**Order of Integreation**
	Without Trend	With Trend	Without Trend	With Trend	
All Share Index	-1.57 [0.48]	-3.05 [0.1414]	-1.64 [0.45]	-3.01 [0.1506]	I(1)
Δ All Share Index	-4.59*** [0.0017]	-4.48*** [0.0098]	-5.74*** [0.0001]	-5.12*** [0.0024]	
GDP Growth	-3.21** [0.0325]	-3.35 [0.0831]	-3.21** [0.0325]	-3.34 [0.0854]	I(0)
Δ GDP Growth	-6.6*** [0.000]	-6.49*** [0.0001]	-7.95*** [0.000]	-10.7*** [0.000]	
Interest Rate	-5.42*** [0.0002]	-3.18 [0.1121]	-5.19*** [0.0004]	--3.13 [0.1235]	I(1)
Δ Interest Rate	-5.52*** [0.0002]	-6.45*** [0.0002]	-5.55*** [0.0002]	-6.82*** [0.0001]	
Inflation	-2.63 [0.1017]	-2.73 [0.24]	-2.49 [0.1316]	-2.57 [0.2936]	neither
Δ Inflation	-2.92 [0.0589]	-2.72 [0.2371]	-2.92 [0.0589]	-2.72 [0.2371]	
Exchange Rate	-0.35 [0.9023]	-4.1** [0.0229]	-0.46 [0.8830]	-4.42*** [0.0099]	I(0) with trend stationarity
Δ Exchange Rate	-5.6*** [0.0002]	-5.57*** [0.0009]	-5.89*** [0.0001]	-6.82*** [0.0001]	
Money Supply	-1.99 [0.29]	-3.022 [0.1477]	-2.31 [0.1773]	-3.08 [0.13]	I(1)
Δ Money Supply	-3.37** [0.0237]	-4.82*** [0.0057]	-3.47** [0.0192]	-3.13 [0.0.12]	

** indicates significance at the 5% level whilst *** indicates significance at the 1% level. The values in square brackets indicate the respective p-values.

Table 4.4: Unit Root Tests: KPSS

Variable	**KPSS Test**		**Order of Integreation**
	Without Trend	With Trend	
All Share Index	0.70**	0.089	I(0) with trend stationarity
∆ *All Share Index*	0.22	0.12	
GDP Growth	0.21	0.17**	I(0)
∆ *GDP Growth*	0.43	0.28***	
Interest Rate	0.52**	0.18**	I(1)
∆ *Interest Rate*	0.0.63**	0.11	
Inflation	0.12	0.10	I(0)
∆ *Inflation*	0.18	0.13	
Exchange Rate	0.52**	0.17**	I(1)
∆ *Exchange Rate*	0.54**	0.14	
Money Supply	0.30	0.07	I(0)
∆ *Money Supply*	0.13	0.11	

** indicates significance at the 5% level whilst *** indicates significance at the 1% level.

Tables 4.3 and 4.4 above report results from ADF, PP and KPSS tests conducted on the varibles for the post crisis period. As per ADF and PP, the ALSI is I(1) when the tests are conducted with or without trend. This result is different as per the KPSS as the ALSI is I(1) without trend but I(0) with trend. When using the ADF and PP tests, GDP is I(0) in the test without trend, whilst it is I(1) in the test with trend. The KPSS reports similar results, but differs in that the test with the trend term shows that GDP is neither I(0) nor I(1), but the trend

term is insignificant. It is therefore concluded that GDP is I(0). As per the ADF and PP, the interest rate is I(0) in the test without trend, whilst it is I(1) in the test with trend. This result is confirmed by the KPSS test, and because the trend term is significant in all tests, it is concluded that the interest rate is I(1). The ADF and PP show that inflation is neither I(0) or I(1), with or without trend, whilst the KPSS contradicts this and shows that it is I(0) with or without trend. The exchange rate is I(1) without trend whilst it is I(0) with trend as per the ADF and PP. The KPSS refutes this result as it is I(1) with trend, with a significant trend term. Lastly, the money supply is I(1) as per the ADF and PP tests with or without trend, but the KPSS shows that it is I(0), with or without trend. During the post cris period, variables that were therefore I(1) were ther interest rate and exchange rate, whilst all other variables appear to have been I(0).

4.3 Vector Autoregressive Modelling

The above results show that not all variables were I(1) during the periods under study. As mentioned in earlier chapters the small sample sizes, which are due to data limitations, used in this study play a role in the non-robust nature of the results experienced in unit root testing. This therefore means that the unit root conditions that are required in order to be able to estimate cointegration relationships are not met. Since these conditions are not met the relationships of interest shall be studied using VAR models in first differences. A VAR model is a multivariate time series specification which determines the linear relationships between multiple time-series variables and the lagged values of these variables. VAR modelling is applicable irrespective of whether the underlying regressors are purely I(0) or purely I(1). It allows for all variables in the model to be endogenous and explains their evolution during the period under study. This therefore allows for the objectives of this study to still be examined even though long run relationships cannot be examined. Furthermore, estimating VARs enables the study of how variables react when a shock is applied to or other variables or themselves-known as impulse response functions- as well as variance decomposition-which

tells us how much of the variability in one variable is explained by shocks to other variables-. Therefore, as the relationship of interest is between the stock market and economic growth, the impulse response functions and variance decompositions of these variables with respect to each other shall be studied.

4.3.1 Optimal Lag Length

As discussed in chapter 3, once the order of integration has been determined, the lag length that is most appropriate to use for the Vector Autoregressive Model(VAR) must be determined, as the results obtained in the models are subject to the lag order. As decided in chapter 3, this is done using information criterion.

Table 4.5: Pre-Crisis Lag Order Selection

Lag	LogL	AIC	SC	HQ
0	82.99898	-7.333237	-7.034802*	-7.268469
1	126.7047	-8.067116	-5.978072	-7.61374
2	180.4509	-9.757230*	-5.877575	-8.915245*

* indicates lag order selected by the criterion

Table 4.6: Post-Crisis Lag Order Selection

Lag	LogL	AIC	SC	HQ
0	121.8555	-11.03385	-10.73542*	-10.96908
1	155.5787	-10.81702	-8.727974	-10.36364
2	209.7896	-12.55139*	-8.671736	-11.70941*

* indicates lag order selected by the criterion

Tables 4.5 and 4.6 above, display results which aid in choosing the appropriate lag length for the estimated VARs, as per the information criteria, for the pre and post crisis periods

respectively. With the exception of Schwarz´s(1978) Bayesian information criterion (SBIC) the Akaike's(1974) information criterion (AIC), Hannan-Quinn criterion(HQIC) criterion indicate that the optimal lag length is 2 for both pre and post crisis periods.

4.3.2 Vector Autoregressive Models

The estimates obtained from the VAR models were insignificant at the usual 5% and 1% significance levels, for both pre and post crisis periods. This therefore means that the null hypothesis of there being relationship between the stock market and economic growth is rejected, and similarly this null hypothesis is rejected for all other macroeconomic variables included in this study. The VARs conducted for both the pre and post crisis periods, displayed too many coefficients and parameters, therefore making the model fit and thus validity and robustness of the results questionable. This is an issue which could further stem from the data limitations faced in the study. The issue regarding the validity and robustness of the obtained results is further investigated in the diagnostic testing below.

4.4 Diagnostic Testing

In order to evaluate the validity and fit of the given models, diagnostic testing is conducted. This is done through testing whether the residuals from the estimated VARs are serially correlated[28] or not. This is done through the use of the Breusch–Godfrey serial correlation LM test, where the null hypothesis states that there is no serial correlation.

[28] Serial correlation exists when a variable is correlated with its lags. This is a problem in any regression model run, because it means that the variables in the model do not fully explain each other and that there are variables missing in the model, thus meaning the model does not have a proper fit.

Table 4.7: Pre-Crisis LM Test

Lags	LM-Stat	Prob
1	NA	NA
2	221.7353	0.0000
3	NA	NA
4	222.9036	0.0000
5	225.2597	0.0000
6	236.1666	0.0000
7	221.0684	0.0000
8	235.0869	0.0000
9	219.9290	0.0000
10	NA	NA
11	238.4357	0.0000
12	NA	NA

Table 4.8: Post-Crisis LM Test

Lags	LM-Stat	Prob
1	232.5386	0.0000
2	230.9300	0.0000
3	NA	NA
4	226.4124	0.0000
5	228.2930	0.0000
6	236.8284	0.0000
7	229.6446	0.0000
8	NA	NA
9	233.7679	0.0000
10	232.6873	0.0000
11	NA	NA
12	NA	NA

Tables 4.7 and 4.8 above display tests for serial correlation within the residuals for the VAR models. During both periods, the null hypothesis of no serial correlation is rejected at all lags. This therefore means that the validities and fits of the VARs are inappropriate and the results are not robust. This could be due to the fact that there are other factors that were not accounted for, data limitations or both. The fit of these models therefore presents limitations in answering the reserach questions of significance, nature of the relationship and causality between real economic activity and stock market within this study. Impulse response functions together with variance decomposition and granger causality shall therefore be employed in the next sections in order to address the research questions.

4.5 Impulse Response Function And Variance Decomposition

4.5.1 Impulse Response Functions

Though the results from the estimated VARs cannot be used in evaluating the relationship between real economic activity and the stock market, the impulse response functions of these variables with respect to each other can be studied. Impulse response functions enable us to study the response of one variable when a shock is added to another. They therefore give information on whether changes in the value of a given variable will have a positive or negative effect on other variables, thus enabling us to investigate the research question pertaining to the nature of the relationship between real economic activity and the stock market during the periods under study. The shocks are induced through the use of the VAR residuals. If the error terms in the VARs are correlated, then it is likely that a shock in one variable may be accompanied by a shock to another variable, meaning that the reactive variable may be responding to shocks to either one or both of the variables with the implemented shocks. The impulse response functions conducted here are therefore conducted using the Cholesky one standard deviation innovations, where the decomposition

is such that changes in one component have no effect on changes to other components as the components are uncorrelated when using this method.

Figure 4.1: Pre-Crisis ALSI Impulse Response to GDP

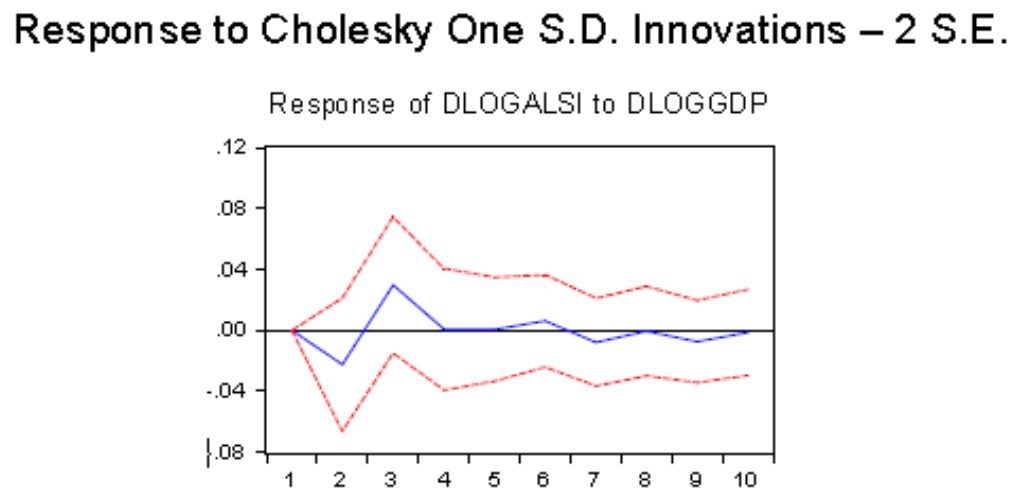


Figure 4.2: Post-Crisis ALSI Impulse Response to GDP

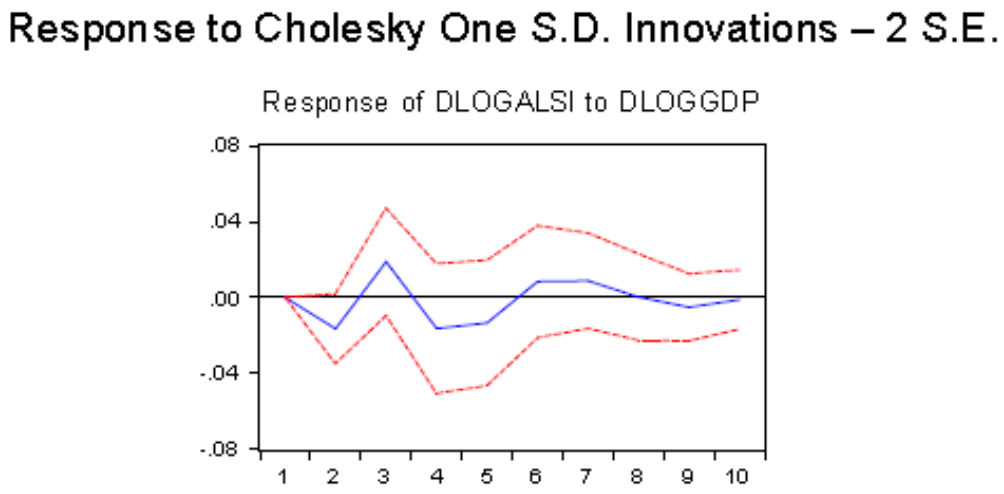


Figure 4.3: Pre-Crisis GDP Impulse Response to ALSI

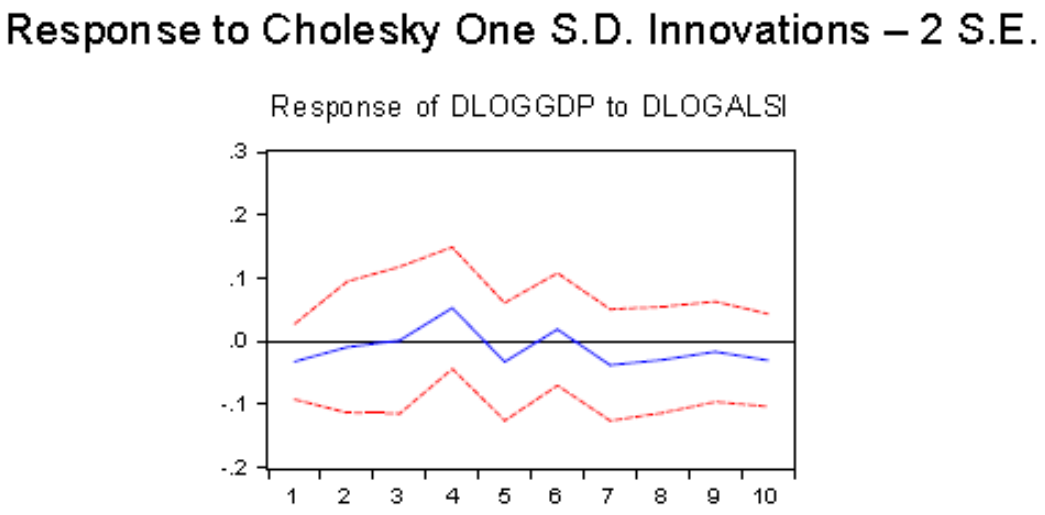
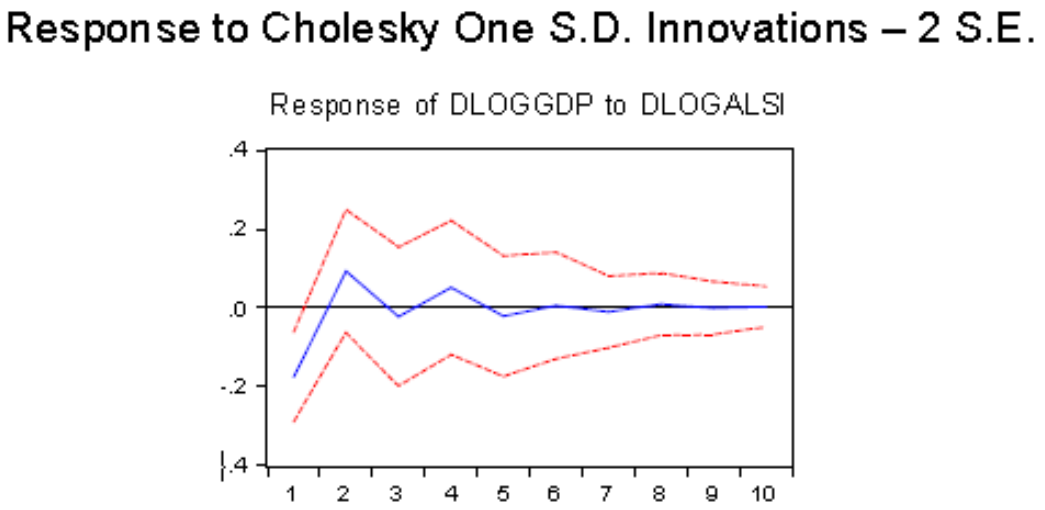


Figure 4.4: Post Crisis GDP Impulse Response to ALSI



Figures 4.1 and 4.2 above display the impulse response functions of the ALSI to shocks to GDP, whilst 4.3 and 4.4 display impulse response functions of GDP to shocks to the ALSI, for pre and post crisis periods respectively. Theoretically, increased economic activity is associated with a boost in consumer savings and investor confidence, and thus an increase in the profitability and value of firms. Similarly, an organized and managed stock market stimulates investment opportunities by recognizing and financing productive projects that lead to economic activity, mobilize domestic savings, allocate capital proficiency, help to diversify risks, and facilitate exchange of goods and services (Caporale et al, 2004), thus

stock markets are expected to facilitate economic growth. A significant and positive causal relationship would therefore be expected between economic growth and stock market performance, from both directions. During both pre and post crisis periods, the initial response of the ALSI to a shock to GDP is negative followed by a recovery back to being positive in the second quarter, remaining significant until the 4th quarter. The initial response of GDP to a shock in the ALSI is positive during both periods. During the pre-crisis period, the relationship becomes insignificant just after the 4th quarter, whilst it does so immediately after the second period during the post crisis period. The results obtained from the impulse response functions above are both contrary to and in support of theory, as they show that the ALSI instantaneously had a negative response to a shock in GDP whilst GDP reacted positively to a shock in the ALSI. In answering the research questions with respect to the significance, nature of the relationship and differences between pre and post crisis periods, we can therefore conclude that there was an immediate negative response with respect to real economic activity affecting stock market performance, whilst there was an immediate positive response with respect to stock market performance affecting real economic activity during both periods. The results of a positive response in the direction from stock market performance to real economic activity not only confirm the theorised relationship but are also similar to those found by Jefferis and Okeahalam(2000), Du Toit and Moolman(2005) and Hsing(2011), in the South African context. The results of a negative response in the direction of real economic activity to stock market performance affecting real economic activity is similar to that found by Brahmasrene and Jiranyakul(2007) in the case of the Thailand stock market and real economic activity. The authors stated that the reasoning behind such an unexpected result stems from prudent monetary policy due to large capital inflows into an economy.

4.5.2 Variance Decomposition

To further aid in answering the research question with respect to the nature of the relationship, variance decompositions of the ALSI and GDP growth are conducted. Variance decomposition tells us how much of the variability in one variable is explained by variability due to shocks in other variables in the system. This therefore tells us the amount of information each variable contributes to other variables in the VAR.

Table 4.9: Pre-Crisis ALSI Variance Decomposition

Period	S.E.	ALSI	GDP	EXCHANGE RATE	INFLATION	INTEREST RATE	MONEY SYPPLY
1	0.089106	100	0	0	0	0	0
2	0.101026	80.10589	4.929109	11.7275	0.000121	1.585243	1.652132
3	0.107835	72.16092	12.01489	10.88692	2.004663	1.427366	1.505245
4	0.110054	70.1865	11.53994	10.50229	1.993571	1.597333	4.180367
5	0.114079	65.32191	10.74374	13.3774	4.065065	1.721408	4.770478
6	0.114774	64.9803	10.90492	13.48546	4.156853	1.7309	4.741563
7	0.117731	62.98018	10.80165	12.81705	5.861591	2.771865	4.76766
8	0.118204	62.61107	10.7172	12.71933	6.069499	2.763811	5.119097
9	0.120702	61.57372	10.6551	13.89527	6.177453	2.769292	4.929168
10	0.122017	61.54617	10.43749	13.93216	6.4474	2.745255	4.89152
11	0.124384	61.48047	10.3704	14.14201	6.332538	2.729867	4.944721
12	0.126346	61.04476	10.06552	14.9591	6.312763	2.650329	4.96753

Table 4.10: Post-Crisis ALSI Variance Decomposition

Period	S.E.	ALSI	GDP	EXCHANGE RATE	INFLATION	INTEREST RATE	MONEY SUPPLY
1	0.029221	100	0	0	0	0	0
2	0.054681	37.50562	9.074945	35.61616	15.68921	0.131579	1.982484
3	0.065473	43.94411	14.66352	26.34183	13.23622	0.257207	1.557107
4	0.074274	39.63091	16.27869	22.09076	10.72934	0.3929	10.8774

5	0.076576	38.73771	18.40981	20.79218	10.9796	0.452632	10.62807
6	0.078517	37.84078	18.65566	21.80598	11.06198	0.431402	10.20419
7	0.080041	37.64038	19.17146	22.22099	10.68652	0.418565	9.862089
8	0.080168	37.70185	19.11116	22.15979	10.65785	0.497742	9.871607
9	0.080706	37.23417	19.26704	22.57779	10.52803	0.532876	9.860086
10	0.080831	37.21811	19.22633	22.67472	10.51778	0.531303	9.831755
11	0.080956	37.10454	19.32219	22.69931	10.54244	0.530306	9.801207
12	0.081054	37.0682	19.27796	22.78413	10.53947	0.535341	9.794891

Table 4.11: Pre-Crisis GDP Variance Decomposition

Period	S.E.	GDP	ALSI	EXCHANGE RATE	INFLATION	INTEREST RATE	MONEY SYPPLY
1	0.13895	93.16982	5.353429	1.476751	0	0	0
2	0.189789	52.20658	3.111516	36.05245	7.24649	0.916442	0.46653
3	0.203935	45.46025	2.701959	36.13734	10.00614	1.145566	4.548743
4	0.216323	40.46093	8.44206	32.17216	8.903574	1.451217	8.570061
5	0.225245	41.31702	9.857127	29.68313	8.637301	2.598824	7.906595
6	0.23343	40.68816	9.853381	29.84723	8.952779	2.555674	8.10277
7	0.240389	39.12021	11.74183	28.91959	9.09542	2.700308	8.422636
8	0.245951	37.54713	12.64226	27.8921	9.417519	2.671827	9.829165
9	0.247816	37.05178	12.89575	28.23552	9.4037	2.721453	9.691802
10	0.251364	36.3686	13.98085	27.49234	9.849709	2.888234	9.420265
11	0.252706	36.04107	14.01916	27.43586	9.833518	3.141204	9.529182
12	0.256044	35.23437	14.36977	28.42584	9.579412	3.107987	9.282617

Table 4.12: Post-Crisis GDP Variance Decomposition

Period	S.E.	GDP	ALSI	EXCHANGE RATE	INFLATION	INTEREST RATE	MONEY SUPPLY
1	0.290319	46.90317	36.67978	16.41704	0	0	0
2	0.345794	44.79642	33.16881	12.2588	0.428366	0.631714	8.715888
3	0.36955	43.76004	29.40397	11.2279	1.981453	1.190311	12.43633
4	0.379417	41.6781	29.74235	10.72788	1.890367	1.191042	14.77027
5	0.384514	41.81932	29.26859	10.87921	2.408555	1.24252	14.3818
6	0.387827	41.32238	28.79209	11.42067	2.699153	1.422254	14.34346
7	0.389735	40.91877	28.58326	11.4598	2.806231	1.469289	14.76266
8	0.390788	40.75755	28.48604	11.56948	2.858518	1.469362	14.85906
9	0.391488	40.72989	28.38443	11.53191	2.949777	1.469996	14.934
10	0.391918	40.66784	28.32781	11.59325	2.970506	1.472599	14.96799
11	0.392204	40.63166	28.33985	11.57741	2.967044	1.470763	15.01327
12	0.392345	40.61738	28.3271	11.57777	2.966122	1.469875	15.04174

Tables 4.9 and 4.10 above display the variance decompositions of the ALSI whilst 4.11 and 4.12 display the variance decompositions of the GDP, each over 12 periods. The ALSI has 100% of its variability explained by the variability in itself during the first quarter, and during the other quarters most of its variability is due to variability itself, followed by the exchange rate and then by variability in GDP, for both the pre and post crisis periods. GDP has most of its variability explained first by variability in itself and then by variability in the exchange rate during all 12 quarters in the pre-crisis period, but has its variability explained first by variability in itself and by variability in the ALSI during the post crisis period.

4.6 Granger Causality

In order to answer the research question pertaining to causality and direction of causality, ganger causality tests are conducted and reported below. As mentioned in chapter 3, the null hypothesis of no Granger(1969) causality can be test using the Wald test and examining the F-test statistic.

Table 4.13: Pre-crisis Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause ALSI	21	1.29854	0.3002
ALSI does not Granger Cause GDP		0.00351	0.9965

Table 4.14: Post-Crisis Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause ALSI	21	6.73943	0.0075
ALSI does not Granger Cause GDP		0.2892	0.7527

Tables 4.13 and 4.14 above report granger causality results for the pre and post crisis periods, respectively. In all instances, the tests do not reject the null hypothesis of no granger causality from either direction, during both pre and post crisis periods.

Chapter Summary

In this chapter, the model estimation and evaluation was conducted. Unit root tests were first conducted in order to determine the order of integration of the variables of interests. All variables were found to have different orders of integration, with some being I(0). Cointegration could therefore not be conducted. Vector Autoregressive models were therefore conducted as they could still aid in answering the research questions within this

paper. The VAR models produced too many coefficients and parameters, with the residual tests showing that the model residuals were correlated. The fit and validity of the models was therefore inefficient. Though this was the case, research questions pertaining to significance, and the nature of the relationship were examined using impulse response functions and variance decompositions. The results obtained from the impulse response functions were both contrary to and in support of theory, as they show that the ALSI instantaneously had a negative response to a shock in GDP whilst GDP reacted positively to a shock in the ALSI. With respect to the unusual results of a negative response of the ALSI to a shock to GDP, Brahmasrene and Jiranyakul(2007) explained that the reasoning behind such a result could stem from prudent monetary policy employed by government, due to large capital inflows into an economy. Furthermore, variance decompositions of the variables showed that the variability in both real economic activity and stock market index was significant in explaining the variability dues to shocks both variables, during both pre and post crisis periods. Lastly, in order to answer the research questions pertaining to causality, granger causality tests were conducted. In all instances, the tests did not reject the null hypothesis of no granger causality from either direction, during both pre and post crisis periods.

CHAPTER 5: FINDINGS AND CONCLUSIONS

5.1 Introduction

This chapter discusses the results and findings reported in chapter 4 as well as concluding the given study. Section 5.2 discusses the findings and conclusions reached.

5.2 Findings and Conclusions

The main objective of this research was to study the relationship between real economic activity and stock market performance in South Africa. Through investigating past literature, pertaining to different economies, it was found that issues regarding this relationship included debates on the significance of the relationship, the nature of the relationship as well as causality and direction of causality within the relationship. Furthermore, authors such as Brahmasrene and Jiranyakul(2007) suggested that crisis times could present structural breaks within the relationship. The questions of this research therefore focused on the above issues within the South African context, pre and post the global financial crisis. The methodology chosen to examine this relationship was cointegration analysis as it was found that it would deal with issues of stationarity with regards to time series data. Though this was the case, using unit root testing, it was found that not all variables were of the same order of integration during both pre and post crisis periods, therefore meaning that cointegration could not be employed. Vector Autoregressive(VAR) modelling was then conducted in order to examine the research questions but the model residuals were found to be serially correlated, thus making the fit and validity of the models inaccurate. Even though this was the case, impulse response functions together with variance decompositions from the VARs could be used in examining the research questions pertaining to significance and nature of the relationship. The results obtained from the impulse response functions were both contrary to and in support of theory, as they showed that the ALSI instantaneously had a negative response to a shock in GDP whilst GDP reacted positively to a shock in the ALSI. With respect to the unusual results of a negative response of the ALSI to a shock to GDP,

Brahmasrene and Jiranyakul(2007) explained that the reasoning behind such a result could stem from prudent monetary policy employed government, due to large capital inflows into an economy. Furthermore, variance decompositions of real economic activity and stock market index showed that the variability in both variables was significant in explaining the variability due to shocks in both variables, during both pre and post crisis periods. Lastly, in order to answer the research questions pertaining to causality, granger causality tests were conducted. In all instances, the tests did not reject the null hypothesis of no granger causality from either direction, during both pre and post crisis periods. Finally, in analysing the all the results obtained from the different models, it was found that there were no major differences between the pre and post crisis periods.

Further Research

As mentioned in the review chapter, the main limitation faced by this study was due to data limitations as it has only been 7 years since the crisis occurred, meaning that limited data points could be used to compare the pre and post crisis periods. This limitation is not unique only to this research paper as the studies reviewed in the literature review also pointed out data limitations to be a great hurdle in examining the relationship of concern within developing countries. Even though this issue was dealt with through the use of only 6 variables, in the regression in order to mitigate problems of robustness, the fit and validity of the models used were found to be limiting. Furthermore long run relationships could not be examined through the use of cointegration analysis, as intended. Therefore, an area of further study within this topic could include examining long run relationships by using cointegration analysis, during both pre and post crisis periods, once more data is available in order to be able to do so.

References

Al-Jafari, M. K., Salameh, R. M., & Habbash, M. R. (2011). Investigating the relationship between stock market returns and macroeconomic variables: evidence from developed and emerging markets. *International Research Journal of Finance and Economics*, 79, pp 6-30.

Arestis, P., Demetriades, P. O., & Luintel, K. B. (2001). Financial development and economic growth: the role of stock markets. *Journal of Money, Credit and Banking*, 33, pp 16-41.

Brahmasrene, T., & Jiranyakul, K. (2007). Cointegration and causality between stock index and macroeconomic variables in an emerging market. *Academy of Accounting and Financial Studies Journal*, 11(3), pp 17-30.

Brooks, C. (2014). Introductory econometrics for finance*. Cambridge university press*.

Caporale, G. M., Howells, P. G., & Soliman, A. M. (2004). Stock market development and economic growth: the causal linkage. *Journal of Economic Development*, 29(1), pp 33-50.

Chen, N. F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of Business*, 59(3), pp 383-403.

Cho, D. C. (1984). On Testing the Arbitrage Pricing Theory: Inter-Battery Factor Analysis. *Journal of Finance*, 39(5), pp 1485-1502.

Cho, D. C., Eun, C. S., & Senbet, L. W. (1986). International arbitrage pricing theory: An empirical investigation. *Journal of Finance*, 41(2), pp 313-329.

Cho, D. C., Eun, C. S., & Senbet, L. W. (1986). International arbitrage pricing theory: An empirical investigation. *Journal of Finance*, 41(2), pp 313-329.

Dejong, D.N., Nankervis, J.C., Savin, N.E., (1992), Integration Versus Trend Stationarity in

Time Series, *Econometrica*, 60, pp423-33.

Enisan, A. A., & Olufisayo, A. O. (2009). Stock market development and economic growth: Evidence from seven sub-Sahara African countries. *Journal of Economics and Business*, 61(2), pp 162-171.

Groenewold, N. (2004). Fundamental share prices and aggregate real output. *Applied Financial Economics*, 14(9), pp 651-661.

Gupta, R., & Modise, M. P. (2013). Macroeconomic variables and South African stock return predictability. *Economic Modelling*, 30, pp 612-622.

Harris, R., Sollis, R., (2003), *Applied Time Series Modeling and Forecasting*, Wiley, West Sussex 193.

Hendry, D. F., & Juselius, K. (2000). Explaining cointegration analysis: Part 1. *The Energy Journal*, 21(1), pp 1-42.

Hsing, Y. (2011). The stock market and macroeconomic variables in a BRICS country and policy implications. *International Journal of Economics and Financial Issues*, 1(1), pp 12-18.

Jefferis, K. R., & Okeahalam, C. C. (2000). The impact of economic fundamentals on stock markets in southern Africa. *Development Southern Africa*, 17(1), pp 23-51.

John, J. A., & Draper, N. R. (1980). An alternative family of transformations. *Journal of the Royal Statistical Society*, 29(2), pp 190-197.

Levine, R., & Zervos, S. (1996). Stock market development and long-run growth. *World Bank Economic Review*, 10(2), pp 323-339.

Levine, R., & Zervos, S. (1998). Stock markets, banks, and economic growth. *American Economic Review*, 88(3), pp 537-558.

Moolman, E., & Du Toit, C. (2005). An econometric model of the South African stock market: economics. *South African Journal of Economic and Management Sciences* , 8(1), pp 77-91.

Nyasha, S., & Odhiambo, N. M. (2015). The Impact of Banks and Stock Market Development on Economic Growth in South Africa: an ARDL-bounds Testing Approach. *Contemporary Economics*, 9(1), pp 93-108.

Poon, S., & Taylor, S. J. (1991). Macroeconomic factors and the UK stock market. *Journal of Business Finance & Accounting*, 18(5), pp 619-636.

Roll, R., & Ross, S. A. (1980). An empirical investigation of the arbitrage pricing theory. *Journal of finance*, 35(5), pp 1073-1103.

Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of economic theory*, 13(3), pp 341-360.

Shahbaz, M., Ahmed, N., & Ali, L. (2008). Stock market development and economic growth: ARDL causality in Pakistan. *International Research Journal of Finance and Economics*, 14(1), pp 182-195.