Abstract

The study investigates the relationship between stock market performance and business cycles in South Africa for the period 2002-2009 using monthly data. This is done by constructing a Vector Error Correction Model (VECM). The study specifies a business cycle model with the business cycle coincident indicator (BC) regressed against, the All Share Price Index (ALSI), Real Effective Exchange Rate (REER), Money Supply (M1), Inflation (CPIX) and the Prime Overdraft Rate (POR). The ALSI represents stock market performance whilst the rest of the variables are to enhance model specification. The study found a positive relationship between stock market performance and business cycles in South Africa. The results also indicated that business cycles are positively related to the lagged variable of the coincident indicator and money supply. In addition, the findings also reveal that BC is negatively related to interest rates and the real effective exchange rate.

Key words: Business cycles, stock market performance, All Share Price Index (ALSI), Vector Error Correction Model (VECM).

Declaration and Copyright

I, the undersigned **Forward Muchaonyerwa**, hereby declare that this dissertation is my own original work with the exception of quotations and references whose sources are acknowledged, and has not been submitted, and will not be presented at any University for a similar or any other degree award.

F.Muchaonyerwa

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Signature

April 2011

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Date

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Dedication

This dissertation is dedicated to Prof. P. Muchaonyerwa who supported and encouraged me to further my studies.

List of acronyms and abbreviations

ABC – Austrian Business Cycle

ADF - Augmented Dickey-Fuller

AIC - Akaike Information Criteria

AIDS – Acquired Immune Deficiency Syndrome

ALSI – All Share Price Index

APT - Arbitrage Pricing Theory

ARDL Autoregressive Distributed Lag

ASGISA - Accelerated and Shared Growth Initiative of South Africa

ATS - Automated Trading Systems

BC – Business Cycle Coincident Indicator

BEE – Black Economic Empowerment

BESA - Board Exchange of South Africa

BJ - Bera-Jarque

BMV - Bolsa Mexicana de Valores

CPI – Consumer Price Index

DF - Dickey Fuller

DF-GLS - Dicky-Fuller Generalized Least Square

DSE - Dhaka Stock Exchange

DTI - Department of Trade and Industry

EG - Engle–Granger

EGARCH - Engle Generalised Autoregressive Conditional Heteroscedasticity

EMH – Efficient Market Hypothesis

EOB - Electronic Order Book

ETFs - Electronic Traded Funds

EWP – Elliot Wave Principle

FDI - Foreign Direct Investment

FSB - Financial Services Board

FTSE – Financial Times Stock Exchange

GARCH - Generalised Autoregressive Conditional Heteroskedasticity

GDP – Gross Domestic Product

GEPF - Government Employee Pension Fund

GHS – General Household Survey

GLS - Generalized Least Squares

HIV – Human Immune Virus

HQ - Hannan-Quinn

IPC - Indice de Precios Cotizaciones

ISE - Istanbul Stock Exchange

JSE – Johannesburg Stock Exchange

LA-VAR - Lag-augmented Vector Autoregressive

LM - Lagrange Multiplier

NAAMSA - National Association of Automobile Manufacturers of South Africa

OLS – Ordinary Least Squares

PER – Price Earnings Ratio

REER – Real Effective Exchange Rate

SARB – South African Reserve Bank

SECA - Stock Exchange Control Act

SSFs - Single Stock Futures

UK – United Kingdom

USA – United States of America

VAR – Vector Autoregressive

VECM - Vector Error Correction Model

WFE – World Federation of Exchanges

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Trends in business cycles and stock market performance have long been a subject of interest by researchers and the debate has generated many, but, diverse conclusions. This study, in turn, seeks to investigate the dynamic relationship between stock market performance and business cycles in South Africa. The rationale behind the selection of this topic is that, business cycles of South Africa have undergone numerous fluctuations, in the recent past, from booms to busts, whilst, on several occasions, stock markets were bullish or bearish. Instability in business cycles makes it necessary to study the relationships between stock performance and economic activity, as this influences investors and other stakeholders of the economy.

Generally, business cycles refer to economy-wide fluctuations in production or economic activity over several months or years. These fluctuations occur around a long-term growth trend, and typically involve shifts over time, between periods of relatively rapid economic growth (expansion or boom), and periods of relative stagnation or decline (contraction or recession). In other words, business cycles are defined as patterns of expansion and contraction in economic activity around its long-term trend (Oppenlander, 1997).

Business cycle indicators are key measures of turning points in the economic cycles of South Africa. These business cycle indicators are classified as; coincident, leading and lagging. The coincident business cycle indicator is a combination of constituents that move in the same direction with economic cycles. During the late 1990s the coincident indicator went into a recession due to a collapse of the financial sector in Asia. The Asian crisis affected businesses in South Africa (Pretorius & Venter, 2004). However, the composite indicator recovered in 2000 and it persisted with an upward trend until 2007 (DTI, 2010). The increasing trend was a result of economic reforms, for instance, the various charters that were introduced in several sectors of the economy between 2000 and 2005 (SouthAfrica.info, 2009). Although there was an upward trend until 2007, once again, the composite indicator

went into a recession in 2008 when the global recession emerged as a result of the crash of the housing market of the United States of America (USA) (Statistics South Africa, 2010).

The constituents of the composite indicator are: new vehicle sales, retail sales, wholesale sales, manufacturing volume and employment. These indices rose from 2000 to 2007, except for new vehicle sales index, which fell in 2006 (NAAMSA, 2010). Manufacturing had the largest share of the production sector between 2000 and 2009. Capacity utilization in manufacturing was over 80% between 2000 and 2009 (Statistics South Africa, 2005, 2006, & 2007). The retail sector experienced growth from the early to mid 2006 due to strong and positive performance in the economy. However, retail sales were almost constant between year 2007 and 2008 due to recession. South African retail had a fairly stronger growth in 2009 compared to the previous year (Statistics South Africa, 2010).

Wholesale sales also increased from year 2002 to 2007 and dropped in 2008. Wholesale trade sales for July 2009 fell by 13.8% year on year due to low confidence in the economy after the world economic recession of 2008/09. From 2000 to 2007, employment in non-agriculture sector rose steadily (Statistics South Africa, 2010). However, during the economic recession of 2008/09 the economy of South Africa lost approximately a million jobs. The National Association of Automobile Manufacturers of South Africa (NAAMSA) releases statistics for new vehicle sales. Statistics for new vehicle sales also show an upward trend from 2000 to a peak in 2006. However, there was a decline of sales from the end of 2006 to 2008/09 owing to global economic recession (NAAMSA, 2010).

The leading business cycle indicator of South Africa comprises of a series of constituents that forecast and signal the future shape of business cycle turning points. The leading indicator is compiled by combining prices of all shares, real money supply (M1), labour productivity in manufacturing, job advertisements in the *Sunday Times* newspaper, commodity prices in US dollars for a basket of South Africa's export commodities and opinion survey of business confidence among other components. The leading indicator rose after 2000 until it started to fall in 2007, signaling the beginning of the 2008/09 economic recession.

According to the data released by the South African reserve bank (SARB), the money supply M1 has been increasing since 2000. M1 increased by 148.07% between January 2000 and December 2009 due to growth in economic activity in the country (SARB, 2010). The Real

Effective Exchange rate (REER) has been fluctuating since 2002, with the lowest rate of 74.68 reached in January 2002 and a highest rate of 119.67 in February 2006. The December 2009 REER stood at 108.13 (SARB, 2010). The variations in the REER have been a result of a number of economic and trade relations changes between South Africa and its main trading partners through the period 2000-2009.

Lastly, the lagging business cycle indicator comprises of constituents that change after the business cycles have already shown a certain trend. The constituents of the lagging business cycle index of South Africa are inflation, inventories and inventories to sales ratio, unit labour costs, short-term and long term interest rates, commercial and industrial loans and consumer installment credit among others (Venter, 2004). The lagging business cycle indicator has been on an upward trend from 2000 to 2009. Inflation and interest rates will be assessed in more detail. The SARB pursues inflation targeting to achieve a rate of between 3% and 6%. The year on inflation figures released by SARB were 2000 (5.4%), 2001 (5.8%), 2002 (9.1%), 2003 (5.8%), 2004 (1.4%), 2005 (3.4%), 2006 (4.6%), 2007 (7.2%), 2008 (11.5%) and 2009 (7.2%) (SARB, 2010).

The prime interest rate is the rate commercial banks apply when issuing loans to the general public. The prime overdraft rate varies with time and generally in connection with the REPO rate. The REPO rate is the rate at which the commercial banks can borrow money from the SARB. The average annual prime rates for South Africa were 15.75% (2002), 14.96% (2003), 11.29% (2004), 10.63% (2005), 11.17% (2006), 13.17% (2007), 15.13% (2008) and 11.71% (2009) (SARB, 2010). The price of borrowing from commercial banks has been lower in 2004, 2005, 2006 and 2009 compared to the rest of the years. In 2008 due to the economic recession the prime rate reached 15.5% in July. Nonetheless, the prime rate improved from May 2009 at 11% and then 10.5% in August 2009 (SARB, 2010).

Investors and various other stakeholders of the South African business environment may not accomplish valuable decisions by focusing on business cycles trend analysis alone. It is apparent, for investors to find out how the stock markets are performing, since this is one of the important sources of finance to the businesses. By taking into account business cycles fluctuations and stock market variation, investors have high chances to come up with lucrative business decisions, hence, the inclusion of stock market performance in the study.

Stock market performance is crucial to businesses in South Africa. Studying stock market performance requires assessing constituents such as market capitalization and the price index among others. It is therefore important to examine the Johannesburg Stock Exchange (JSE). The JSE facilitates trades in listed shares of companies. Domestic market capitalisation of the JSE has been rising from year 2001 to 2007 and it fell sharply from over US$800b in 2007 to just below US$500b in 2008 (WFE, 2009). The rising trend was a result of increased purchase of shares and competitive share prices. However, at the end of 2007, the market cap fell due to falling share prices and this was a signal of a recession. The share prices started to rise in the last quarter of 2009 and this was a sign that the world recession was easing. The All Share Price Index (ALSI) is an equity index which mirrors the performance of the South African ordinary share market. A large quantity of the number of securities listed on the JSE is incorporated into the index. The ALSI is benchmarked against global standards and is basically an indicator of the general mood of the market.

Although stock markets globally faced extraordinary tests in the year 2008, the JSE performed reasonably well (JSE, 2010). The JSE equities division improved trading systems by adopting and applying the version used by the London Stock exchange (LSE). In 2008 revenues from operations increased by 22% compared to year 2007. Profit before net financing rose by 41% while operation costs increased by 1% in year 2008 (Louber, 2009). The number of share trades in the first quarter of 2009 increased by 24% relative to the first quarter of 2008. During 2009 the JSE had shown a supple performance as indicated by rising trade volumes in the cash equity markets and strong performance from other divisions. Despite the harsh economic environment in 2009, revenue from the JSE rose by 8% compared to year 2008. The rise in the revenue has been due to strategic initiative such as the Africa Board amongst other things (Loubser, 2010). However, in 2009, JSE's equity derivatives fell because of investor uncertainty after the global financial crisis. Investor confidence however, started to show signs of revival in November 2009.

1.2 Statement of the problem

The economy of South Africa is the biggest in Africa, but still, theoretical and empirical research have given little emphasis on the nature of the relationship between stock market performance and business cycles. This presumed relationship has generated a lot of controversy in the field of economics and further research needs to be carried out in order to

understand this link. This is due to the assumption that, most investors are dependent on the performance of the stock market for decision making. Furthermore, business cycles depend directly on the performance of businesses in the economy, whilst, business performance is dependent on the decisions made by investors when faced with different opportunities and threats. The relationships that exist between stock performance and business cycles affects the large business population who need to understand this link in order to make decisions that will enable them to get a good return from their investments. The major research question, therefore is, what is the nature of the relationship between stock performance and business cycles?

1.3 Objectives of the study

The main objective of this study is:

- To examine the long run relationship between business cycles and stock market performance in South Africa.

The other objectives of the study are:

- To describe the trends in South Africa's business cycle indicators from 2000 to 2009.
- To outline trends in stock market performance of South Africa from 2000 to 2009 focusing on the main constituents of the Johannesburg Stock Exchange (JSE).

1.4 Significance of the study

The study is a valuable source of information for policy formulation in the business environment because, such information is vital in setting up guiding principles for decision making. It is very important for business people to understand the trends that have been followed by business performance in their country. By understanding these trends, investors will be enabled to know the nature of the economy they are operating in, hence, it guides in their decision making processes. In addition, potential investors may use this knowledge to minimise risks when planning for investments. This study is also a good source of information for researchers, as the results that emerge from this study will inform debates on this subject. This research further contributes to empirical literature on economic activity and stock market growth in South Africa.

1.5 Organisation of the study

This study is divided into six chapters. Following this introductory chapter, chapter two gives an overview of the business cycles and stock market indicators of South Africa from 2000 to 2009. Chapter three reviews both the theoretical and empirical literature on business cycles and stock market performance. In chapter four, research methodology is illustrated, model specified and data sources are named. Chapter five presents all the findings and the interpretation of results. Finally, chapter six concludes the study and makes policy recommendations.

CHAPTER TWO

AN OVERVIEW OF BUSINESS CYCLES AND STOCK MARKET PERFORMANCE IN SOUTH AFRICA

2.1 Introduction

The purpose of this chapter is to outline the history of South Africa's business cycles and stock markets performance indicators. There are five sections in this chapter. Following this introductory part, section 2.2 analyses the business cycle indicators namely the coincident, leading and lagging indicators of South Africa. Section 2.3 reveals trends and key performance indicators of the Johannesburg Stock exchange (JSE) while section 2.4 gives a general assessment of business cycles and stock market performance. The last section 2.5 concludes the chapter.

2.2 Business cycle indicators

Business cycle indicators are the most important pointers of turning points of economic cycles in an economy. The trends in the indicators explain a great deal about business cycle matters of South Africa. The behavior of the indicators is used to forecast future economic cycle trends and to describe current phases and business cycle developments or to confirm particular trends that have already happened.

2.2.1 Coincident business cycle indicator

The coincident business cycle indicator is an index of constituents that move more or less in the same direction with economic cycles. This indicator shows an integrated time series of constituents that coincides with the shape and turning points of economic activity. In other words, movements of the components that make up this index coincide with the movements in business and economic cycles. The composite coincident business cycle indicator is very important in business cycle studies because the index gives a more realistic picture of the movements which takes place in performance of businesses in South Africa.

In South Africa constituents of the composite indicator were compiled long before the first democratically elected government of 1994. However, some components have been seen that are no longer reliable predictors of business cycles. With the introduction and emerging of innovative economic policies after 1994, components of the coincident indicator were revised. The economic policy changes after 1994 included the elimination and revision of trade restrictions between South Africa and rest of the world together with gradual liberalisation of exchange controls. The composite business cycle indicator components were therefore revised according to economic significance, statistical adequacy, historical conformity to and timing relationship with the business cycle (Pretorius & Venter, 2004). Table 2.1 shows the seven time series components that were included in the old coincident indicator and the five components in the evaluated indicator.

Table 2.1: Comparing previous and current coincident indicator components

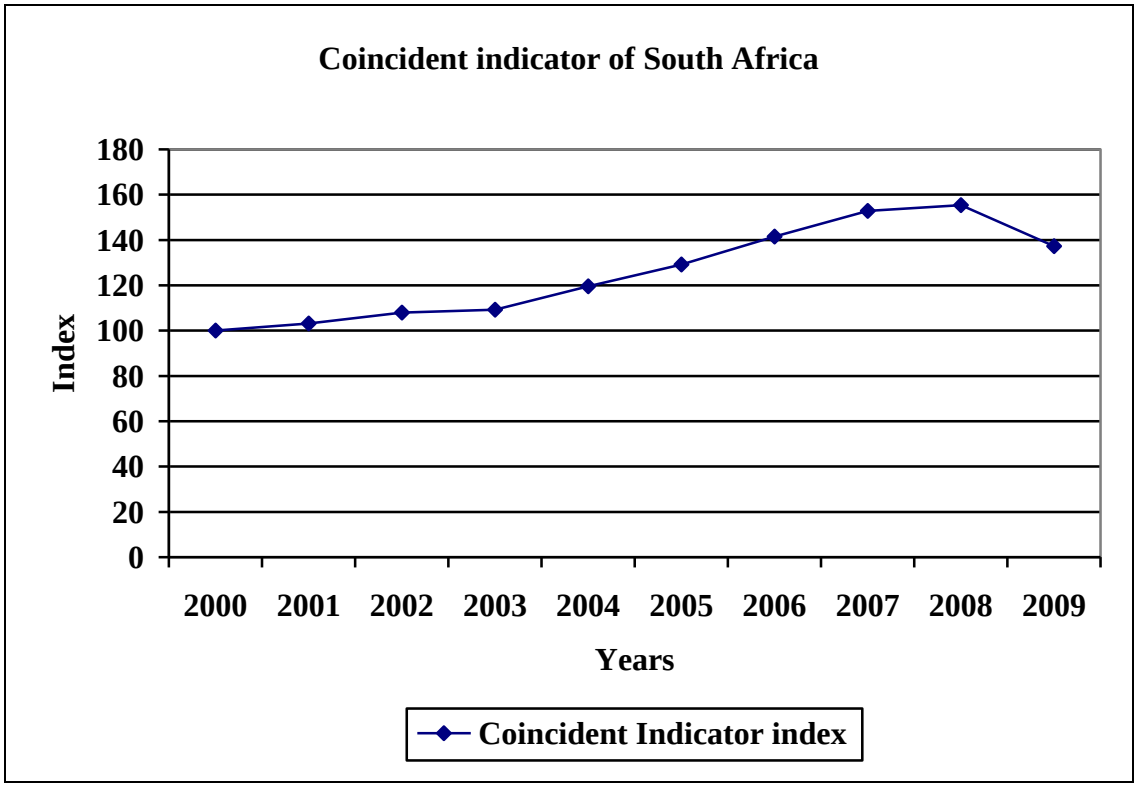
Previous components	**Current Components**
Gross value added at constant prices, excluding agriculture, forestry and fishing	Gross value added at constant prices, excluding agriculture, forestry and fishing
Value of wholesale, retail and new vehicle sales at constant prices	Value of wholesale, retail and new vehicle sales at constant prices
Utilisation of production capacity in manufacturing	Utilisation of production capacity in manufacturing
Employment in the manufacturing, mining and construction sectors	Total formal non-agricultural employment
Physical volume of manufacturing production: durable goods	Industrial production index
Physical volume of manufacturing production: non-durable goods	
Value of imports at constant prices, excluding minerals	

(Source: Pretorius & Venter, 2004)

Figure 2.1 shows the trends of the coincident business cycle indicator from 2000 to 2009. The trends depicted by the coincident indicator are regarded as an accurate reflection of the

overall business cycle turning points of South Africa because of the concurrence nature of the indicator with economic activity trends.

Figure 2.1: Coincident indicator of South Africa



(Data Source: DTI, 2010)

Prior to 2000 (not shown on the graph), there was a recession in the coincident index from the fourth quarter of 1997 to 1999 and much of this was attributed to a collapse in the financial sector in Asia. This crash of the Asian financial market affected trade between South Africa, Asia and other trading partners bringing the effects to businesses in South Africa (Pretorius & Venter, 2004). Figure 2.1 shows that, the coincident indicator recovered from 2000 and it continued with an upward trend until the third quarter of 2007 (DTI, 2010). The increasing trend of the coincident indicator was due to a variety of economic reforms that took the form of improvement in the fiscal and monetary aspects of the economy resulting in businesses performing well (SouthAfrica.info, 2009). The composite indicator went into a recession in the last quarter of 2007 when the global economic downturn started emerging from crash of the housing market of USA which extended globally (Statistics South Africa, 2010).

The period 2000 to mid-2007 was characterised by a positive economic performance in South Africa as shown by the trends in the coincident indicator. Most economic sectors recorded positive growth throughout this period and the economy generally performed well (DTI, 2009). The development of the economy of South Africa has been attributed to, among other things, various economic charters that were put in place in several sectors of the economy between 2002 and 2005 (SouthAfrica.info, 2009). These charters were introduced to enhance effective operation in sectors of the economy such as the mining, agriculture, petroleum and liquid fuel industry, tourism, health and financial services sector (SouthAfrica.info, 2010). Real GDP growth rate increased from year 2000, with GDP growing by 4.2% in the period from 1999 to 2000 (DTI, 2009). GDP continued on an upward trend from 2001 up until 2007 with the highest recorded in the 2004-2005 year of 5.1% (DTI, 2010). The seasonally adjusted real GDP at market prices for the second quarter of 2005, compared with the first quarter of 2005, increased by an annualised rate of 4.8%. The corresponding increase for the first quarter of 2005 was 3.5% compared with the fourth quarter of 2004 (Statistics South Africa, 2005).

The most important sectoral contributors to increase in economic activity for the second quarter of 2005 were the manufacturing industry, wholesale and retail trade, hotels and restaurants industry, real estate and business services industry, transport, storage and communication industry, agriculture, forestry and fishing, general government services and personal services (Statistics South Africa, 2005). The unadjusted real GDP at market prices increased by 4.5% during second quarter of 2005 compared with the second quarter of 2004, following an increase of 4.2% in the first quarter of 2005 compared with the first quarter of 2004. The unadjusted real GDP at market prices for the first six months of 2005 increased by 4.4% compared with the first six months of 2004 (Statistics South Africa, 2005).

Electricity is an important resource in the functioning of businesses in the economy of South Africa especially the capital intensive manufacturing businesses. Although there were enormous challenges, electricity generation recorded improvement in the 2000s. Electricity management has always been one of the priorities of government and several other measures are in place to ensure sufficient production and management of this vital resource (Statistics South Africa, 2009). One such measure tabled by Eskom is increasing consumer tariffs by 35% between 2010 and 2013 so as to generate funds for capital expenditure in the public utility (Statistics South Africa, 2009).

South Africa's economic activity has also been performing well due to success stories in the tourism sector. The expansion in the past eleven years was remarkable with tourism spending escalating by more than 100% since 1994. Tourism grew rapidly between 1994 and 1998 at a rate of 11.8%. The country consolidated its performance between 1998 and 2001 and then grew by 6.2% from 2001 to 2005. Over seven million foreign tourists arrived in the country in 2005, a 10% increase on the prior year (South Africa Tourism, 2005). International rankings of top tourism destinations had placed South Africa at the thirty-second position in 2005 in terms of total size. With this important role played by tourism, the Accelerated and Shared Growth Initiative of South Africa (ASGISA) - a government growth initiative - has earmarked tourism as a high-priority sector. The government and the private sector regard the industry as a foundation of economic and employment growth. In addition, tourism is a key source of tax income, and has stirred investment in infrastructure across the country ahead of FIFA 2010 soccer tournament. Furthermore, the home tourism market has increasingly been seen as the center to future sustainability and has been projected to excel even after 2010 FIFA soccer finals in the country (South Africa Tourism, 2005).

The mining sector has also contributed effectively to economic development in South Africa. Precious metals contribute 65% to the country's mineral export earnings and 21% of total exports of goods in 2006. This industry is one of the largest employers in the country. A number of new mining projects were initiated such as the Anglo-Australian, Rio Tinto aluminum smelter at the Coega Industrial Development Zone (IDZ) while Russian billionaire Viktor Vekselberg is investing in manganese production. In addition, De Beers are building new mines and the Indian steel giant Tata Steel constructed a high-carbon ferrochrome plant on the KwaZulu-Natal coast (SouthAfrica.info, 2009).

South Africa's private financial sector experienced impressive growth since 1994, increasing its share of GDP from 6% to 13% between 2004 and 2008. This has been due to immense growth in private credit extension. However, despite the doubling in the size of the financial sector since 1994, investment and savings rates have been mediocre over most of the post-apartheid period. Only a small proportion of private credit is being extended for fixed investment - only 5.2% in 2008. Fixed investment rates have recently improved driven by rising public investment expenditure, but savings rates remain low (Statistics South Africa, 2009).

South Africa's government set millennium development goals which set targets of economic achievements in the country. The severity of poverty has been reduced since 2002. The 2007 poverty and inequality report indicated strong overall income growth resulting in the rise of the income of the poorest, that is, 10% - 20% of the population. However, still of great concern is that income inequality seems to have increased over most of the period. With regard to education, there are notable improvements in the sector though there is still more room for quality improvement. General Household Survey (GHS) conducted by statistics South Africa reveals that 98% of 13 year old children attended education institutions in 2006. The same survey reveals that 98% of 18 year old children had completed grade seven and above in 2006 (Statistics South Africa, 2009).

Gender equality also impacts on the performance of economic activity in South Africa. Gender disparities in the education sector have been largely eliminated by 2006. At secondary schools the Gender Parity Index (GPI) has been skewed in favor of girls throughout the years from 1999 to 2006. At tertiary institutions gender distribution in respect of enrollment is skewed in favor of female students. Feminisation in work places has also been a strategy lately, so as to involve women participation in businesses and economic activity (Millennium Development Goals, 2007).

Healthy workforces give rise to high productivity. However, the authenticity of this statement has been hugely tested in South Africa. Although, the health sector was revived tremendously well between 2000 and 2009, the sector was faced with many challenges owing to fast growing population and other economic crises. The reinforcement of health systems also comes amid threats of the most deadly diseases such as malaria, tuberculosis, HIV and AIDS among other diseases. These diseases have claimed the lives of the working population for many years and this impacted negatively on business growth as workers spend time on funerals, nursing the sick and absenteeism meaning that production at work places was compromised. Despite the fact that the sector faced numerous challenges, quite a number of public health facilities provided top range medical facilities and services until currently. From 2000 to 2009 there has been a rise in the number of HIV and AIDS patients on antiretroviral treatment in addition to Comprehensive Programme and Care and Treatment for HIV and AIDS across the nine provinces of South Africa (SouthAfrica.info, 2009).

In most recent years, South Africa has been on the correct path to deal with various economic and growth issues, such as the developing of further open, rule-based, predictable, non-discriminatory trading and financial system; addressing special needs of the least developed countries; addressing the special needs of landlocked countries; addressing debt problems; developing and implementing strategies for decent and productive work for youth; accessing affordable essential drugs; and making available the benefits of new technologies, especially information and communications. These issues brought an increase in the pace of economic activity in South Africa (Millennium Development Goals, 2007).

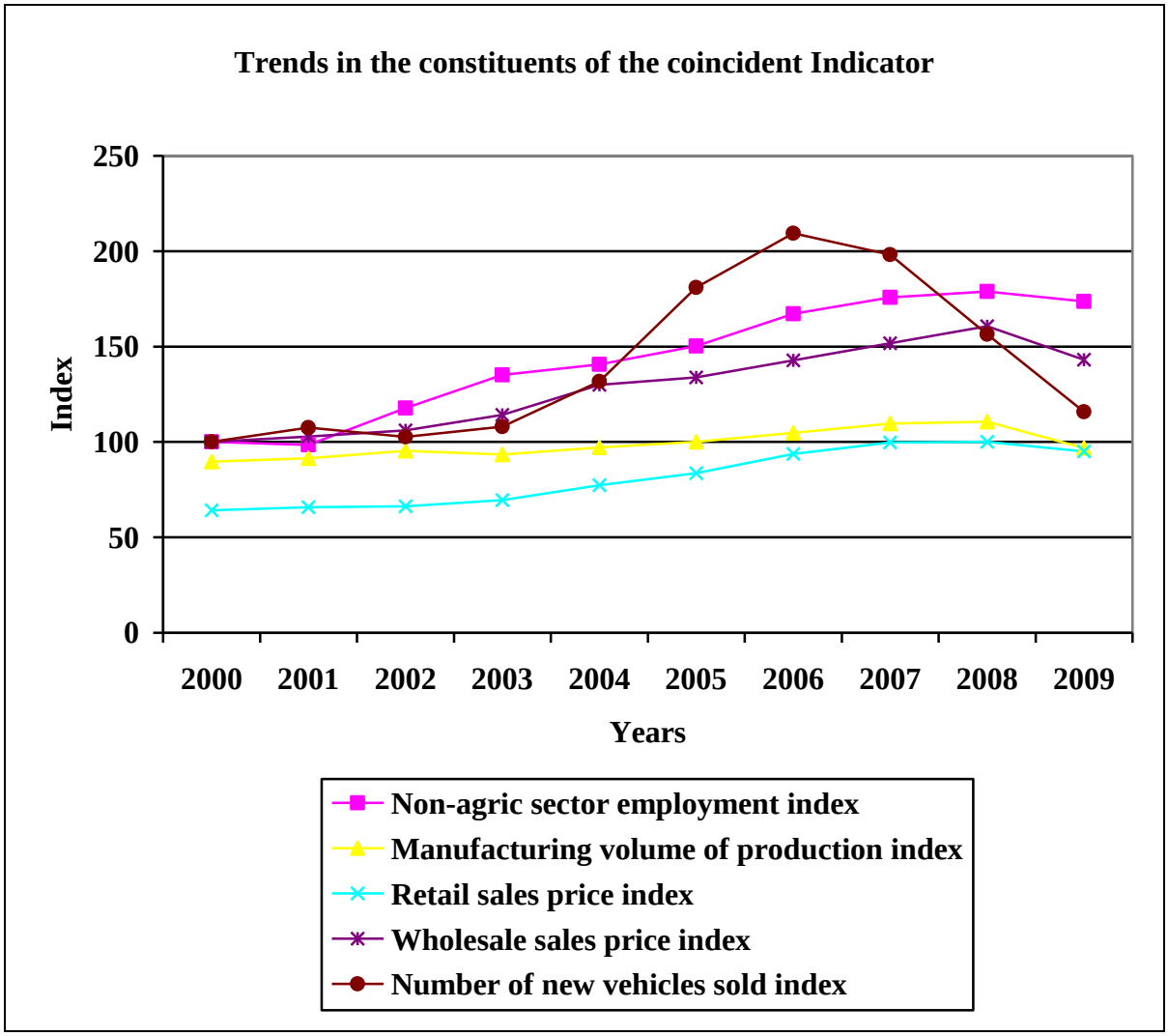
2.2.1.1 Constituents of the coincident indicator

The coincident indicator is the best representative index for business cycles turning points and movements. It is extremely important to find out the relationships which exist between the constituents of the composite indicator. If the components trend together it shows that the coincident indicator is a true representation of the business cycles movements.

Figure 2.2 shows the trends in the main constituents of the composite business cycle index from 2000 to 2009. Movements in the index for new vehicle sales, retail sales, wholesale sales, manufacturing volume and non agricultural employment are illustrated on the graph. Figure 2.2 shows that the components of the coincident indicator are trending together in the same direction and at almost the same time. On average, from 2000, all the variables were rising until at least up to around 2007 except for the new vehicle sales index which had already started to drop after the pick in 2006 (NAAMSA, 2010).

The manufacturing industry was well on course in increasing production capacities and creating employment. Manufacturing accounts for the biggest share of the production sectors of the economy, 54.3% in 2008 (DTI, 2010). Within manufacturing itself, there has been a wide divergence of performance. Through the Motor Industry Development Programme, the automotive sector has more than doubled in size since 1994, with an exponential growth in exports, but, challenges remained in terms of localisation and employment generation. The natural resource-based sectors have also demonstrated relatively strong growth. In the early 2000s, the coincident business cycle indicator continued to increase owing to, among other things, high capacity utilisation in the manufacturing industry.

Figure 2.2: Constituents of the coincident indicator of South Africa



(Data Source: DTI, 2010)

Capacity utilization in the manufacturing industry was 80% in 2000; 81% in 2001; 80.7% in August 2002; falling by 0.6 of a percentage point to 80.1% in August 2003 (Statistics South Africa, 2003). The under-utilisation of capacity was mainly due to shortages of raw materials, labour and insufficient demand among other things. Capacity utilization increased to 84.9% in August 2004, 85.7% in August 2005, 85.8% in August 2006 and just over 86% in August 2007 (Statistics South Africa, 2005, 2006, 2007). These increases show that the manufacturing industry was well focused to increase production capacity and create employment. GDP growth was 5% in both periods between 2005-2006 and 2006-2007 (DTI, 2010). The construction industry grew at an annualised 6.2% in the second quarter of 2005, up from 5.1% in the first quarter. Continued growth would show investment in public

infrastructure rising as a percentage of GDP from 5.4% in 2002-2003 to 6.4% in 2008-2009 (Byrnes, 2006).

Retailing in South Africa is dominated by several large holding companies which operate in various categories, ranging from groceries to clothing and footwear, and furniture and furnishing. The retail sector has experienced growth from 2002 to 2006. This was due to a stable economic environment which was as a result of positive effects from economic charters introduced in several sectors of the economy. Consumer incomes were in line with economic conditions which saw the end users being able to spend a great deal on retail goods. However, the retail sales were almost constant between 2007 and 2008 as the world economic recession drove prices of goods up (Statistics South Africa, 2010). Despite the global recession which impacted local markets, South African retail experienced slightly stronger growth in 2009 compared to the previous year and growth was expected to stabilize in 2010. However, the effects of the economic downturn of 2008 were still felt through 2009 because consumers realised there was no immediate change in the economic climate as they continue to further curb spending on non-essential items (Response Group Trendline, 2010).

Wholesale sales increased from 2002 until 2007 and started to drop in 2008 as shown in Figure 2.2. Positive achievements in the economy experienced in the early to mid 2000s were the reason why wholesale trade was ever increasing. The success of retail trade can be argued to have impacted positively on wholesale trade as these two are inter-connected. The effects of the global economic crisis of 2008/09 also affected wholesale trade negatively and the most affected were the hardware, paint and glass sectors. The fact that many people lost jobs and, high fuel and food prices during 2008 implied that people could not spend money on non essential goods; hence this affected retailers and wholesalers who supply non basics. Statistics South Africa, 2010 pointed out that, wholesale trade sales at constant 2000 prices for July 2009 fell by 13.8% year on year. The fall in the wholesale sales was because confidence in the economy had not been restored, after the pinch of the world economic recession of 2008/9. However, Statistics South Africa projected a steady recovery of the wholesale sector in 2010 as the World economy continued to recover and also because of the soccer finals in the country (Response Group Trendline, 2010; Statistics South Africa, 2010).

Employment in the non-agriculture sector is another important constituent of the composite business cycle indicator. Employment had been a major challenge to the South African

economy owing to inadequate education and population growth. From 2000 to 2007, employment in non-agriculture sector has been rising steadily as depicted by Figure 2.2. Employment rose steadily as a result of many economic policies including the Black Economic Empowerment (BEE) (Millennium Development Goals, 2007). Employment equity was promoted to remove any imbalances on employment coming from racial and gender grounds. The growth in employment from 2007 into early 2008 was a result of the construction industry absorbing a large number of labourers during construction of various stadia, buildings and numerous upgrades in infrastructure ahead of soccer finals in 2010. Though the employment index continued to show an upward trend to mid 2008, Statistics South Africa (2010) stated that the overall economy slashed just about a million jobs until the end of 2008 due to the economic recession and the worst affected was the manufacturing sector. Non-agricultural employment decreased by 1% in the third quarter of 2009 compared to the second quarter. Employment fell by 3.9% in the third quarter of 2009 compared with the third quarter of 2008. South Africa's jobless rate increased to 24.5% of the labour force in the third quarter from 23.6% in the second quarter in 2009 (Mapenzauswa & Pizzey, 2009).

South Africa's formal employment growth has come largely from the services sector, mainly in the wholesale and retail and business services sectors. These employment gains are presently unstable. Wholesale and retail employment growth has been due to substantial and unsustainable private credit extension, leading to a widening current account deficit. Business services employment growth has been driven mostly by two factors namely the outsourcing of activities such as logistics and catering and the growth in the private security sector. The unsustainable dependence of retail and wholesale employment growth on private credit extension rather than income growth in productive sectors has been confirmed by the large reversals of employment in this sector in the light of the crumple in credit extension as a result of the 2008/09 global economic crisis. Therefore long-term increases in employment need to be underpinned by higher growth in the production sectors of the economy (Statistics South Africa, 2010).

The National Association of Automobile Manufacturers of South Africa (NAAMSA) releases and analyse statistics for new vehicle sales. Data on new vehicle sales showed a very steep upward trend from 2000 to 2006 as shown in Figure 2.2. The new vehicle sales reached its peak in 2006 with the market hitting 714,315 units (NAAMSA, 2010). The upward trends were as a result of condusive economic climate which was brought about by various

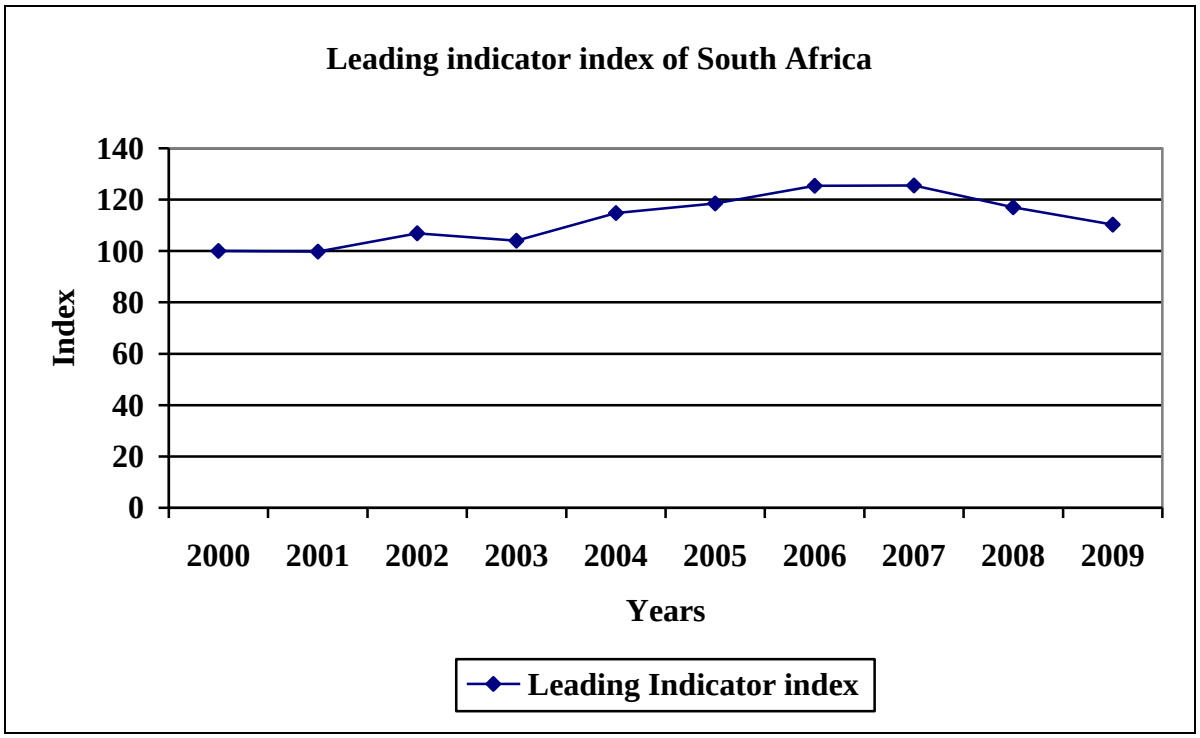
economic policies such as Black Economic Empowerment (BEE). Interest rates were lower from 2000 to 2006 which made it very favorable for car purchasers to obtain finance for acquisition of new vehicles. However, the trend declined from the end of 2006 to 2008/09. The fall in new vehicle sales in 2008/09 was a result of the global economic recession of 2008/09 which was characterised by exorbitant interest rates. The prime overdraft rate reached a maximum of 15.5% between July and November 2008 implying a rise in the cost of borrowing, impeding households from borrowing to finance new vehicle purchases (NAAMSA, 2010).

High interest and inflation rates in the economy posed a number of constraints on households which were not able to save but could spend on necessary goods only. In 2008, the global economy was negatively affected by increases in food and fuel prices, the effects of which were felt severely in the economy of South Africa and households could not spent on purchasing new cars. Beyond 2008, interest rates declined by 5.5% and new vehicle prices became stable and this has been complemented by an improvement in loan finance approval rate (NAAMSA, 2010). These optimistic developments supported the new vehicle car market positively. However, uncertainty about the global economic recovery was estimated to negatively impact on the volume of new vehicle sale especially the export market. South Africa's new vehicle market ended 2009 on a relatively weak note (258,132 units), with the sales total for the whole year turning out at their lowest since 2003 (NAAMSA, 2010). Anticipated growth rate of new vehicle sales has been projected by NAAMSA to expand by 15% in 2010 owing to the expected economic growth of 2% plus, and 2010 World Cup soccer finals which was anticipated to boost demand from the car rental industry.

2.2.2 Leading business cycle indicator

The leading indicator contains a series of constituents that predict and signal the future shape of business cycle turning points. Leading business cycle constituents are measurable variables that change ahead of the underlying economic cycle. The leading business cycle indicator of South Africa is compiled by taking into consideration the prices of all classes of shares, real M1 money supply, labour productivity in manufacturing, job advertisements in the *Sunday Times* newspaper, commodity prices in US dollars for a basket of South Africa's export commodities and opinion survey of business confidence among other components. Trends in the leading business cycle index from 2000 to 2009 are shown on Figure 2.3.

Figure 2.3: Leading business cycle indicator of South Africa



(Data Source: DTI, 2010)

Figure 2.3 shows the trends of the leading indicator of business cycle in South Africa. As shown by Figure 2.3, the leading business cycle indicator was rising from 2000 until the last quarter of 2007. The upward trend of the index has been linked to stability in the economic conditions of the country. The economic trends explained in the coincident indicator also had an impact on the movement of the leading business cycle indicator of South Africa. Of greater note were the economic charters that were introduced to various sectors of the economy between 2002 and 2005 which aimed at improving both the fiscal and monetary setup of the economy. As already been noted, these policy actions brought favorable results in most of the economic sectors. However, the leading indicator started to slow down in the last quarter of 2007 into 2008 signaling the global economic crisis which emerged from the wreckage in the mortgage bond market of USA in 2008/09.

As has already been noted that the leading indicator is an index of many constituents, this study explains the trends in two of the constituents namely money supply (M1) and Real Effective Exchange Rate (REER). These components of the leading indicator were chosen for various reasons. Money supply is an important factor in business due to the fact that, for any

economy to function correctly there should be money circulating in it. Furthermore, money supply is very important in business cycle studies as it determines consumer spending power, national debt levels, business growth and inflation. REER captures the relationship between the South African currency and a basket of other currencies from trading partners, hence, it captures an important aspect of South Africa's external trade.

Money performs a range of functions and most importantly it acts as a medium of exchange. The money available in an economy also determines the extent to which businesses operate. The South Africa Reserve bank (SARB) has classified money supply into categories ranging from narrow to broad definitions of money. The narrow definition described money supply (M1) as money in circulations plus demand deposits, whilst the broad definition of money (M3) includes other various monetary components. According to statistics released by SARB, M1 has been increasing since 2000. M1 increased by 148.07% from January 2000 to December 2009 (SARB, 2010). This increase in money supply was due to the expansion of economic activity in the country as more and more money was needed to finance all the sectors of the economy which continued to grow in most of the years.

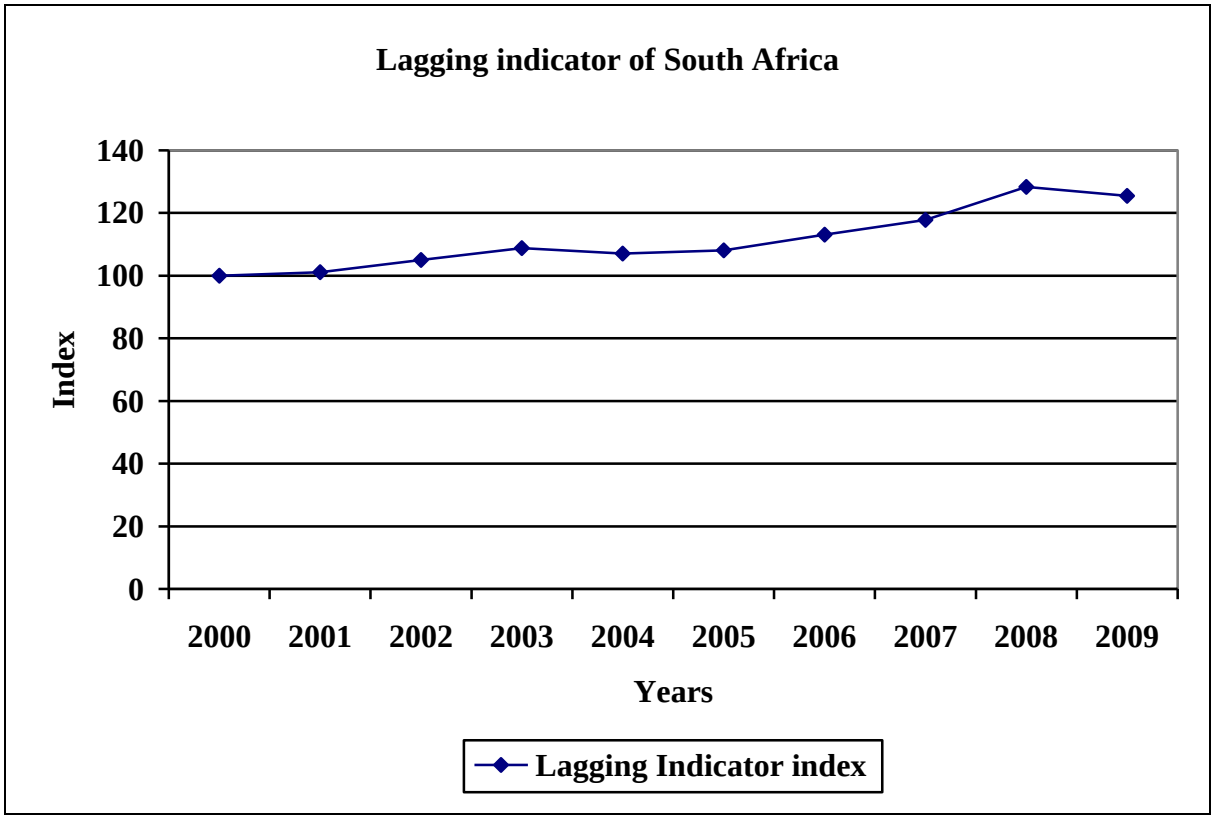
It is important to take into account international trade and exchange rates because most of the economic developments in the country are brought about by participation in external trade, hence, the importance of examining the REER of South Africa. The REER is a weighted average of the country's currency relative to an index or basket of other major currencies adjusted for inflation. The REER has been fluctuating since 2002, with the lowest rate of 74.68 attained in January 2002 and a highest rate of 119.67 in February 2006. From mid 2006 the REER has been declining with the lowest index of 88.15 in November 2008 attained between mid 2006 and December 2009. The December 2009 REER stood at 108.13 (SARB, 2010). The fluctuations in the REER have been attributed to economic changes and trade relations between South Africa and its major trading partners throughout the period 2002-2009.

2.2.3 Lagging business cycle indicator

The lagging business cycle indicator is an index of all business cycle constituents that change after the business cycle has already begun to follow a particular trend. In other words, it lags behind the shape and turning point of economic cycles, for instance, a peak in interest rates

and inflation occurs within 12 months from the beginning of an economic slowdown. Figure 2.4 shows trends in the lagging business index for South Africa from 2000 to 2009.

Figure 2.4: Lagging business cycle indicator for South Africa



(Data Source: DTI, 2010)

The constituents of the lagging business cycle index of South Africa are inflation (consumer and producer prices), inventories and inventories to sales ratio, unit labour costs, short-term and long term interest rates, commercial and industrial loans and consumer installment credit among others (Venter, 2004). The lagging business cycle indicator has been on an upward trend from 2000 to 2009. The reason behind these trends is the result of various economic policy actions put into effect in the early 2000s such as the Black Economic Empowerment Charter 53 of 2003 which strengthened economic activity. The economic policy actions that are explained in the analysis of the coincident indicator also affected the trends of the lagging indicator.

It has been noted that the lagging indicator is an index of many constituents and trends of two constituents namely inflation and prime interest rates are explained. These components of the

lagging indicator were chosen for various reasons. Inflation is defined as, the general rise in prices of goods and services and impacts businesses in all sectors of the economy - hence it is an important constituent in business cycle issues. Interest rates define the cost of borrowing and are important in this study because they greatly impact on the level of investment and hence economic activity.

The SARB has a mandate of inflation targeting to achieve a rate of between 3% and 6%. The year on year inflation figures released by SARB show that the central bank achieved the target in 2000 (5.4%), 2001(5.8%), 2003 (5.8%), 2004 (lowest ever at 1.4%). 2005 (3.4%) and 2006 (4.6%). SARB did not achieve its fixed target in 2002 (9.1%), 2007 (7.2%), 2008 (highest ever at 11.5%) and 2009 (7.2%) (SARB, 2010). The success in inflation targeting in the early 2000s was due to various economic reforms such as the economic revival economic charters introduced in different sectors of the economy. The under achievement in 2007/08 was attributed to, among other things, the political crisis in the neighboring country Zimbabwe which led to rise in demand for South African goods by Zimbabweans. The high rate of 2009, in turn, can be seen as the response to the global economic recession which was felt in South Africa in 2008.

The prime interest rate or prime overdraft rate is a reference interest rate which commercial banks use when issuing variable interest rate loans to the general public. The prime overdraft rate can fluctuate over time and usually in correlation with the REPO rate. The REPO rate also known as the repurchase rate is the interest rate at which the commercial banks can borrow money from the South African reserve bank. Every time when the repo rate is adjusted by the monetary authorities, the prime interest rate also changes, meaning that the general public will also be affected. The REPO rate is one of the important factors influencing the supply of money in the economy of South Africa.

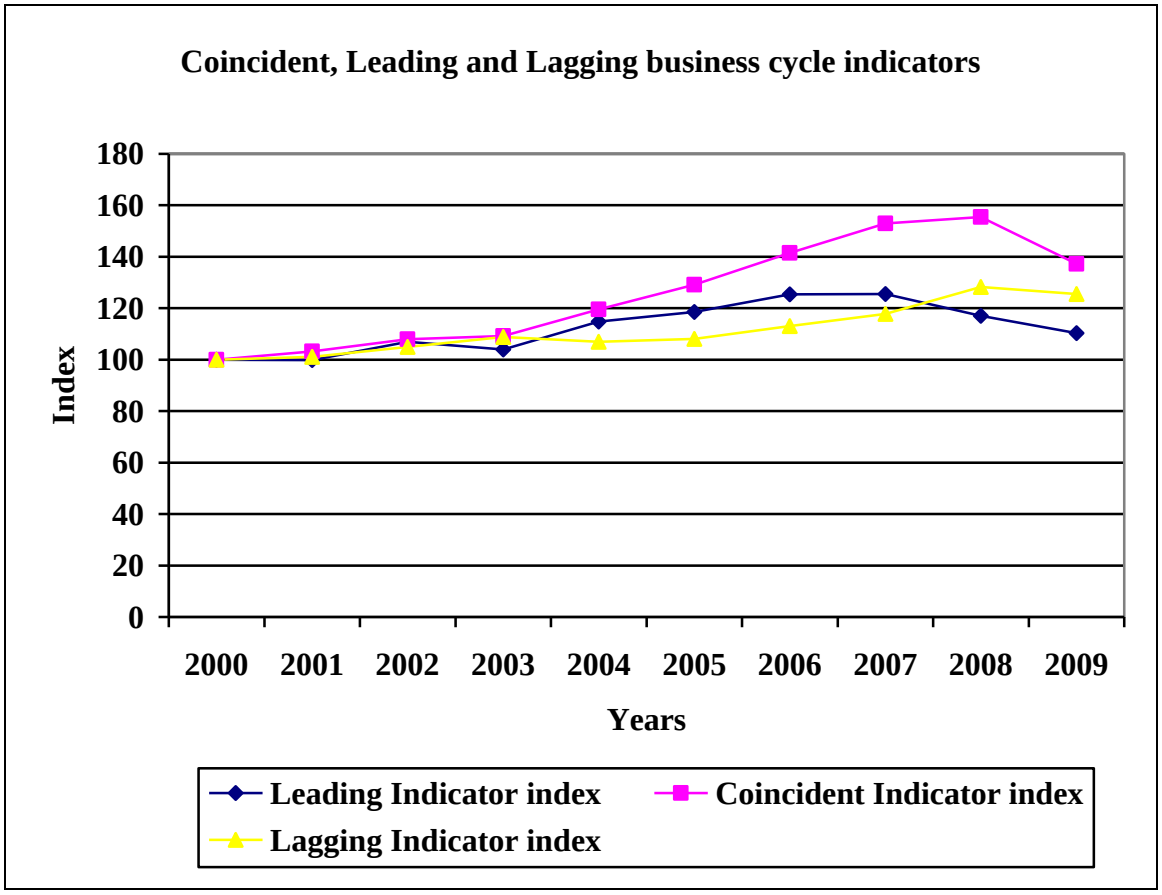
When the Monetary policy committee decides to lower the REPO rate, money supply is increased. This is a very important strategy to encourage the growth of businesses and consumer spending because they now have access to cheap money. One problem is that an increase in money supply is inflationary. As more money is available the value of the currency decreases due to inflation. Hiking the REPO rate decreases money supply. This move might be seen as harsh by other economic players but this is a very good way of keeping inflation down. However, this discourages business growth and consumer spending

as it makes more expensive for businesses and consumers to borrow money. The average annual prime rates for South Africa were 15.75% (2002), 14.96% (2003), 11.29% (2004), 10.63% (2005), 11.17% (2006), 13.17% (2007), 15.13% (2008) and 11.71% (2009) (SARB, 2010). The cost of borrowing from commercial banks has been a little favorable in 2004, 2005, 2006 and 2009 at less than 12% as compared to previous years where it was far greater than 12%. In 2008 due to the world economic recession the prime rate reached 15.5% from July to November. However the prime rates started to go down in May 2009 at 11% and then 10.5% from August to December (SARB, 2010).

2.2.4 The relationship between business cycles indicators

It is important for stakeholders in the economy, such as government and private sector, to understand the meaning of each of the business cycle indicators and to know their relationships. This kind of relationship is helpful to the investors because they become aware of future, present and past business cycles issues which help in decision making. Well focused investors want to know the current status of economic affairs as well as to forecast into the future and find out how the economy is likely to perform so that they make viable and profitable business decisions.

Figure 2.5: The relationships between business cycle indicators



(Data Source: DTI, 2010)

Figure 2.5 shows the trends in business cycles indicators from 2000 to 2009. By looking at the graph there is a relationship between the indicators. However, it is understood that the leading indicator predicts the future business cycle trends, the coincident indicator move in the same direction as the economic cycles while the lagging indicator responds to the previous economic cycles. For instance, on one hand, the graph shows a decline in the leading indicator of South Africa between 2007/08 while the coincident indicator was rising, but started to fall in 2008/09 as predicted by the leading indicator in the prior period. On the other hand, the lagging indicator has been steadily rising into 2009 but gradually declining in the last months of 2009 and was expected to fall further in 2010 in response to the 2008/09 economic recession. The economic recession was brought into South Africa as the world economy went into a decline after a collapse in the housing market of the USA in 2008/09.

Stock markets are essential to businesses in the economy of South Africa. The study of stock market performance is analysed through trend analysis of various stock market constituents such as market capitalization, liquidity of the exchange and the overall price index among others. It is imperative, therefore, to assess the functions and activities of the Johannesburg Stock Exchange in order to determine how the stock market of South Africa has been performing. This, in turn, provides the opportunity to assess the linkage between business cycles and stock market performance.

2.3 The Johannesburg Stock Exchange (JSE)

The Johannesburg Stock Exchange (JSE) is a full service securities exchange which provides trading, clearing and settlement of equities, derivatives, interest rate products and other associated instruments. The stock exchange was established in 1887 and has been experiencing numerous changes since then.

2.3.1 An outlook of the JSE

The JSE facilitates trade in listed shares of companies. The exchange used floor trading formation from its start until 1996. As from 1996, a new high-tech computer trading replaced the open floor system. This high-tech computer system was known as the JSE Automated Trading Systems (JSE ATS) and also referred as the Johannesburg Equities Trading System (JET). The JET system operated until 2002 and was replaced by the JSE SETS Trading System. The JSE endeavors to raise investors' confidence by dealing in authentic and fair prices and ensures that the market is not influenced to investors' disadvantage. The exchange functions inside a proper regulatory framework that is adhered to by all market players and is carefully enforced by a regulatory act. The JSE has been based on self regulation with rules and directives directed to protect the interests of the general public who are buying and selling shares. Such legislation was embodied in terms of the Stock Exchange Control Act (SECA) of 1985 which has been amended several times due to changes in economic situations. The SECA which is overseen by the Financial Services Board (FSB) sets rules that govern the activities of the JSE (JSE, 2010).

2.3.2 The role of the JSE

The JSE contributed in increasing the awareness around good corporate governance (OECD, 2009). In contributing to the corporate governance framework, the JSE has been providing incentives to listed companies to commit to higher governance standards. The stock exchange in alliance and collaboration with other stock exchanges acts to further improve governance standards globally (OECD, 2009). In 2008, the JSE announced a new constituency of the Socially Responsible Investments (SRI) index which assesses environmental, social and economic sustainability practices and corporate governance of listed companies (OECD, 2009). South Africa's largest pension fund, Government Employee Pension Fund (GEPF) collaborated with the JSE on SRI index in 2008. The GEPF used research and development to establish its own SRI policies. GEPF's research criteria cover three main areas; Environmental, Social and Governance and related sustainability concerns. Two research themes HIV and AIDS and Black Economic Empowerment are tailored to the South African perspective and relevant to companies with considerable operations within South Africa.

2.3.3 Companies listed on the JSE

The number of listed companies is the total firms which have shares listed on the JSE at the end of a financial period, split into domestic and foreign but excluding investment funds and unit trusts. A company is domestic when it is incorporated in South Africa and foreign when it is incorporated in any other country. By being listed on the JSE, companies position themselves to benefit from access to capital for growth and fund acquisitions and boosting their profiles with customers, suppliers and investors thereby making more business opportunities available. In addition, a listing allows companies to facilitate broad based Black Economic Empowerment (BEE) deals, a prerequisite to effective corporate citizenship in South Africa.

The JSE lists shares on two separate markets, the Mainboard and AltX. Requirements for listing on the Mainboard are strict, while the AltX lists smaller fast growing companies who fail to meet the Mainboard criteria. In addition, SATRIX is an instrument introduced by the JSE in 2008 to track the performance of the underlying ALSI index. The exchange is fully electronic, using the JET system, an order based system whereby trades are automatically executed when matching buying and selling prices.

The JSE listed 421 companies by end of 2009 and had a market capitalization of over US$482 billion, making it the largest exchange in Africa and among the ten largest in the world. The listed companies on the JSE has dropped significantly from 1990 (769 companies) to 2009 (421 companies). The stock exchange experienced a number of new listings and quite a number had been delisted since 1990. A significant drop has been observed from 1995 to 2005. The major reason was the improvements and strictness of the JSE systems in respect of corporate governance standards. Many companies deregistered because of the failure to meet the full requirements of the constantly evaluated corporate governance standards.

2.3.4 JSE domestic market capitalisation

The market capitalisation of the JSE is the amount of issued shares of domestic companies multiplied by their relevant prices at any time. Market cap substantiate the all-inclusive value of the stock market at some particular point. The JSE market cap value includes shares of the domestic market, shares of foreign companies which are exclusively listed on stock exchange, ordinary and preferred shares of domestic companies and shares without voting rights. Market cap does not include collective investment funds, rights, warrants, Electronic Traded Funds (ETFs), convertible instruments, options, futures and foreign listed shares other than exclusively listed ones. It also excludes companies whose only business goal is to hold shares of other companies and companies admitted to trading, that is, those companies whose shares are traded on the exchange but not listed at the exchange. Figure 2.6 shows the trend of market capitalisation at the JSE from 2000 to 2008.

Figure 2.6: Domestic market capitalisation

(Data source: WFE, 2009)

Domestic market capitalisation of the JSE grew progressively from 2001 to 2007 and fell sharply from over US$800b in 2007 to just below US$500b in 2008 as shown on Figure 2.6. The upward trend from 2001 to 2007 has been attributed to increased purchase of shares and competitive share prices throughout the period. Businesses were generally performing well and due to expansion many shares were sold at the stock exchange which saw the market cap increasing. However, between end of 2007 and 2008, market capitalization fell. This was associated to falling share prices and this was a clear signal of the recession of 2008/09. The share prices, however, started to rise again in the last quarter of 2009 and this was a signal that the world economic recession was gradually easing.

2.3.5 JSE stock exchange survey

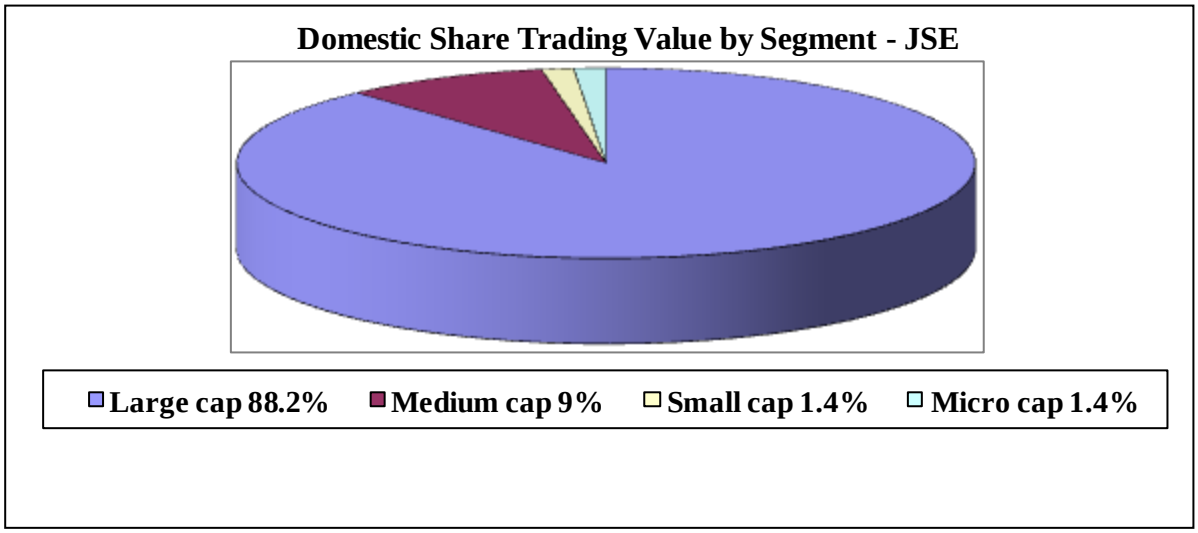
The World Federation of Exchanges (WFE) embarked on a survey to examine market capitalisation of the JSE in 2007 and a number of results were obtained and presented graphically (WFE, 2007). The issues that were analysed were domestic market cap by

segment (Figure 2.8), domestic share trading value by segment (Figure 2.7) and turnover velocity of domestic shares by segment (Figure 2.9) (WFE, 2007).

2.3.5.1 Domestic value of share trading

To achieve a more complete view of market activity, shares trading value is split into two main categories of trades according to the facility or means used to perform the trading functions. At the outset, trade is made through the Electronic Order Book (EOB). These are trades that signify the transfer of ownership and are done mechanically through the exchange's EOB, where orders placed by trading members are generally exposed to all market users and routinely coordinated according to specific regulations set up by the exchange. Secondly, there are bargained deals which denote the transfer of ownership made through a joint negotiation and involving at least one exchange's member intermediary. These trades may not be exposed to the market until after the trade is completed. They can be executed in a number of ways, including special trading platforms or other structures, and are reported by the mediator to the exchange's authority. They can be executed and/or reported on systems operated by the JSE securities exchange. Figure 2.8 shows domestic share trading at the JSE (WFE, 2007).

Figure 2.7: Domestic Share Trading Value by Segment



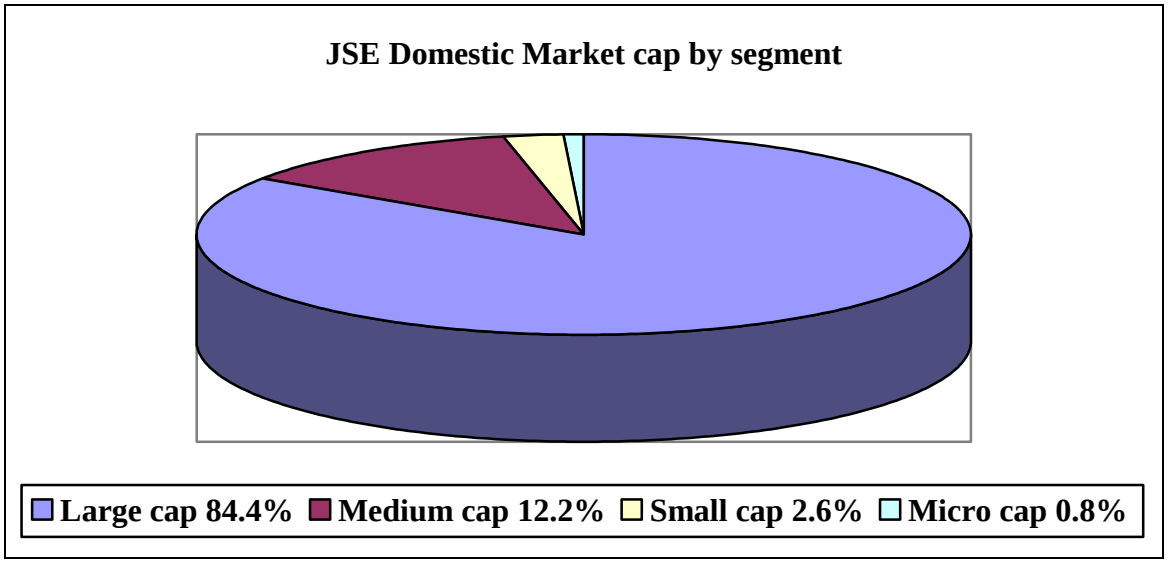
(Data Source: WFE, 2007)

Figure 2.7 shows that 88.2% of the domestic share trading value occurs in the large cap companies while 9% in the medium cap companies, 1.4% in the small cap companies and 1.4% in the micro cap companies (WFE, 2007). It can be concluded that the highest share trading value takes place in the large cap companies and the reason is because of their sheer size of share trading combined with a broad base of investors. At the JSE, there are quite a number of large firms with a very large volume of share trading. These firms include the British American Tobacco, Old Mutual, Vodacom group and various other multinational companies. The small and medium cap comprises of companies that have low volumes of share trading and these firms have a narrow base of investors who buys shares in them.

2.3.5.2 Market cap by segment

Domestic market capitalisation of the JSE attempts to find out which proportion of listed companies are in large cap, medium cap, small cap or the micro cap category. Figure 2.8 shows the results of the survey on domestic market capitalization by segment.

Figure 2.8: Domestic Market cap by segment



(Data source: WFE, 2007)

From Figure 2.8, it can be noted that 84.4% of the companies listed on the JSE are large cap companies. This implies that a greater proportion of the companies listed on the securities exchange had a large cap by the end of 2007. These firms have a market cap of between

US$10b and US$200b. Figure 2.8 also shows that 12.2% of the companies listed at the JSE were medium cap, 2.6% small cap and 0.8% micro cap by the end of 2007 (WFE, 2007).

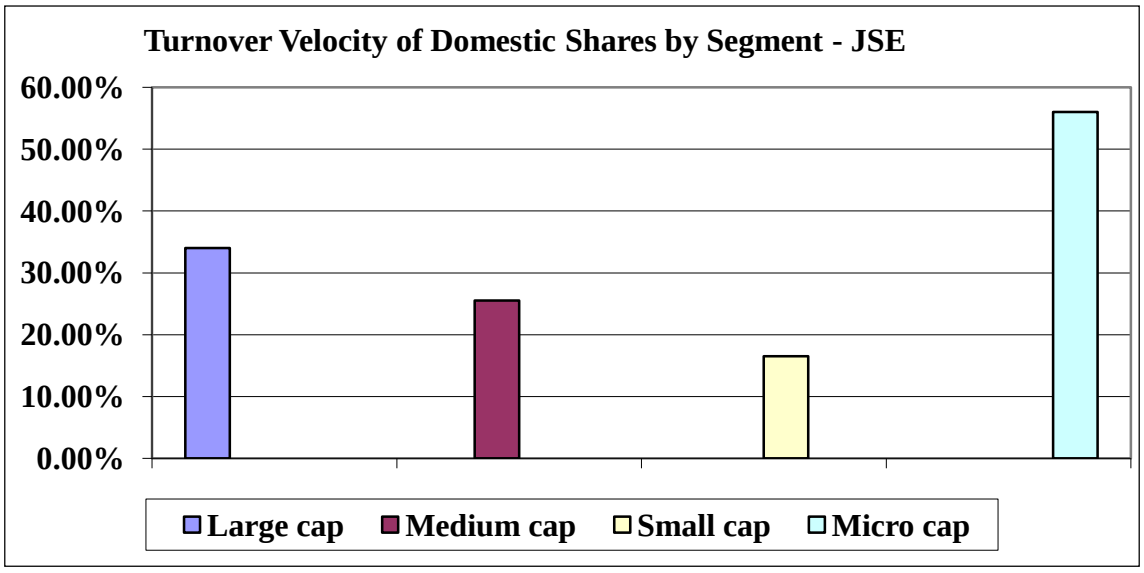
2.3.5.3 Turnover velocity of domestic shares at the JSE

The turnover velocity is the relation between the Electronic Order Book (EOB) turnover of JSE domestic shares and their market capitalization. The value is annualised by multiplying the monthly average by 12, according to the following formula:

$$\text{Turnover velocity} = \frac{\text{Monthly EOB domestic share turnover}}{\text{Month-end domestic market capitalization}} \times 12$$

Figure 2.9 shows the turnover velocity of domestic shares by segment. The figure analyses turnover velocity of listed companies at the JSE according to market cap.

Figure 2.9: Turnover Velocity of Domestic Shares by Segment



(Data source: WFE, 2007)

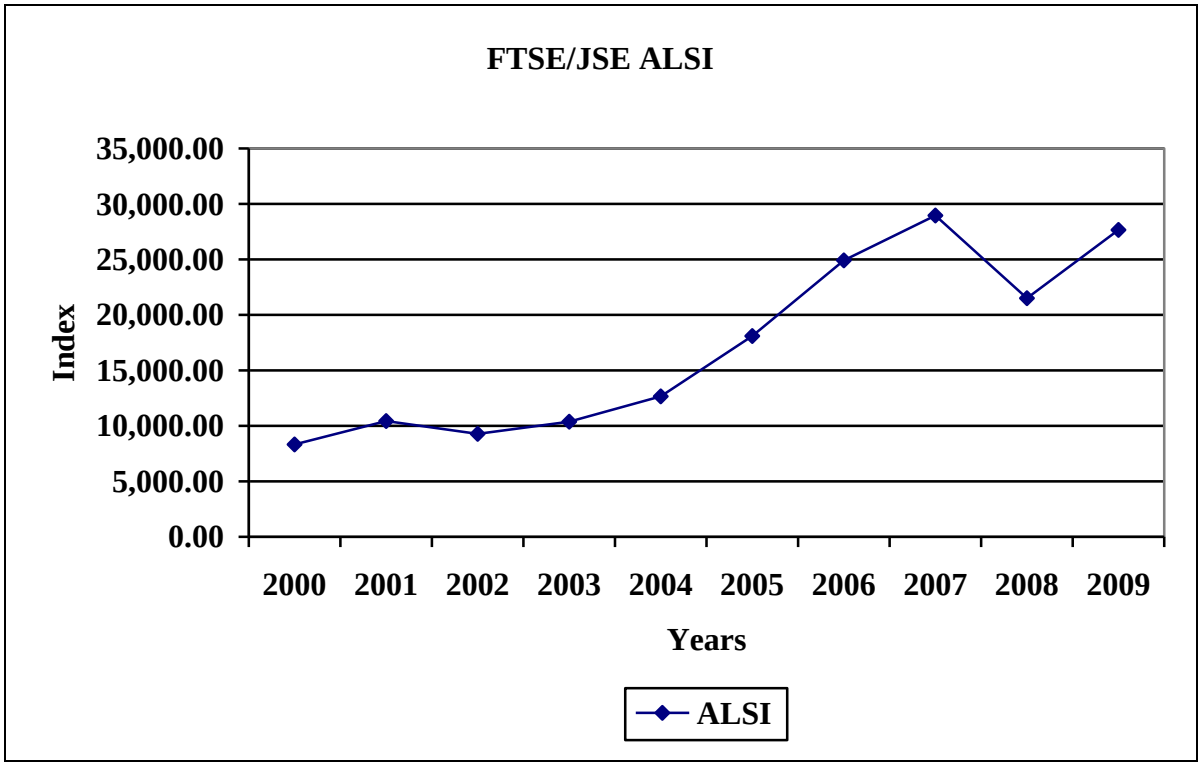
Figure 2.9 show that micro cap enterprises had the highest turnover velocity of domestic shares of about 56% than any other category. The large cap companies had a turnover velocity of 34%, while the medium cap enterprises have 26% and the small cap companies had the lowest turnover velocity of domestic shares at 17% in 2007 (WFE, 2007).

2.3.6 Broad Stock market index levels (ALSI)

The FTSE/JSE All Share Top 40 Companies Index is an equity index intended to reflect the performance of the South African ordinary share market as a whole. The All Share Price Index (ALSI) measures the performance of the overall market. A relatively big proportion of the total number of securities listed on the JSE are incorporated into the index, on the basis that movements in the share prices of those constituent companies can be said to represent the market as a whole. Companies selected for inclusion in the Top 40 Index are the largest 40 by market cap. The purpose of the index is to have a tool that will be able to describe the market at a given point in time in terms of price levels, dividend yield and earnings yields. The FTSE/JSE ALSI is benchmarked against international standards and is an indicator of the general mood of the market. Investors also use the ALSI40 index as a benchmark against which performance of their portfolio can be assessed. Figure 2.10 shows the trend in the ALSI from 2000 to 2009 taking the year end figures.

The long-run performance of the JSE had been very good as shown by the visible increasing trend of the ALSI in Figure 2.10. The global economic crisis which emerged in the USA is responsible for a sharp decline in the ALSI40 index in the last quarter of 2007 into 2008. However, up until the first quarter of 2007, the FTSE/JSE All Share Index has afforded a yearly return of 22.5% over the previous thirty years (Brown, 2007).

Figure 2.10: JSE All Share price index



(Data source: WFE, 2009; JSE Data, 2010)

2.3.7 Investment ratios of the JSE

Ratios are relationships between two or more figures from financial statements, intended to show profitability or effectiveness of management of a company. Table 2.2 shows the average price earnings ratio and dividend yield for the JSE in two different periods from 1999 to 2009.

Table 2.2: JSE average Price earnings ratios and Dividend yields

Average PER and Dividend yields		
Years	**1999-2003**	**2004-2009**
Price Earnings Ratio (PER)	13.78	14.12
Gross Dividend yield (%)	2.97	2.90

(Data Source: WFE, 2009 own calculation)

Gross dividend yield is a ratio that shows how much a company pays out in dividend each year relative to its share price. In other words, dividend yield is a way to measure how much cash flow an investor gets for each dollar invested in an equity position. Furthermore, the yield reflects the actual cash generated for shareholders on the stock they have selected. Investors who require a minimum stream of cash flow from their investment portfolio can secure this cash flow by investing in stocks paying high dividend yield. Table 2.2 shows that the average dividend yield was 2.97% from 1999-2003. The average dividend yield decreased by 0.07% from 1999-2003 average to 2.90% in the period 2004-2009.

The price earnings ratio (PER) is a ratio of a company's current share price compared to per share earnings. A high PER suggests that investors are expecting higher earnings growth in the future compared with a lower PER. It shows how much investors are willing to pay per rand of earnings. The average PER in the period 1999-2003 of 13.78 means that investors on average were willing to pay R13.78 for R1.00 of their earnings. Between 2004 and 2008 the PER increased to 14.12 implying that investors were willing to pay 34 cents more for R1.00 of their earnings compared to the period 1999-2003 (WFE, 2009).

2.3.8 JSE market performance in 2008/09

Performance of the JSE is strongly related to the market environment for a particular year. With stable volumes and sharp market value decreases, it is not surprising that overall revenues stagnated in 2008. JSE limited released results that showed flexibility of the stock exchange even with difficulties faced by all stock markets in 2008 which include increased volatility and declining investor sentiments. Despite the fact that stock markets globally faced extraordinary tests in 2008, the JSE performed well. The JSE benefited much from the presence of the British American Tobacco (BAT) company which had the largest market capitalisation on the stock market in 2008. Several of the 2008 listings were foreign companies resulting from the JSE's efforts to attract more foreign companies (JSE, 2009).

The JSE equities division upgraded its trading engine to the version applied by the London Stock exchange (LSE) which offers functionality and can handle greater message traffic and stabilising downstream JSE systems. The clearing and settlement division introduced rules to permit the rolling of settlement under exceptional circumstances in 2008. The average daily number of equity market trades increased by roughly 50% to just over 69000 in 2007. Equity

market trading fees were cut by 7.5% as of June 2008 and much focus was placed on client services. The JSE remained the world's biggest international operator in Single Stock Futures (SSFs) while the equity derivative contract volumes rose by 45% in 2008 from 2007. Information sales were also in the positive as shown by an increase in number of terminals receiving JSE information packages which grew by 15% from 42,923 in 2007 to 49,225 in 2008. In 2008 revenues from operations rose by 22% to R1, 072 million compared to R877 million in 2007. Profit before net financing increased by 41% while operation costs increased by 1% in 2008 (Loubser, 2009).

During 2008, the JSE embarked on various strategic initiatives such as the African strategy. The African strategy aimed at promoting growth of capital markets on the African continent by attracting foreign capital market and allowing investors access to opportunities in Africa. The JSE also worked towards closer relations with the Board Exchange of South Africa (BESA). Net assets value per share grew by 24%, net cash flow from operating activities rose by 49% to R489 million in 2008 from R329 million in 2007. Pre-tax profit in 2008 went up by 37% from R405 million in 2007 to R544 million in 2008. The basic earnings per share rose by 37% and declared dividend was 192 cents per share (Loubser, 2009).

The number of share trades for the first quarter of 2009 increased by 24% relative to the first quarter of 2008. This development was contrary to the trends of many overseas stock exchanges which experienced reduced transaction activities comparing 2008 and 2009. Number of shares traded was up by 27% in March 2009 while value of trades was only down by 6% from March 2008 (JSE, 2009). The JSE adopted an internationally recognized messaging system known as FIX to enable the exchange to offer more effective and efficient message routine services to meet client demands. Throughout the year 2009 the JSE showed a resilient performance as depicted by rising trade volumes in the cash equity markets and strong performance from other divisions. Despite the harsh economic environment in 2009, revenue from the JSE rose by 8% from R1, 072 million in 2008 to R1, 156 million. The rise in the revenue has been a result of strategic initiative such as the launch of the Africa Board and the acquisition of the BESA (Loubser, 2010).

The operating costs for the JSE increased by 12% from R723 million in 2008 to R810 million in 2009 which resulted in a 2.4% decrease in net profit after tax from R374 million to R366 million in 2009. The cost increased due to higher personnel costs subsequent to the BESA

acquisition and a decision to strengthen the IT team in order to augment JSE technology (Loubser, 2010). The equities business contributed to the bulk of the JSE's revenue which was 56% or R647 million compared to 2008 of R579 million which was 54% of revenue at the JSE. Foreign investors were net buyers of R75 billion of equities during 2009, a swing of R130 billion on the previous year. An increase in foreign inflows in 2009 indicate a confidence in South Africa's economic prospects as well as trust in the JSE's world class system and regulation capabilities (Loubser, 2010). Although trading volumes in the cash equity increased in 2009, JSE's equity derivatives fell and this was due to investor uncertainty and deleveraging in the aftermath of the global financial crisis. Investor confidence however started to show signs of recovery in November 2009.

2.4 General Assessment of business cycles and stock market performance

Business cycle phases and trends are very crucial in determining economic progress in South Africa. It is important that investors track business cycles trends in order to institute viable investment decisions to operate profitably. It can be argued that when an economy is in a recession investors become wary as they fear negative return on their investments or total failure of their businesses.

Apart from studying business cycles, investors also need to check on how the stock markets are performing. Stock markets which perform well attract a great deal of investment since investors want to maximize return from their investments. When stock markets are doing well it means prices of shares are relatively high and this attracts investors to buy shares from companies. When companies generate huge sums of share capital it means they invest and expand. If this happens to hundreds of companies listed on the JSE stock exchanges, it implies that business activity increases. It is therefore, important to find out the exact kind of relationships between business cycles and stock market performance.

2.5 Conclusion

This chapter examined the trends in South Africa's business cycle through analysing the coincident, leading and lagging business cycle indicators. An analysis of performance indicators at the Johannesburg Stock Exchange had been done as well, which includes the domestic market capitalization and All Share Price Index.

The trend analysis of the business cycle indicators identified periods of turning points in South Africa's economic activity from 2000 to 2009. The economy recovered from the Asian crisis of the late 1990s into 2000 and grew significantly into mid-2000 until the last quarter of 2007 were the mortgage bond market of the USA went into shambles and spilled over the effects to the world economy in 2008/09. Prices of stock also fell due to the global economic meltdown of 2008/09 and this can help explain a reduced performance of the stock market in the time of the recession. However, as the world economy started to show signs of recovery towards the end of 2009 the stock prices started to increase and this might be an indication that there exist a relationship between stock market performance and business cycle.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter outlines the theoretical and empirical literature behind business cycles and stock market performance. The theoretical section conducts a review of literature on the Austrian Business Cycle theory, Elliot Wave Principle and the Efficient Market Hypothesis. The empirical section explores studies that have been conducted by different authors regarding business cycles and stock market performance. This chapter is divided into five sections. Subsequent to this introductory section, section 3.2 covers theoretical literature on business cycles and stock market performance. Section 3.3 present empirical findings on stock markets and business cycles. A general assessment of literature is presented in section 3.4 while section 3.5 concludes the chapter.

3.2 Theoretical literature

This section discusses the theoretical literature on business cycles and stock market performance. A theory which explains why business cycles occur is to be discussed together with two theories of stock market performance. The theory of business cycle to be examined is the Austrian Business Cycle (ABC) theory while stock market theories are the Efficient Market hypothesis (EMH) and the Elliot Wave principle (EWP).

3.2.1 An overview of business cycle theoretical literature

Classicalists' argue that business cycles are a result of momentary maladjustment of the economy, which would eventually level out. Economic instability is caused by exogenous factors such as inappropriate fiscal and monetary policies. According to these theorists, natural economic forces of demand and supply are given a chance to interact freely so that they achieve full employment equilibrium without any intervention from the government or monetary authorities. The Keynesians, on the contrary, argue that the existence of business cycles is indication of market failure and so provides a rationale for government participation

to stabilise the economy. The major argument by the Keynesians is that market mechanism will take longer to move towards full employment and if disequilibrium is not resolved in a short to medium term, it will cause social and political instability and may be a threat to market systems because of high levels of unemployment. Monetarists argue that business cycles occur because financial authorities may over supply or under supply money in the economy. In other words, Monetarists describe business cycle as a result of wrong monetary policy. According to monetarists, adequate control of money supply by prudent supervision of the financial systems and undertaking economic reforms that are more competitive and ensuring flexible market system is important to business cycle stability.

3.2.2 The Austrian Business Cycle (ABC) theory

The ABC theory was developed by Mises (1912) and supported by Mises (1949), Hayek (1935) and various other proponents such as Garrison (1997, 2001). The general thrust of the theory is its use of conservative macroeconomic variables of savings, money supply, interest rates and investment (Mises, 1912). The fundamental element of the ABC theory is that, the monetary authority's ability to expand money supply creates credit for lending. This growth of money supply will therefore have effect on interest rates, savings and investment which causes business cycles. Mises (1912) revealed that the most essential determinant of business cycle is the impact of monetary expansion which in turn lowers interest rates. When money is available in the economy it becomes cheaper for investors to borrow. Investors will use the opportunity to expand their investments and choose to invest in long production processes thereby shifting consumption from present to the future. This will result in business cycle growth and booms. This concept was advanced by Hayek (1935) who argued that the business cycle growth as a result of credit creation is not very sustainable, because the fall in interest rates is not a permanent phenomenon (Barnett & Block, 2006).

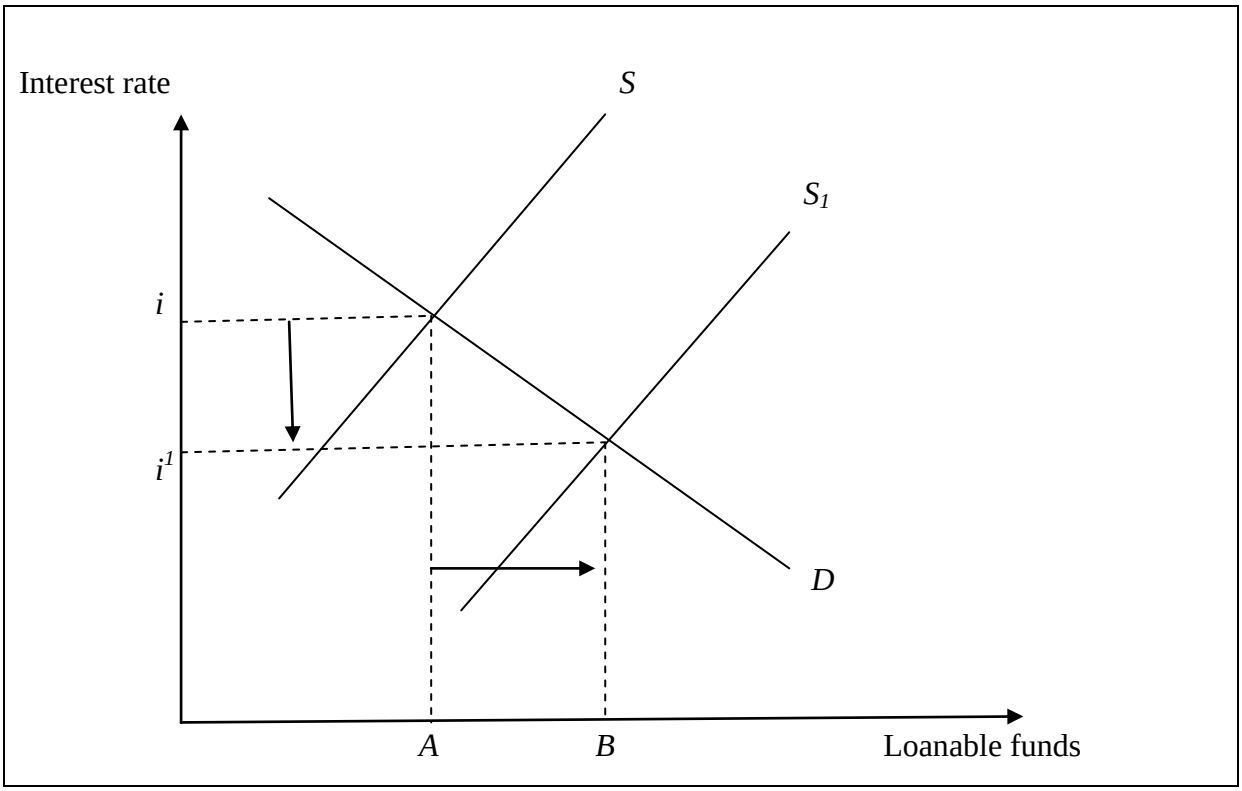
Garrison (1997, 2001) further expanded on Mises and Hayek's credit expansion elements, through the use of the Loanable Funds analysis. Garrison (2001) ascertained that, a business cycle emerges from a simple comparison of a sustainable savings induced boom and an unsustainable credit induced business cycle boom. An increase in savings by households and a credit expansion coordinated by the central bank will both have significant effects to economic activity. The ABC theory therefore cites that investment levels are determined by the supply and demand of loanable funds. Supply shows the willingness of households to

save at various rates of interest and it can also result from the ability of the central bank to pump money into the economy. Demand for loanable funds shows the keenness of investors to take advantage of the money supplied into the economy, either as a result of household savings or central bank credit, and use it for investment purposes. The market for loanable funds in the ABC theory brings together the demand for borrowing and supply of lending to set up a market rate of interest (Garrison, 1997). This is illustrated in the following section.

3.2.2.1 Savings induced and credit creation booms in ABC theory

Figures 3.1 and 3.2 show equilibrium in the loan market where the natural rate of interest is *i* as shown and the amount of income saved and borrowed for investment purposes is *A*.

Figure 3.1: Savings Induced business cycle boom

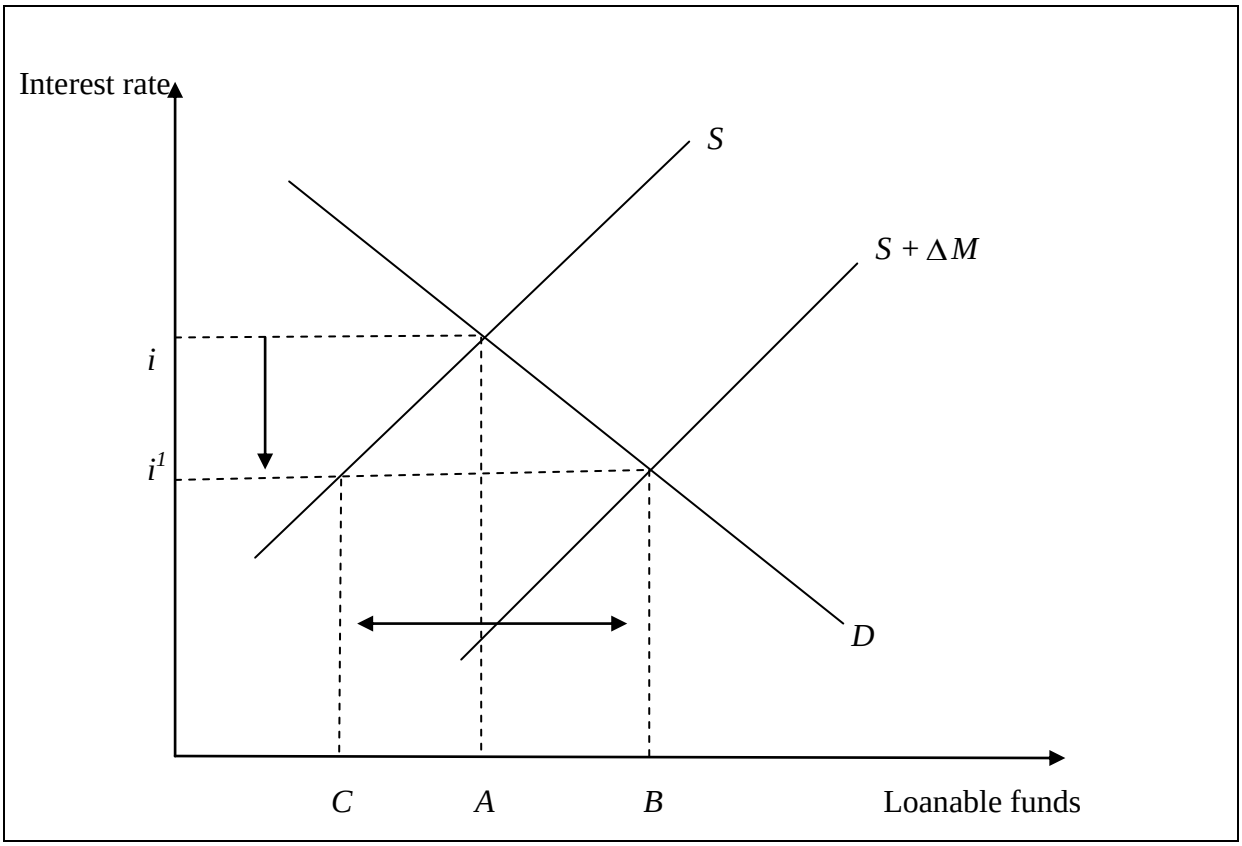


(Source: Garrison, 1997)

On Figure 3.1 an increase in the thriftiness by households as shown by shifts in the supply curve from *S* to S_1 indicates that households have become more future oriented since they now prefer to shift consumption from present to the future. This has resulted in the increase in loanable funds causing the interest rates to fall, thereby, enticing businesses to undertake investment projects previously considered unprofitable (Garrison, 1997).

At the new lower market clearing rate of interest, both savings and investment increase by the amount *AB*. This increases the economy's productive capacity since investors are now able to borrow at cheaper price, giving rise to investment and economic activity growth. In the event that households are forced to de-save for instance in times of recessions, the supply curve *S* shifts to the left giving rise to higher interest rates and reduced loanable funds. This implies that investors are left with few funds to invest and when investments dwindles this result in fall in business activity thereby resulting in a recession**.** The above analysis occurs as a result of households' actions. However, the subsequent analysis explains how business cycles are brought via credit expansion by the monetary authorities.

Figure 3.2: Credit induced business cycle boom



(Source: Garrison, 1997)

The ABC theory reveals that monetary authority committee such as one for SARB may engage in credit creation as shown in Figure 3.2. The figure illustrates that after credit expansion, money supply shift outward and interest rates fall below the market rate as denoted by a shift of the supply curve from *S* to $S+\Delta M$. The shift in supply is not brought

about by households' savings but by the central bank that injected more money into the economy. The Central bank has, thus, inflated the supply of loanable funds by introducing new money in the credit market. As the market-clearing rate of interest falls from i to i^1, businesses are lured to increase investment by the amount *AB* signifying growth in economic activity and business cycles. The fall in interest rates sends a signal to entrepreneurs that they should invest and lengthen their composition of production and substitute present consumer goods for future goods. In other words, increasing the supply of loanable funds holds the interest rate artificially low and drives a wedge between saving and investment. However, the low rate of interest will have stimulated temporary rather than sustainable business cycle growth. Households may mistakenly perceive the lower, observable interest rate to mean that the natural rate has fallen. These kinds of misperceptions are the origin of the business cycles. Ultimately, a credit-induced artificial business cycle boom is inherently unsustainable and is followed inevitably by a bust, as investments fall back into line with savings.

In the loanable funds framework, many aspects of the ABC theory are evident. When money is injected into credit markets, the injection effects, which the Austrian theorists call over price-level effects, take the form of too much investment. Actual investment in excess of desired saving make up what Austrian theorists call forced saving. The ABC theory reiterates that credit induced business cycle boom does not last (Block, 2001). The irregularities that were initiated by the production process during a credit induced boom will emerge because changes in consumption and investment were not based on changes in preferences. The Austrians, however, do not hold as true the view that there has been over-investment after a fall of interest rates in credit creation. According to them it is a mal-investment.

In the ABC theory, credit-induced decrease in the rate of interest creates a mismatch between inter-temporal resource usage and inter-temporal consumption preferences. At some point a business cycle bust is inevitable due to the inter-temporal difference between the time preference of consumers and the products of entrepreneurs. As the mal-invested capital is reallocated in line with consumer demand, output will fall, creating a recession (Wagner, 1999). The spending patterns of income earners mismatch with the production decisions that created their income. The discrepancy between earning and spending patterns ultimately turns a boom into a bust. The misleadingly low rate of interest that generated the boom finally gives way to a high real rate of interest as investors bid against one another for increasingly scarce resources (Cowen, 1997). The bust, which is simply the market's recognition of the

unsustainability of the boom, is followed by liquidation and capitals restructuring through which production activities are brought back into conformity with consumption preferences (Garrison, 2001).

The ABC theory reiterate that, whatever the interest elasticity of the investment aggregate, the impact of interest-rate movements on the structure of capital is crucial to the maintenance of inter-temporal equilibrium. Changes within the capital structure may be significant even when the change in net investment is not. Those structural changes can be equilibrating or disequilibrating, depending on whether they are savings-induced or credit induced. The ABC advocates that the boom and bust are more significantly identified with misallocations of resources within the economy's capital structure. Under extreme assumptions about labour mobility, an economy could undergo a policy-induced inter-temporal distortion and with no change in total employment. Actual market processes, however, involve adjustments in both capital and labour markets that transform capital-market distortions into labour-market fluctuations. During an artificial boom, when workers are bid away from late stages of production into earlier stages, unemployment is low; when the boom ends, workers are simply being released, and unemployment rises (Garrison, 2001).

The ABC theory explains the importance of interest rates and various other conservative macro-economic variables in studying business cycles. Although the theory put much emphasis on interest rates as major determinant of business cycle, savings, investment, employment and money supply are also influential to business cycles (Tullock, 1987; De Soto, 2006). In the real world scenario, these macro-economic variables, which feature in the ABC theory, are important in deciding business performance and hence economic activity. For instance, in the South African context, fluctuations in the interest rate and money supply affects business activity and business cycle trends as pointed out in Chapter two. Although the ABC theory does not openly mention the contribution of the stock markets to business cycles, performance of stock markets can be argued to contribute to business activity and hence business cycles.

The ABC theory, however, has limitations, in that, it over emphasises the impact of interest rates. Interest rates on their own may not create the effects that ABC theory asserts. Increased investments after a fall in interest rates can be a result of other economic factors. The mainstream economics ascertain that credit expansion leads to inflation, suggesting that

business cycles produce inflation. The Austrian position has not integrated this economic fact in their analysis. Garrison (2001:1), instead, points out that the ABC theory does not hinge on there being any inflation during the business cycle boom. However, inflation is always a monetary fact (Friedman, 1992:49). The ABC theory also ignores the rational expectation hypothesis. The cluster of errors that results from entrepreneurs all reacting to credit expansion as if it reflects a change in the savings rate is contrary to rational behaviour in the neoclassical sense. The theory fails to explain the ability of people to distinguish between an increase in personal savings and an increase in central bank holdings of government debt, which is an important and reasonable requirement of individual rationality in economic actions.

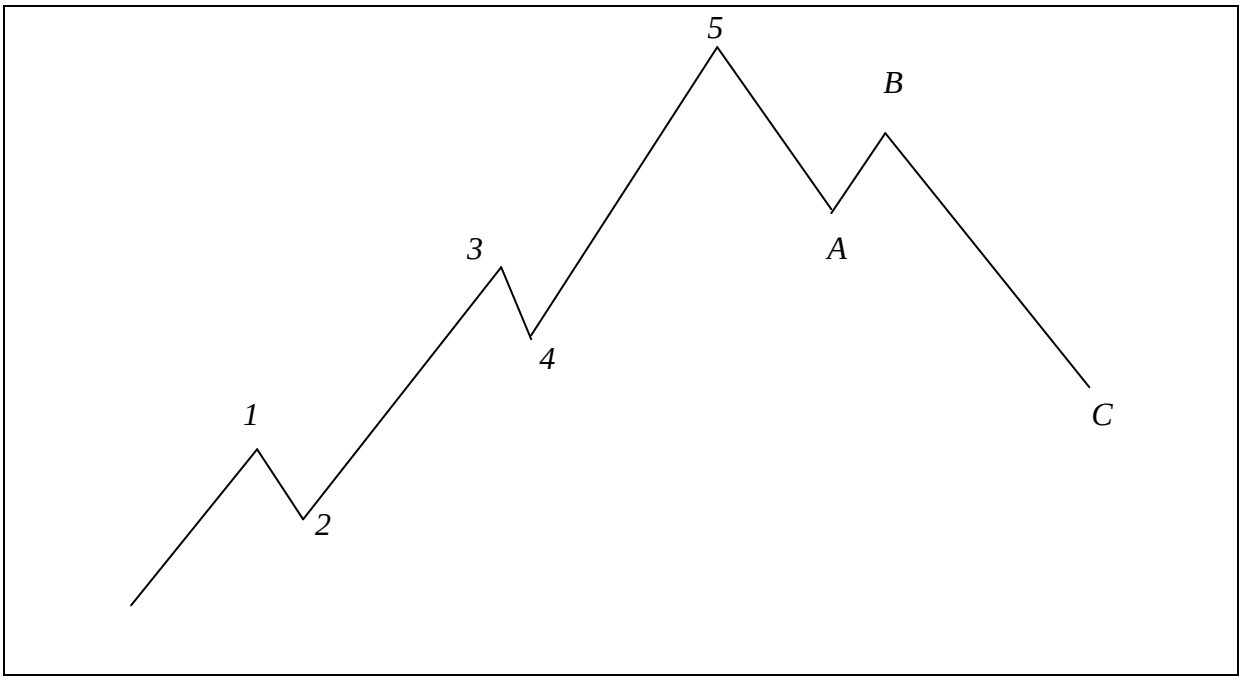
3.2.3 Elliot Wave Principle (EWP)

Ralph Nelson Elliott (1871-1948) developed the Elliot wave theory in the late 1920s into the 1930s and published it in 1938 (Elliott, 1938). The theory is an in depth explanation of how financial markets are traded in recurring cycles. Elliot reiterated that financial markets cycles resulted from investors' responses to external influences known as psychology of the masses. The theory found that upward and downward swings of mass psychology always showed up in the same repetitive patterns called waves. Elliot's theory is almost based on the Dow Theory in that, stock prices move in waves. In this theory, Elliot also pointed out that stock markets are presented in the detailed wave principle.

Elliott (1938) revealed that stock prices alternate between five and three waves at all degrees as shown in Figure 3.3. As the waves develop, big price patterns spread out in self similar fractal geometry. Initially, an impulsive wave which goes around the main trend has five waves. In financial markets, every action creates an opposite reaction since price movements must be followed by opposite movements. These price movements are divided into trends and corrections or sideways movements. Five waves in the direction of the main trend are followed by three corrective waves and this was named a *5-3* move which completes a stock market cycle. Although the patterns pictured on Figure 3.3 are bullish, the same applies for bear markets where the main trend is down. A bull stock market is a market in which prices are rising or are expected to rise and such markets are characterised by optimism and investor confidence. Bull markets do not last forever, soon a bear market will come which is

associated with falling prices and fading investor confidence. The wave principle is illustrated in Figure 3.3.

Figure 3.3: Elliott's Wave Theory



(Source: Fost & Prechter, 1998)

3.2.3.1 Impulsive wave in the EWP

The impulsive waves consist of five wave patterns, wave *1* to *5* in Figure 3.3. When wave *1* of a bull market starts, the news is generally negative. Market analysts continue to revise their earnings estimates lower and the economy does not look strong. Volume may increase a bit as prices rise, but not enough to alert many analysts. Wave *2* corrects wave *1*, but can never extend beyond the starting point of wave *1*. Usually, news is still bad and as prices retest the prior low, bearish reactions quickly builds and investors complacently maintains that the bear market is still in place. Some positive signs appear for those who are looking ahead.

Wave *3* is generally the largest and most influential wave in a trend. The news is now positive and investors start to raise earnings estimates. Prices rise rapidly, corrections are short-lived and shallower. Wave *4* is normally corrective and prices may meander sideways for an extended period. Volume of stock trade is well below that of wave *3*. This is a good time to buy a pull back if one understands the potential ahead for wave *5*. Wave *5* is the final

leg in the direction of the dominant trend. The news is universally positive and everyone is bullish. Unfortunately, this is when many average investors finally buy in. Volume is lower in wave *5* than in wave *3*, and many thrust indicators start to show divergences.

3.2.3.2 Corrective trend in the EWP

Corrections are typically harder to identify than impulse moves. In wave *A* of a bear market, the fundamental news is usually still positive and most analysts see the drop as a correction. Some technical indicators that accompany wave *A* include increased volume, increased volatility in the options markets and possibly a higher turn in open interest of related futures markets. Prices reverse higher, which many see as a resumption of the now long-gone bull market. Those familiar with classical technical analysis may see the peak as the right shoulder of a head and shoulders reversal pattern. The volume during wave *B* should be lower than in wave *A*. At this point, stock market variables are probably no longer improving, but most likely they have not yet turned negative. Prices move impulsively lower in five waves. Volume picks up, and by the third leg of wave *C*, almost everyone realises that a bear market is firmly established. Wave *C* is typically at least as large as wave *A*.

An understanding of the EWP theory enlightens on the possibilities in the stock markets of South Africa's JSE. The JSE on many occasions experiences bearish and bullish characteristic which could be a result of stock market waves as explained in the EWP. It is also important to note that at the JSE upward trends are also accompanied by opposing trends, as illustrated in the theory. Although EWP does not openly connect stock markets conditions to business cycles, there, is a chance that the waves which are explained in the theory may be a result of changes in the business cycle turning points or that these waves have influence on business cycle turning points. Hence or otherwise, there is need to understand the link between stock prices and business cycle turning points.

The EWP has its own limitations. The theory bases its strength on wave predictions which are very uncertain, subjective and not an objective judgement of numbers (Benoit & Hudson, 2004). The theory also lacks a theoretical basis. In a real world situation, if investors are able to predict market trends, it means no investor will ever make mistakes and they will eventually beat the market because they know what is going to happen on the market. However some investors still make losses despite their knowledge of the EWP. In addition,

the theory is too unclear to be a useful tool, because it cannot persistently recognise when the waves begins or ends.

3.2.4 Efficient Market Hypothesis (EMH)

Fama (1965) developed the theory of efficient market hypothesis (EMH). This theory stresses that financial markets have efficient information such that prices on traded assets like bonds or stocks, already imitate all known information and they instantly respond to new information on the market. The concept is based on the reflection of relevant information in market prices of the securities. There is no participant who can always surpass the market by using any information that the market already knows. EMH is based on the notion that individuals in the market have rational expectations, meaning on average that the populace is correct and every time when new significant information appears, all the agents adjust and update their expectations accordingly. When there is new information investors react differently, some over react and others under react randomly in a normal distribution pattern.

Three forms of efficiency have been delineated in the efficient market hypothesis, the weak-form efficiency, semi-strong-form efficiency and strong-form efficiency. The three forms have different connotations on how financial markets work. Under weak-form efficiency, all information content available from past price changes needs to be reflected in current price. Investors cannot, however, obtain abnormal returns by analysing relevant historical information about the securities. Semi-strong efficiency implies that share prices adjust to publicly available new information very rapidly and in an unbiased fashion, such that no excess returns can be earned by trading on that information. In strong-form efficiency share prices reflect to all information public and private and no-one can earn excess returns. If there are any barriers to private information becoming public (such as insider trading laws) then strong-form efficiency is unfeasible.

Through applying the EMH to JSE, it can be established whether the securities exchange is weak form efficiency, semi-strong efficiency or strong-form efficiency. The result will therefore entail how South Africa's JSE performs and therefore the study can achieve the objective of accessing the performance of stock markets in South Africa.

Despite the fact that the Efficient Market Hypothesis (EHM) has been extensively accepted by many researchers in the field of capital markets, the hypothesis' strength has been under increased inspection and question of late. The EMH has its own shortcomings when matched with real world practice. The imperfection in financial markets is attributed to a mixture of cognitive biases such as representative biases, information biases, inability to use configured rather than linear reasoning, overconfidence, overreaction and other human errors in reasoning and information processing. These errors in reasoning influence most investors to miss profitable opportunities making those who reason correctly to profit from bargains in neglected value stocks. In other words, it is possible for investors to use market information and surpass the market. In addition, investors are not always rational as depicted by the EMH.

3.2.4.1 Empirical testing of the efficient market hypothesis

Conclusions from practical testing of the efficient market hypothesis with stock prices have not been consistent. At South Africa's JSE, Thompson and Ward (1995) showed that there has been share price dependence, but this has been too small to be profitably exploited and concluded that JSE is operationally efficient. Claessens *et al* (1995) in a world bank study reported considerable serial correlation in equity returns from 19 emerging markets and suggested that stock prices in emerging markets violates weak form EMH. Poshakwale (1996) found the evidence of non-randomness stock price behavior and the market inefficiency on the Indian market. Khababa (1998) examined the behavior of stock price in the Saudi Financial market seeking evidence for weak-form efficiency and found that the market was not weak-form efficient. The study explained that inefficiency might be due to delay in operations and high transaction cost, slenderness of trading and illiquidity in the markets.

Although several studies such as Urrutia (1995), Grieb & Reyes (1999), Kawakatsu & Morey (1999) support non randomness of emerging markets' stock prices, some other studies related to these same markets, for instance Butler & Malaikah (1992) and Panas (1990) opposed. Harvey (1993) stated that stock returns of emerging countries are highly predictable and have low correlation with stock returns of developed countries. The study concluded that emerging markets are less efficient than developed markets and that higher return and low risk can be obtained by incorporating emerging market stocks in investors' portfolios.

Mabhunu (2004) tested the weak form efficiency of the JSE as a result of concerns raised over the strength of the EMH. The study revealed that the JSE is efficient in the weak form despite previous studies ascertaining the JSE to be inefficient in the weak form. The study also made comparison between the JSE and four other African stock markets and the JSE was seen to be more efficient than the other markets. The performance of the JSE, which enhanced information distribution as well as the efficiency in trading, added to the progress of the JSE's proficiency. The expansion in operational efficiency and revenues from the late 1990s has also been a key input to the expansion in the weak form efficiency of the JSE (Mabhunu, 2004).

3.3 Empirical literature

This section analyses business cycles and stock market performance studies to shed some light on the relationship between the two constituents. A large body of evidence comes from developed countries and African literature is scarce. In particular, there are a few studies that have been done to find the link between business cycles and stock market performances in South Africa, especially if we want to take the 2008/09 global economic crisis into account. Empirical literature can be categorised in a number of ways. These include categorisation by country (developed and developing), variables used and the type of analysis (survey and econometric studies). Empirical literature review in this section follows the first categorisation.

3.3.1 Empirical literature from developing countries

Wang (2010) investigated the link between the volatility of China's stock market and macroeconomic variables such as the real GDP, inflation, and interest rate for the period from 1992 to 2008 using monthly data. The study implemented two steps in its investigation. Initially, the volatility for each variable using a Engle generalised autoregressive conditional heteroscedasticity (EGARCH) model was estimated and an examination of the causal relationship between the volatility of the stock prices and the macroeconomic variables by using a lag-augmented vector autoregressive (LA-VAR) model. Results revealed that there was no causal relationship between stock market volatility and economic activity measured by real GDP. This implied that stock prices were not significant in explaining economic activity and business cycles, and vice versa. The results also showed a bilateral causal relationship between inflation volatility and stock market volatility, suggesting the existence

of a feedback occurrence between China's CPI and stock prices. Results also showed unidirectional causal relationship between stock market volatility and interest rate volatility running from stock prices to the interest rate.

The study by Wang (2010) conforms to the general theoretical framework of this study, through its use of variables such as inflation and interest rates. These variables play a significant role in business cycle theory as depicted in the ABC theory. However, results seem incompatible with economic theory and are somehow unrealistic as they showed that there was no causality between stock market volatility and business cycle over the period of study in China. The assertion that, business cycles do not influence stock market performance or vice versa, needs to be accepted with great caution.

Shyu & Hsia (2008) used a Switching Regime ARCH (SWARCH) model and other time series models to investigate the volatility of Taiwan's monthly stock market returns. The empirical results demonstrated that the SWARCH-L specification offered a better statistical fit to leading stock markets of the emerging economies. The study also provided evidence of a causal relationship between stock return volatility and the business cycle. The smoothed probabilities for medium and high-volatility systems lead to variations in the coincident business cycle index while a change in the coincident business cycle indicator preceded the probabilities for low-volatility systems. Such evidence strongly reinforced the value of information provided by stock instability, particularly in an irregular or highly volatile manner, in signalling variations in Taiwan's business cycles.

Sehgal & Tripath (2005) tested if there was a stock market size effect in Indian. The study used time series data for top 482 Indian companies for the period 1990-2003. Six alternative measures of company used were, market capitalisation, enterprise value, net fixed assets, net annual sales, total assets and net working capital. Size based investment strategy appeared to be possible as it provided extra normal returns on risk adjusted basis. The size effect did not owe to any seasonality or business cycle factors in India as shown by the results. The study had implications for mutual funds managers, investment analysts and small investors who were constantly on guard for trading strategies that can beat the market. The occurrence of a strong size premium also raised doubts about the informational effectiveness of the Indian equity market.

Azarmi *et al* (2005) investigated the relationship between stock market development and economic growth in India from 1981 to 2001 using simple regression analysis. Annual time series data was used in this study. Results suggested that stock market development in India was not associated with economic growth over a twenty-one year study period. However, the study found support for significance of stock market to economic activity during the pre-liberalization period. They also found a negative correlation between stock market development and economic growth for the post-liberalization period. Results were therefore consistent with the assertion that the Indian stock market may be viewed as a casino that is not contributing to the growth of the country. The division of the study into the pre and post-liberalisation was essential because these two periods were under different administrations and the results shown are also different. However, an analysis of the entire period shows that the impact of the pre-liberalisation period was stronger than the post-liberalisation period in respect to the relationship between stock market development and economic growth.

Nowbutsing & Odit (2009) studied the impact of stock market performance on economic growth in Mauritius over the period 1989 to 2006. The Mauritius stock market development and performance was measured by size and liquidity. The study defined stock market size as the share of market capitalization over GDP and liquidity as volume of share traded over GDP. Foreign Direct Investment (FDI) and human capital development were proxy variables for economic activity. The study carried out a time series econometric investigation both in the short run and long run by forming an error correction model (ECM). The study employed the simple two step procedure of Engle and Granger to examine the cointegration between economic growth and stock market performance. As a result of a small sample size and a few parameters estimated, the study considered the Engle–Granger approach more striking than the Johansen approach. Results indicated that stock market growth positively affected economic growth in Mauritius both in the short run and long run. The study further concluded that stock market development is an important constituent for economic growth in Mauritius.

The results of the study by Nowbutsing & Odit (2009) seem to be realistic and conforming to economic theory. The assertion that stock market growth is an important variable of economic growth is hailed because when stock markets are performing well and growing, it implies that businesses also grow and hence economic growth. However, the variables of economic activity used, FDI and human capital development needs to be justified in order to see if they are best measures of economic growth in real world scenario.

Enisan & Olufisayo (2009) investigated the long run and causal relationship between stock market performance and economic growth from seven countries in sub-Saharan Africa using the autoregressive distributed lag (ARDL) test. Stock market capitalisation was used as proxy to stock market development whilst real GDP was used as economic activity representation. Cointegration tests revealed that stock market development and economic growth were cointegrated in Egypt and South Africa. Results showed that stock market development has a positive and significant long run relationship with economic activity. Causality tests using the Granger tests on Vector Error Correction Model (VECM) showed that stock market performance Granger cause economic activity in Egypt and South Africa. Granger causality in the context of VAR showed evidence of bi-directional causality between stock market performance and economic growth for Cote D'Ivoire, Kenya, Morocco and Zimbabwe. Based on results, the study argues that stock markets can help promote the growth of African economies.

Arango *et al* (2002) examined the Bogota stock exchange and showed proof of non-linear relationship between share prices and interest rate. The results did not support any efficiency on the main stock market in Colombia. Hsing (2004) also studied the Bogota stock exchange by adopting a VAR model to take care of the simultaneous determination of several endogenous variables for example real interest rate, exchange rate, the stock market index and output. The results showed an inverse relationship between stock prices and interest rate. The variables that were used in Arango *et al* (2002 and Hsing (2004) namely interest rate, exchange rate and stock market index are constituents of the business cycle indicators of South Africa and they have strong implications on business cycles studies as shown in the ABC theory.

Oskooe (2010) assessed the relationship between stock market performance and economic growth in Iran by using causality tests within the Vector Error Correction Model (VECM) structure. Quarterly time series data was used from the third quarter of 1997 to the third quarter of 2008. As a precaution to prevent spurious regression, unit root tests were done for all time series data in their levels and their first differences. Johansen's co-integration testing was used to examine whether the variables are co-integrated and are of the same order, taking into account the maximum eigenvalues and trace statistics tests. Ultimately, the Granger causality test was used to identify direction of causality between the variables of the

estimated model. It was observed that the level of real economic activity was the key feature in the movement of stock prices in the long run. Furthermore, the stock market plays a role as a leading business cycle indicator of future economic growth in Iran in the short run. The results from this study are realistic because, when the stock market performs well, the impact is transferred to businesses and this in turn impacts on the overall economic growth.

Sabur (2009) examined economic returns and stock market volatility using daily all share price index of Dhaka Stock Exchange from 1986 to 2007. The study investigated the time-varying risk return connection in GARCH structure and the persistence of shocks to volatility in the stock market of Bangladesh. The GARCH form models revealed that Bangladesh was a volatile economy and there was a short-term and long-term persistence shocks, like other emerging markets. The extraordinary feature of the study is the inclusion of a huge sample size, with up to date data, that reveals the risk return character and volatility persistence shocks in the emerging stock market. The positive and significant auto-correlation in the Dhaka stock market time-series data signifies that the stock market of Bangladesh has limited supply of securities, lack of development of specialised financial institutions and lower level of speed of adjustment to new information.

Uddin & Alam (2007), at the Dhaka Stock Exchange (DSE), investigated the links between share price and business cycles, share price and changes of interest rate, changes of share price and interest rate, and changes of share price and changes of interest rate at. The results showed that, interest rates had a significantly negative relationship with share price and that, changes of interest rates had a significantly negative relationship with changes of share price while share prices were positively related to business cycles. The result that, share prices are positively related to business cycles conforms to the real world situation, as supported by the fact that, during the period of the economic recession of 2008/9 stock prices were low but as the recession eased towards the end of 2009 stock prices rose.

Tachiwou (2010) investigated the association between stock market progress and economic growth of West African monetary union over the period 1995-2006. A time series econometric analysis was performed both in the short run and long run by constructing an Error Correction Model (ECM). The measures of stock market performance in the study were size and liquidity. The study defined size as the share of market capitalization over GDP and liquidity as volume of share traded over GDP. Economic growth was measured by real GDP

growth rates which, in numerous other studies, have been used to measure economic activity and business cycles. The results showed that stock market performance positively affects economic growth in West African monetary union both in the short run and long run. The study, further asserted that stock markets are gauges of economies' financial health and that they indicate the moods of investors in a country. Stock market development is an essential element for business growth. The results are generally acceptable in the real world because, more often than not, when stock markets perform well, businesses also do well and hence economic activity expands.

Hernandez Perales & Robinns (2001) examined the relationships between stock market, real economic activity and monetary factors in Mexico. Lead-lag relationships among the Indice de Precios Cotizaciones (IPC) returns of the Bolsa Mexicana de Valores (BMV), industrial production and money supply were investigated using Granger causality tests. The financial variables were represented by the IPC of the BMV, the real variables by the industrial production index and unemployment rate, and the monetary variables by M1. Results showed that stock returns of the BMV are a leading indicator of future Mexican real economic activity. Moreover money supply (M1) played a role in leading the stock returns and real industrial production. Using Granger causality tests between volatilities of the IPC, industrial production and M1, the study revealed that the volatility of the IPC returns predicts the volatility of industrial production. The study also identified an asymmetric response in industrial production in the event of a negative percent change in the BMV returns and ascertained that, significant asymmetric responses in the industrial production and interest rates when a negative percent change in money supply happens.

Shahbaz *et al* (2008) examined the relationship between stock market performance and economic activity in the case of the developing economy of Pakistan. The study used annual time series data covering a period from 1971 to 2006. Two tests namely Dicky-Fuller Generalized Least Square (DF-GLS) and Ng-Perron (Ng-Perron, 2001) were used to find the integrating order of the variables for stock market performance and economic growth. To examine long run relationship amongst the variables, Johansen & Juselius Co-integration and autoregressive distributed lag ARDL bounds testing techniques were applied. To inspect long-run causal linkages and short-run dynamics, Engle-Granger causality and ARDL tests were used respectively. After identifying the order of integration, results suggested that there existed a very strong relationship between stock market development and economic growth.

Engle-Granger-Causality estimation confirms in the long-run, that there is bi-directional causality between stock market progress and economic growth. However, for short-run, there existed a uni-directional causality running from stock market performance to economic growth. The short-run uni-direction causality is realistic in the real world situation as already been observed from other studies. In addition, the long-run association is also valid, given the fact that, as businesses grow due to stock market growth, they are likely to issue more shares giving rise to growth in stock markets hence a bi-directional causality.

Bahadur & Neupane (2006) studied the causality relationship between stock market performance and economic growth for Nepal. The study used time series data for the period from 1988 to 2005 and carried out a causality examination using Granger causality test. Stock market development was represented by market capitalisation and economic growth by real GDP. The study discloses that stock market performance and economic growth have a long-run relationship. Results further revealed that stock market variations helped to predict the future economy. Furthermore, the results showed that stock market liquidity does not Granger cause economic growth. Granger causality ran from market capitalization to economic growth with considerable feedback. The result that changes in real GDP is Granger caused by changes in market capitalization is vital. This supports to justify the leading role of the stock market in influencing economic activities even in a developing country like Nepal, which has a comparatively small capital market to other countries.

Kaplan (2008) examined the relationship between stock market performance and real economic activity and reactions of real economic activity to shocks in stock prices in Turkey. The study estimated the related vector autoregressive (VAR) model and long-run causality was also assessed. The long-run equilibrium relationship between stock prices and real economic activity was analysed using Johansen cointegration test. The study used quarterly data for stock market indices and GDP between the first quarter of 1987 and the fourth quarter of 2006. The data used was obtained from the central bank of the Republic of Turkey and Istanbul Stock Exchange (ISE) electronic data delivery systems. The following model was estimated:

$$LRGDP_t = \beta_0 + \beta_1 LRSP_t + \xi_t \text{..... ....} (3.1)$$

Where, $LRGDP_t$ represented real economic activity (real GDP) and $LRSP_t$ denoted real stock market price index. Unit root test was carried out for each of the variables using the Augmented Dickey-Fuller (ADF) test. The number of lags was done using the Akaike Information Criteria (AIC). The outcome of the unit root test indicated that the variables were integrated of the same order 1, I(1). The Johansen cointegration tests checked if there was a long run association among $LRGDP_t$ and $LRSP_t$ series. The optimum lag length was carried out using Akaike information criterion (AIC) and Hannan-Quinn (HQ) criteria. The cointegration results indicated a long run relationship shown by a cointegrating relationship among the variables. The results implied that the link between the variable was binding in Turkey and stock prices were closely related to changes in real activity. The study also examined Granger causality within the framework of a VAR and a uni-directional causality which runs from stock prices to real economic activity was identified. The results conform to the real world situation because the expansion of the stock market normally leads to business growth hence economic activity and business cycle growth.

3.3.2 Empirical Literature from developed countries

Kearney & Daly (1998) used Generalized Least Squares (GLS) inference methodology to model the determination of Australian stock market conditional volatility via the Hendry general-to-specific estimation methodology. The study used a low frequency monthly data set for Australia's stock market returns, interest rates, inflation, money supply, industrial production and current account deficit over the period from 1972 to 1994. The study employed a two-stage estimation process by firstly estimating conditional volatilities and then modelling their interrelationships. Results revealed that conditional volatilities of inflation and interest rates were directly associated with stock market volatility. Furthermore, the conditional volatilities of industrial production, current account deficit and money supply were indirectly related to stock market conditional volatility. Industrial production has been used as a representation of business cycle changes. The strongest effect was found to be from the conditional volatility of the money supply to the conditional volatility of the stock market. Previous research on the volatility of the Australian stock market includes the work of Brailsford & Faff (1993) and Kearns & Pagan (1993), both of whom examined the relative explanatory power of alternative models of conditional volatility, but neither of whom, related stock market volatility to the volatility of financial and business cycle variables. The use of the variables such as inflation, industrial production, interest rate and money supply

makes this study important. These variables are important constituents of business cycle indicators of South Africa.

Koutoulas & Kryzanowski (1996) used a similar method to that which was used in Kearney & Daly (1998) with the intention of investigating the useful power of macroeconomic conditional volatilities in an arbitrage pricing model of monthly Canadian stock market returns. Results showed that the conditional volatilities of industrial production and exchange rates were vital constituents in their model while interest rates had an insignificant role. This result ruled out the importance of the interest rate. However, interest rates determine the cost of borrowing which in turn influence investment and hence or otherwise the interest rates are viewed as an important business cycle and stock market determinant in economic theory.

Nawroski & Carter (1995) examined if the business cycles of the United States of America were related to business cycles in other countries in order to determine whether they influences portfolio performance. They considered phases of the USA business cycles and the investment performance of Internationally Diversified portfolios. Hunt (1987) provided the macro-economic methodology that serves as the basis for determining phases of the cycle. The market theory used in the study was that international stock markets are segmented and that Markowitz (1991) portfolio theory and utility maximisation were the appropriate models. Statistical performance measures for various stock market indexes for each phase of the economic cycle were calculated. Performance statistics included annualised geometric mean returns, standard deviation, semi variations, t-tests, skewness and kurtosis and semi variability ratios were used in the analysis. The study concluded that business cycles influence the performance of stock portfolios both within and outside the United States and, thus, has implication for international diversification.

Silvapulle *et al* (1999) examined whether efficient asymmetric behaviour of Malaysian industrial production can be explained by the stock markets. The study considered threshold models to capture the asymmetric relationship between monthly Malaysian industrial production and Kuala Lumpur Composite Stock Index. A range of null hypotheses of equality restrictions were tested against inequality constraints and the composite null hypothesis involving steepness in business cycles. The results revealed that negative stock market returns have steeper effects on business cycles than do positive returns. Incorporating these

findings into modelling the relationship between industrial production and the stock market improves the prediction of business cycles volatility.

Rahman *et al* (2009) studied the links between selected macro-economic variables and stock prices for Malaysia using a vector autoregressive (VAR) structure. The economic activity variables used in the analysis were money supply, exchange rate, interest rate and industrial production. These variables were seen to have a significant long run effects on Malaysia's stock market in a vector error correction model (VECM) structure. Through testing a VECM, the study showed that changes in Malaysian stock market index has a co-integrating relationship with changes in money supply, interest rate, exchange rate and industrial production index. Moreover, based on variance analysis, the study highlighted that Malaysian stock market had a stronger dynamic interaction with industrial production index as compared to money supply, interest rate, and exchange rate. This study is important to the South African economy as it used industrial production, money supply, stock prices, exchange and interest rates which are constituents of business cycle indicators and also play a significant role in business cycle under the ABC theory. The result that there is a relationship between stock market performances and industrial production seems to be realistic but there is need to verify if industrial production alone is the best representation of business cycles.

Gallegati (2005) investigated the relationship between stock market returns and economic activity in USA. The study applied a wavelet multi-scaling approach based on a non-decimated discrete wavelet transform to investigate the relationship between stock returns and economic activity over different time scales. The maximum overlap discrete wavelet transform (MODWT) was applied to the DJIA stock price index and the industrial production index from the first quarter of 1961 to the third quarter of 2005. The results showed that stock market returns tends to lead economic activity but only at the highest scales of 16 months and longer or as the wavelet time scale increases. Such findings seem to be consistent with a leading relationship between stock market returns and overall economic activity determined by the behaviour of big institutional investors that refer mainly to macro-economic fundamentals in their investment activity.

Canova & De Nicolo (1995) developed two versions of a general equilibrium model to study the effects of factors that change both share prices and real economic performance. A model focusing on technological advances produced results that corresponded more closely to USA

experience. A persistent technological advance boosts future expected cash flows by raising expected output above its long-run trend but encourages people to delay consumption, so that share prices are only weakly associated with the fluctuations of the business cycle. In contrast, government spending boosts future expected cash flows as people work harder and raise output, but they also encourage people to bring forward their consumption which produces an unrealistically strong relationship between the business cycle and share prices.

Bowden & Martin (1995) examined the relationship between international business cycles and trends in international stock prices. The study applied the Fournier inverse method to determine time functions which describe elements of the business cycle. The method was divided into a frequency and time domain. The countries studied were the US, UK, Australia, Canada, Germany and Japan. Results from the study revealed that while national business cycles were consistent, they were also contradictory in many aspects. Evidence for coherence between stock market and business cycles was weak although international stock markets exhibited greater coherence. The results of weak coherence between stock markets and business cycles can be accepted but it is argued that such results are unrealistic. All other things being equal, stock performance should be related to business cycles because growth of stock markets ought to have a positive impact on businesses and economic activity hence expectations of a strong coherence between stock performance and business cycles.

Siliverstovs & Duong (2006) have assessed the relationship between stock market and real economic activity (represented by real GDP) for five European countries namely Germany, France, Italy, Netherlands and UK. A VAR modelling was employed in the study. In addition to the variables that were commonly used in such an analysis like stock market returns, real economic activity and interest rate, the study also included the composite leading indicator in the empirical VAR models. The leading index was constructed by the European Commission for European Union countries and was meant to reveal judgement and prospects of businesses and consumers on current and future economic posture of countries. The finding was that the stock market exerts little impact on the real activity. Nevertheless, the evidence from the generalised impulse response functions indicates that the real activity positively reacts to the positive shocks in the stock market. Although results show that there was a rather weak relationship between stock markets and economic activity, the bottom line is that a relationship exists. The weak relationship could be a result of the variables that were used in

the study, for instance, instead of using a leading indicator they should have used a coincident indicator which move more or less with economic cycles.

Antonios (2010) studied the causal link between stock market performance and economic growth for Germany for the period 1965-2007 using a Vector Error Correction Model (VECM). The variables used in the study were stock market overall price index, GDP and bank lending rate. Cointergration tests of the stock market performance indicator and economic growth were carried out using Johansen co-integration analysis based on the classical unit roots tests. The results of Granger causality tests indicated that there was uni-directional causality between stock market progress and economic growth which runs from stock market development to economic growth. The outcome is realistic in the sense that growth in stock markets normally brings growth in businesses and hence increased economic activity. The uni-directional causality can be argued to be a short run phenomenon which can turn to bi-directional causality in the long run because as businesses grow stock markets will also be triggered by growth in economic activity.

Naes *et al* (2010) argued a strong link connecting stock market liquidity and economic activity. Using data for both the US and Norway, the study demonstrated that stock market liquidity contains useful information to predict the current and future state of business cycles. The study used a regression analysis to examine the relationship in question and furthermore a Granger Causality econometric model to assess causality. Results showed that time variation in equity market liquidity were related to changes in participation in the stock market, particularly for small firms. Stock market liquidity deteriorated when the economy was slowing down, and this effect was most evident for small firms. Using stock ownership data from Norway, the study discovered that the portfolio compositions of investors change with the business cycle and that investor participation was correlated with market liquidity, more particularly for small firms. Results also showed that (Granger) causality goes from the stock market to the real economy.

Liljeblom & Stenius (1997) examined the connection between conditional stock market volatility and macro-economic volatility by using monthly data for Finland from 1920 to 1991. Conditional monthly volatility was computed by applying simple weighted moving averages, and also acquired from GARCH estimations. The outcome was unexpectedly strong when compared to those on US data. Tests of the explanatory power of the macro-

economic volatilities showed that from one-sixth to above two-thirds of the changes in aggregate stock volatility might be linked to macroeconomic instability. The results also indicated a negative relationship between stock market volatility and trading volume growth. This outcome was explained as a result of irregular demand shifts cancelling out as the market was increasing, or as an indication of volume growth being some proxy for the level of economic activity.

Asai & Shiba (1995) examined the connection between macro-economic variables, such as the industrial production index, interest rate and inflation rate, and the stock market in Japan. The study used Toda and Yamamoto (1995)'s vector auto-regressions (VAR) specification. The results showed that the macro-economic variables used in the study Granger cause stock market variable. In addition the lagged stock market variable affects its current value but its impact tends to lessen in the long-run. The study concluded that policy implication was that price keeping operation by the Japanese government did not work, but proper macroeconomic policies would benefit not only the real market but also the stock market. The outcomes of this study are acceptable because, it is realistic to say that variations in economic variables such as production, interest rates or inflation can influence stock markets. Movements in these macro-economic variables impacts on businesses and hence stock markets therefore the result is acceptable. However the study reveals that the effect of the Japanese stock market to economic variables was not clear.

3.3.3 Empirical Literature from South Africa

Odhiambo (2010) examined the causal relationship between stock market development and economic growth in South Africa. The study used annual time series data for the period 1971-2007 and autoregressive distributed lag (ARDL)-Bounds testing method was employed. Three constituents of stock market performance, namely stock market capitalisation, stock market traded value and stock market turnover were used against real GDP per capita, a constituent for economic activity. Empirical results showed that the causal relationship between stock market performance and economic activity is susceptible to the components used for measuring stock market development. When market capitalisation was used as a measure of stock market performance, economic growth was seen to Granger-cause stock market development. Moreover, when stock market traded value and stock market turnover were used, stock market development seemed to Granger-cause economic growth. Overall,

causality running from stock market development to economic growth was stronger. The results were valid both in the short-run and long-run.

Moolman (2004) used a Markov regime-switching model to review the relationship between stock returns and macro-economic variables in South Africa. Cointergration and vector error correction techniques were applied in the examination. The study reveals that, the extent to which stock market returns depend on macroeconomic variables depends on the condition of the business cycle in South Africa. The result are reasonable in the sense that there may be no standard results on the link between stock market returns and macro-economic variables, but there are varying outcomes depending on how the economy is performing at a particular point in time.

Moolman & Jordaan (2005) investigated the feasibility of using leading indicators to forecast the turning points of an index of commercial shares on the JSE Securities Exchange. The purpose of the study was to assess and contrast the performance of diverse leading indicators in leading the commercial share price index and in forecasting turning points in the commercial share price index. A multivariate logit model was employed and estimated using the leading indicators. Even though the overall share price index is a leading indicator of the business cycle, it is possible that other leading indicators can lead the prices of certain groups of shares such as commercial shares. The results of the empirical analysis showed that the best composite model included these variables; money supply, composite index of leading indicators, new orders, nominal effective exchange rate, building plans, the rand/US$ exchange rate, and the yield spread.

Jefferis & Okeahalam (2000) applied the cointegration procedure to investigate the relationship between stock returns and macro-economic variables in South Africa, Botswana and Zimbabwe for the period 1985 to 1995. The study established that stock returns in these countries were driven by real exchange rate, long-term interest rates and GDP. It is very important however, to carry out the same study taking into account the latest data as this may possibly produce new results. For the case of South Africa, the period 1985-1995 combined both the apartheid era and two years after apartheid hence a more important and rational analysis could be to assess the two periods separately first before combining the periods.

Van Rensburg (2000) studied the impact of macro-economic variables on the JSE stock returns using the Arbitrage Pricing Theory (APT) over the period 1980 to 1994. With the support of the vector autoregressive (VAR) procedure, the study found that stock returns on the Johannesburg Stock Exchange (JSE) are determined primarily by resource and industrial sectors in South Africa. The result is acceptable mainly because performance of the industrial sector determine how business are performing and this in turn decide how many shares are to be issued by businesses. The study however does not tell how stock returns also influence industrial sector performance. In addition, a similar analysis using current data will give more results for the post apartheid era since this study concentrated much with data for the pre-apartheid period.

Literature review above is from South Africa, U.S, U.K, China, India, Taiwan and Australia, among others. The findings for the studies above can be summarised in the Table 3.1.

Table 3.1: Summary of selected empirical findings

Study	Countries	Methodology	Findings
X Wang (2010) - Stock Market & Macroeconomic Volatility.	China 1992:1-2008:12	EGARCH & LA-VAR	No significant relationship between stock prices and real GDP.
Shyu & Hsia (2008) - Stock market volatility & business cycles.	Taiwan	SWARCH	Causal relationship between stock return volatility and business cycle.
Sehgal & Tripath (2005) - Size Effect in stock Market.	India 1990-2003	OLS	Stock market size does not owe to any business cycle factors.
Nowbutsing & Odit (2009) – Stock markets & economic growth.	Mauritius 1989 - 2006	Cointergration & VECM	Stock market growth positively affect economic growth
Oskooe (2010) – Emerging stock market performance & growth.	Iran 1997-2008	Cointergration & VECM	Economic activity causes stock market performance in the long run while the opposite is true in the short run.
Sabur (2009) - Stock returns and volatility.	Bangladesh 1986 - 2007	GARCH 1986-2007	Stock exchange volatile, positive and significant autocorrelation in the Dhaka stock market time series data.
Tachiwou (2010) - Stock Market and Economic Growth	West Africa Monetary Union 1995-2006	VECM	Stock market performance positively affects economic growth in West African monetary union.
Shahbaz *et al* (2008) - Stock Market and Economic Growth	Pakistan 1971-2006	DF-GLS), Ng-Perron & ARDL	Bi-directional causality in long-run, uni-directional in short-run, from stock market performance to growth.
Bahadur & Neupane (2006) - Stock Market and Economic Development.	Nepal 1988-2005	Granger causality test	Real GDP is Granger caused by changes in market capitalization.
Odhiambo (2010) – Stock markets & economic growth.	South Africa	ARDL-Bounds	Stock market performance causes economic growth both in the long run and short run.

Kaplan (2008) - Stock market & real economic activity.	Canada and USA 1987-2006	VECM	Long run relationship between real economic activity and stock prices.
Kearney & Daly (1998) - Causes of stock market volatility.	Australia 1972-1994	GLS-ARCH	Stock market volatilities are determined by volatilities in inflation, interest rates and industrial production.
Liljeblom & Stenius (1997) - Stock market volatility and macroeconomic volatility.	Finland 1920-1991	GARCH	Negative relationship between stock market volatility and trading volume growth.
Silvapulle *et al* (1999) - Relationship between Business Cycle and the Stock Market.	Malaysia	OLS – t tests	Negative stock market returns have steeper effects on the business cycle than positive returns.
Rahman *et al* (2009) - Macroeconomic determinants of stock market	Malaysia	VAR & VECM	Stock market had a stronger dynamic interaction with industrial production index as compared to money supply, interest rate, and exchange rate.
Gallegati (2005) - Stock market returns and economic activity	USA 1965:1-2005:3	MODWT	Stock market returns tends to lead the level of economic activity.
Antonios (2010) - Stock Market & Economic Growth	Germany 1965-2007	Cointergration & VECM	Stock market performance Ganger causes economic growth.
Naes, *et al* (2010) - Stock Market Liquidity and the Business Cycle	Norway & USA	Granger Causality	Causality goes from the stock market to the real economy.
Asai & Shiba (1995) - Stock Market & Macroeconomic Variables.	Japan	VECM	Macroeconomic variables used in the study Granger cause stock market variable.

3.4 General Assessment of empirical literature

The empirical studies listed in Section 3.3 investigated stock market volatilities in different financial markets of developing and developed countries. Some of the studies investigated the relationship between stock market performance and economic activity while other studies assessed the causality link between stock markets and economic activity.

Most studies which studied the link between stock markets and economic activity used market capitalisation as a proxy of stock market growth and real GDP as a measure of economic activity (Tachiwou, 2010; Sehgal & Tripath, 2005; Nowbutsing & Odit, 2009). These studies noted that stock market is related to economic activity. Other studies assessed the impact of macro-economic variables on stock market performance. The variables that were often used included interest rates, inflation, industrial production, exchange rates and money supply (Antonios, 2010; Rahman *et al*, 2009; Silvapulle *et al*, 1999; Kearney & Daly, 1998). These studies revealed that macroeconomic variables are related to stock performance.

The use of real GDP as a measure of economic activity and business cycle trends is subject to criticism. For instance, South Africa's economy went into a recession in 1997/9 as a result of the financial crisis in Asia but throughout this period real GDP was rising and it was only the growth rate of GDP which fell. This indicates that it is inadequate to use GDP as a proxy to economic activity and business cycle in the South African context.

Some empirical literature used stock prices to assess the link between stock market performance and business cycles (see Antonios, 2010; Bowden & Martin, 1995; Rahman *et al*, 2009; Kaplan, 2008). These studies revealed that stock prices were related to business cycle variable such as production index, inflation, interest rates, exchange rates and money.

Empirical evidence on South Africa's stock market performance and economic activity has been assessed by Odhiambo (2010); Moolman, (2004); Jefferis & Okeahalam (2000) and Van Rensburg (2000). Odhiambo (2010) used stock market capitalisation, stock market traded value and stock market turnover against real GDP per capita in his causality tests whereas Moolman, 2004; Jefferis & Okeahalam (2000) and Van Rensburg (2000) used stock market returns and macroeconomic variables. There is a gap that further study on this topic may use

a price index to represent stock market performance in assessing the relationship between stock market performance and business cycles.

Several economic techniques of time series data parameter estimation were used in empirical studies listed in Section 3.3. The estimation methods are lag-augmented vector autoregressive (LA-VAR), Switching Regime ARCH, GARCH, autoregressive distributed lag (ARDL) tests, Cointergration and VECM, Generalized Least Square and Granger causality test. The most popular technique is cointergration and VECM. It is vital to apply this technique in this study. Variables should be tested for stationarity using the Augmented Dickey Fuller technique (ADF). Cointergration is then used to determine whether our variables have a long run relationship or not. The Johansen technique assists in cointergration tests. The Johansen has become a vital tool to estimate time series models. Earlier on, the Engle–Granger (EG) procedure was used but the advantage of Johansen is that it uses a maximum likelihood structure and also it gives way to the determination of cointergration ranks which the EG method does not. If cointergration is established, an Error Correction model is estimated.

3.5 Conclusion

This chapter has presented the Austrian theory of business cycle (ABC) theory to explain how and why business cycles occur. The theory indicates that a number of economic variables such as savings, investment, inflation, money supply and interest rate cause business cycles. The Efficient Market Hypothesis (EMH) and Elliott Wave Principle (EWP) were used to explain stock market systems. The difference is that EWP suggests that investors' uses market information to predict future prices and make investment decisions that enable them to beat the market, a notion that was completely dismissed by the EMH.

Empirical evidence reveals somewhat a number of different studies and conclusions on stock market and business cycles. Some empirical facts stated that there is a positive correlation between stock market performance and business cycles. In other studies it was concluded that there is no link whatsoever. Other studies suggested a negative relationship. Numerous other studies concluded that there is bi-directional causality between stock market performance and business cycles while others settled for uni-directional causality. Although so much research has been carried out, not much has been done on business cycles indicators and stock prices, more specifically, in relation to South Africa, hence, this study.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The review of literature on business cycles and stock market volatility in both developed and developing countries has shed some light on the link between business cycles and stock markets. This chapter, however, specifies the methodology applied to find the relationship between business cycles and stock market performance in South Africa. There are six sections in the chapter. Following this introductory section, section 4.2 gives a theoretical framework which underpins the methodology. Section 4.3 specifies a model that connects the business cycle indicator to its explanatory variables and includes definition of variables. Data sources and expected signs of coefficients follow in section 4.4. A review of the estimation techniques for the study is presented in section 4.5, 4.6 and 4.7, while section 4.8 concludes the chapter.

4.2 Theoretical Framework

The theoretical framework used to specify a model in the study stems from augmentation of the Austrian Business Cycle (ABC) theory. The theory states that business cycles are influenced by savings, money supply and demand, interest rates, production and investment (Mises, 1912; Hayek, 1935; Garrison, 2001). The following linear function is set;

$$Y = F(X_1, X_2, X_3, \ldots X_n) + \varepsilon_t \quad \ldots\ldots (4.2.1)$$

Where, Y is an endogenous variable, X_1 to X_n are the explanatory variables and ε_t is an error term. This means Y is explained by the variables in X_n plus an error term. Applying the same geometric set up to the ABC theory the following business cycle model is specified:

$$BC = F(S, M_s, M_d, Int, Inv) + \varepsilon_t \quad \ldots\ldots (4.2.2)$$

Where, BC is a business cycle indicator, S are Savings, Int is interest rate, Inv is investment, M_d is money demand and M_s is money supply.

The ABC did not include stock market performance but it can be argued that stock markets play an important role in businesses and hence to overall economic activity. With this way of thinking it is important that this study augments the ABC by including a variable of stock market performance (All Share price Index) and other variables such as inflation and real effective exchange rate. The most important variables in the ABC namely interest rates and money supply, also play an important role in this study while savings and investment are excluded due to data problems. The following section, therefore, specifies the model to be estimated in the study.

4.3 Model specification and definition of variables

In the study, the business cycle coincident indicator will be modelled as a function of the All Share Price Index (ALSI), Real Effective Exchange Rate (REER), Prime Overdraft Rate (POR), Inflation (CPI) and Money Supply (MS). The reasons of this choice of variables are outlined below. A business cycle model can therefore be specified as follows:

$$BC = \beta_0 + \beta_1 ALSI_t + \beta_2 REER_t + \beta_3 POR_t + \beta_4 CPIX_t + \beta_5 MS_t + \mu_t \text{..... ....} (4.3.1)$$

In order to avoid any misinterpretation of empirical results, this section provides the description of all variables appearing in the specified equation. All the variables are converted to logarithms in order to obtain elasticity coefficients on these variables and minimising the impact of outliers. The business cycle model is hence in the form:

$$LBC = \beta_0^* + \beta_1^* LALSI_t + \beta_2^* LREER_t + \beta_3^* LPOR_t + \beta_4^* CPIX_t + \beta_5^* LMS_t + \mu_t^* \text{..... .....} (4.3.2)$$

Where: ***LBC*** is the natural logarithm of the business cycle coincident indicator. The coincident indicators reflect the intensity of economic activity and combine all the information about the economy. This encompasses aggregate indicators of utilisation of production capacity in the manufacturing sector, industrial production index, housing activity, index of wholesale, retail and new vehicle sales and formal non-agricultural

employment index. Since the business cycle indicator reflects the intensity of economic activity, it therefore qualifies to represent business cycles movements. In one way or the other, this index is influenced by the variables explained below.

LALSI is the natural logarithm of the composite stock market price index (ALSI) which is the proxy for stock market performance in the study. This index represents prices of all classes of shares at the Johannesburg Stock Exchange (JSE). This index is relevant to this study because it impacts on businesses, which in turn, impacts on business cycles.

LREER is the natural logarithm of the real effective exchange rate of the rand, measured in foreign currency terms. Thus an increase in this variable indicates an appreciation of the rand and a decrease indicates a depreciation of the rand. The exchange rate is vital to the study because the economy of South Africa is an open economy which is greatly supported by international trade, hence, the importance of REER.

LPOR is the natural logarithm of the prime overdraft rate, the rate at which banks are willing to lend money to the general public. This rate of interest is very crucial in determining the level of investment in the economy. Interest rates are very relevant to the study because they determine the extent of borrowing by investors, which impact on investment.

CPIX is the natural logarithm of consumer price index excluding mortgage costs and it measures price change for a constant market basket of goods and services from one period to another in South Africa's metropolitan and urban areas. The choice of CPIX is that this rate is officially targeted by SARB and is a primary measure that determines national interest rates.

LMS is the natural logarithm of the total amount of money available in an economy at a particular point in time and in this study we use M1 which is the currency in circulation and demand deposits.

$\boldsymbol{\mu_t}$ is the error/disturbance term

4.4 Data Sources and expected signs of coefficients

The study uses monthly time series data from January 2002 to December 2009 in order to determine the relationship between stock market performance and business cycles in South Africa. The data for the coincident business cycle indicator of South Africa (BC) is obtained from Statistics South Africa (SSA). Data for ALSI is obtained from the Johannesburg Stock Exchange (JSE). The money supply (MS) data is obtained from the South Africa Reserve Bank (SARB). The data for the REER, which relates the Rand to other foreign currencies of South Africa's major trading partners, is obtained from the SARB. The data for both CPIX and POR is also obtained from the SARB.

The expected sign of ALSI is positive. The rationale behind this is that, when businesses are operating efficiently the value of shares goes up and as people buy more shares, companies generate more capital. When capital is generated, businesses invest more and they are most likely to expand and grow signifying business cycle growth. In such a case, it is argued that, there is a positive relationship between business cycles and stock market performance.

Business cycles are expected to either have a negative or a positive relationship with inflation (CPIX). When general price levels of goods and services go up, it impacts on the final users, who are forced to reduce their buying behaviour because the products are more expensive. This scenario affects the wholesale and retail business sectors hence a decline in business growth. However, inflation may be brought about by the central bank increasing money supply. When money supply increases investments rises, though it is inflationary, hence, there may be a positive relationship between business cycles and inflation.

Interest rates (POR) are expected to have a negative coefficient. If the cost of borrowing rises investors may not be willing to take the risk of investing expensive money, hence, they stop or reduce borrowing meaning that investment also reduces. If investment reduces and businesses are faced with high cost of repaying their bonds it may imply a decline in business growth.

The sign for MS coefficient is expected to be either positive or negative. When money is injected into the economy, interest rates may fall because money is available. These scenarios entice the investors to borrow and invest implying a growth in investments and businesses.

However, this depends on how big the money supply is, because, if the money is oversupplied this might become inflationary which has already been predicted to be negatively related to business cycles.

The REER is expected to be either positively or negatively related to the coincident business cycle indicator. When the REER falls, the South African Rand gains value, which implies that exports drops because they are expensive to the rest of the world. This reduces business activity and revenues of exporting firms, therefore a positive relationship. However, if the REER falls it means the rand appreciates and it might be fairly easy for businesses to import at cheaper prices If imports increases it means business activity in the local market improve which presents an opportunity for firms to make profits and expand, therefore a negative relationship.

4.5 Stationarity and Cointegration

Most economic series are not stationary in their levels such that estimations based on them provide invalid results. Finding out whether a series is stationary or otherwise is very important as it can strongly influence its behaviour and properties. Cointegration seeks to establish whether our variables have a long term relationship or not. If we establish some cointegration we then estimate an Error Correction Model (ECM). Accordingly, this section is going to review the techniques employed to test for stationarity and cointegration.

4.5.1 Stationarity test

It is vital that time series data for econometric analysis is tested for stationarity. If a series is non stationary it must be differenced “d” times before it becomes stationary, then it is said to be intergrated of order “d” , written as I(d). Applying the difference operator more than “d” times to an I(d) process will result in a stationary series but with moving average error structure. An I(0) is a stationary series, while an I(1) series contains one unit root. An I(2) series contains two unit roots and so would require differencing twice to induce stationarity. To test for stationarity, an informal graphical approach is employed together with two formal tests known as Dickey and Fuller (1981, 1984) and Phillips and Perron (1988) tests.

According to Dickey and Fuller (1981, 1984) and Phillips and Perron (1988) a stationary series can be defined as one with a constant mean;

$$E(Y_t) = \mu \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{..} \{4.5.1)$$

A constant variance;

$$Var(Y_t) = E(Y_t - \mu)^2 = \delta^2 \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad (4.5.2)$$

and a constant auto-covariance;

$$Y_k = E[(Y_t - \mu)(Y_{t-k} - \mu) \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad \text{.....} \quad (4.5.3)$$

The level of stationarity ranges from strict, weak stationarity or white noise. A series is strictly stationary when the distribution remains the same as time progresses, implying that the probability that Y falls within a particular interval is the same now as at any time in the past or future. Weak stationarity refers to a series with a constant mean, constant variance and constant auto-covariance while a white noise process has a constant mean, constant variance and a zero auto-covariance except at lag zero (Brooks, 2002:230-232). The use of non-stationary data in econometric modelling gives invalid standard assumptions for asymptotic analysis. Non-stationary data can also lead to dangers of running spurious regression. A spurious regression is one with two variables trending together overtime and could have a high R^2 and *t*-statistics values even if the two variables are totally unconnected. The effect of a shock in time *t* on a stationary data gradually dies away with time, whereas in a non-stationary series, the effect of a shock persists throughout the period.

There are several methods and techniques of testing for stationarity but the most common are the Dickey Fuller (DF) test, Augmented Dickey Fuller (ADF) test (Dickey & Fuller, 1981, 1984) and Phillips-Perron (PP) test (Phillips & Perron, 1988). The DF test has been criticised of being weaker than the ADF and PP unit root tests.

4.5.1.1 Dickey Fuller (DF) test

The DF method, tests the null hypothesis that a series contains unit root against an alternative hypothesis that a series is stationary. Dickey Fuller test estimates the following equation;

$$\Delta Y_t = (\rho - 1)Y_{t-1} + \mu_t = \delta Y_{t-1} + \mu_t \text{..... ....} (4.5.4)$$

Three models can be estimated for each variable using the DF test, that is, an equation with no constant and no trend; with constant and no trend and with constant and trend. The test is done on δ under the hypothesis that $\delta = 0$, there is a unit root. When the statistical value is smaller than the critical value in the DF test we reject the null hypothesis of a unit root and fail to reject the alternative hypothesis, which say there is no unit root and therefore conclude that the series is stationary.

In this study, the ADF test and PP test for stationarity are used for unit root tests and are chosen instead of the DF because of the various reasons that are explained below. The essence of conducting two distinct stationarity tests is to ensure that the series enter the model to be estimated in non-explosive form and also to address the issue of tests with low power.

4.5.1.2 Augmented Dickey Fuller (ADF) test

The DF method has been criticised for the near observation equivalence. This arises when the analytical tests have low statistical power because they often cannot distinguish between true unit-root processes ($\delta = 0$) and near unit-root processes (δ is close to zero). In addition the DF test is valid only if μ_t is assumed not to be autocorrelated, but would be so if there is autocorrelation in the dependent variable of the regression ΔY_t. The test would therefore be outsized, meaning that the true size of the test would be higher than the normal size used. The error term should, thus, satisfy the assumption of normality, constant error variance and independent error terms failure would render the DF tests biased (Takaendesa, 2006). These problems can be eliminated by using a stricter version of DF test method known as the ADF test together with the PP test. The ADF test is preferred to the DF test since the latter has critical values that are bigger in absolute terms and may sometimes lead to a rejection of a correct null hypothesis (Brooks, 2004:379). The ADF test is carried out by augmenting the lagged values of the depended variable ΔY_t and estimates the following equation;

$$\Delta Y_t = \beta_1 + \beta_2 t + \lambda Y_{t-1} + \sum_{i=1}^{n} \eta \Delta Y_{t-i} + \mu_t \text{..... ....} (4.5.5)$$

This equation has an intercept and a time trend. The number of augmenting lags *n* is determined by minimising the Schwartz information criterion (SIC) or minimising the Akaike information criterion (AIC) or lags are dropped until the last lag is statistically significant. Econometric Views (Eviews) software allows all the options to choose from. The test is done on λ, and the critical values from DF tables are used. The null hypothesis of a unit root is rejected in favour of the stationary alternative, if, the test statistic is more negative than the critical value and is significant. The test statistic on the λ coefficient test whether there is need to difference the data to make it stationary or to put a trend in the regression model to correct for the variables deterministic trend. In some instances if data is exponentially trending, then we might need to take the log of the data first before differencing it. In this case in the ADF unit root tests we need to take the differences of the log of the series rather than just the differences of the series.

4.5.1.3 Phillips–Perron (PP) test

The Phillips-Perron test, is a unit root test used in time series analysis to test the alternative hypothesis that a time series is I(1) and it builds on the DF of the null hypothesis that $\delta = 0$ in $\Delta Y_t = \delta Y_{t-1} + \mu_t$. The DF is known to have low power against the alternative hypothesis that the series is stationary with a large autoregressive root and for this reason, the PP test is used. The PP test differs from the ADF test mainly in how they deal with serial correlation and heteroscedasticity in the errors. The PP test has an advantage over the ADF test as it gives robust estimates when the series has serial correlation and time dependent heteroscedasticity and there is a structural break. In particular, where the ADF tests use a parametric autoregression to approximate the ARMA structure of the errors in the test regression, the PP tests ignore any serial correlation in the test regression. The test regression for the PP tests is;

$$\Delta Y_t = \alpha_1 + \gamma Y_{t-1} + \alpha_2 (t - T/2) + \sum_{i=1}^{m} \phi_i \Delta Y_{t-1} + \mu_{2t} \text{..... ....} (4.5.6)$$

Where, ΔY_t is the first difference operator, *T* is the sample size and μ_{2t} is the covariance stationary random error term. The lag length *m* is decided according to Newley-West's (Newly and West, 1987) suggestions. The null hypothesis of non-stationarity is tested using the t-statistic with critical values calculated by Mackinnon (1996). The null hypothesis that

the series is I(0) is rejected when the test statistic is more negative than the critical value and is significant in favour of the alternative hypothesis that the series is stationary.

4.5.2 Cointegration test

Cointegration assesses the long run link between economic variables. Cointegration of two or more time series suggests that, there is a long run or equilibrium relationship between them. Therefore, the economic interpretation of cointegration is that if two or more series are linked to form an equilibrium relationship spanning the long run, then, even though the series themselves may be non-stationary, they move closely together over time and their difference will be stationary. Their long-run relationship is the equilibrium to which the system converges over time, and the error term can be interpreted as the disequilibrium error or the distance that the system is always from equilibrium at time *t*.

The two main methods of testing for cointegration are the Engle-Granger (EG) two step method (Engle & Granger, 1987) and the Johansen procedure (Johansen; 1991, 1995). The former seeks to determine whether the residuals have an equilibrium relationship or are stationary and the latter seeks to determine the rank of the matrix.

4.5.2.1 Johansen's methodology

The Johansen method is preferred to Engle-Granger approach because, it captures the underlying time series properties of the data. It is a systems equation test which provides estimates of all cointegrating relationships that may exist within a vector of non-stationary variables or a mixture of stationary and non-stationary variables. Once the number of cointegrating relationships has been established, a series of likelihood ratios tests can be performed to test different hypothesis about them. The technique is based on full system estimation and has greater power and helps to eliminate simultaneous equation bias and raise efficiency relative to single equation methods. In the study Johansen (1995) methodology is used because the maximum likelihood framework involved offers much better properties and strengths than the traditional EG approach which is residual based.

The Johansen methodology uses the following procedure:

i. Testing the order of integration of the variables under consideration. When the variables are integrated of the same order we proceed with the cointegration test and also the data should be plotted graphically to identify a linear time trend of the variables.
ii. Setting the appropriate lag length of the model through estimation of the model and determine the rank of matrix, $\prod$ (see equations 4.5.8 & 4.5.9).
iii. Selecting the appropriate model regarding the deterministic components in multivariate system.
iv. Determining the number of cointegrating vectors by applying causality tests on the error correction model to identify a structural model and determine whether the estimated model is reasonable.

If variables in the business cycle model 4.3.2 are integrated of the same order and are thought to be cointegrated then a VAR of order *p* can be set and given as;

$$Y_t = \mu + D_1 Y_{t-1} + ... + D_p Y_{t-p} + \varepsilon_t \quad (4.5.7)$$

Where Y_t is an *n* x *1* vector of variables that are integrated of order one, denoted as I(1) and ε_t is *n* x *1* vector of innovations. This vector can be re-written as a vector error correction model (VECM) Y_t of the form:

$$Y_t = \mu + \prod Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (4.5.8)$$

$$\text{Where } \prod = \sum_{i=1}^{p} D_i - \mathrm{I} \text{ and } \Gamma_t = -\sum_{j=i+1}^{p} D_j \quad (4.5.9)$$

Γ_i is a (n x n) coefficient matrix and Π is a (n x n) matrix whose rank determines the number of cointegrating relationships. If the coefficient matrix Π has reduced rank $r < n$, then there exist *n* x *r* matrices α and β each with rank *r* such that $\Pi = \alpha\beta'$ and βY_t is stationary. *r* is the number of cointegrating relationships, the elements of α are known as the adjustment

parameters in the vector error correction model and each column of β is a cointegrating vector. It can be shown that for a given *r*, the maximum likelihood estimator of β defines the combination of Y_{t-1} that yields the *r* largest canonical correlation of ΔY_t with Y_{t-1} after correcting for lagged differences and deterministic variables when present.

It is essential to consider two important issues before proceeding to test for the rank of Π. Initially, the appropriate order (*k*) of the VAR should be determined. The Johansen method is affected by the lag length employed and hence it is critical to decide on the optimal lag length (Brooks, 2002:404). Brooks proposes the use of multivariate versions of information criteria, which includes the sequential modified likelihood ratio (LR), AIC, Hannan-Quinn information criterion (HQ) and the Final prediction error (FPE) Schwarz information criterion (SIC). Moreover, these information criterions frequently produce contradictory VAR order selections and therefore it is vital to use both information criterion approach and the *a priori* knowledge from economic theory to select proper order of the VAR.

The second issue relates to the selection from the various types of VARs based on five deterministic assumptions. Eviews 7 supply the following deterministic trend assumptions: Case 1 assumes no deterministic trend in the data and no intercept or trend in the VAR and in the cointegrating equation (CE); Case 2 assumes no deterministic trend in the data, but an intercept in the CE and no intercept in the VAR; Case 3 assumes a linear deterministic trend in the data and an intercept in the CE trend in VAR; Case 4 allows for a linear deterministic trend in data, intercept and trend in CE and no trend in VAR and Case 5 allows for a quadratic deterministic trend in data, intercept and trend in CE and linear trend in VAR. As a guidance, Eviews 7 advise the use of Case 2 if none of the series have a trend, Case 3 if all trends are stochastic, Case 4 if some of the series are trend stationary. Case 1 is used when all series have zero mean and Case 5 may provide a good fit in-sample but will produce implausible forecasts out-of-sample, which makes both rarely used. Case 6 contains summary of all five trend assumptions and assists in determining the choice of the trend assumption (Eviews 7 User Guide 2: 687)

Johansen proposes two different likelihood ratio tests of the significance of the canonical correlations and thereby the reduced rank of the Π matrix: the trace test and the maximum eigenvalue test, as shown below;

$$J_{trace} = -T\sum_{i=r+1}^{n}\ln(1-\hat{\lambda}_i) \text{..... ....} (4.5.10)$$

$$J_{\max} = -T\ln(1-\hat{\lambda}_{r+1}) \text{..... ....} (4.5.11)$$

Where T is the sample size and $\hat{\lambda}$ is the i^{th} largest canonical correlation. The trace test tests the null hypothesis of *r* cointegrating vectors against the alternative hypothesis of *n* cointegrating vectors. The maximum eigenvalue test, in contrast, tests the null hypothesis of *r* cointegrating vectors against the alternative hypothesis of *r+1* cointegrating vectors. Neither of these test statistics follows a chi-squared distribution in general; asymptotic critical values can be found in Johansen and Juselius (1990) and are also given by most econometric packages. Since the critical values used for the maximum eigenvalue and trace test statistics are based on a pure unit root assumption, they will no longer be correct when the variables in the system are unit root processes. Thus, the real question is how sensitive is Johansen's procedure to deviations from the pure unit root assumption.

4.6 Vector Error Correction Model (VECM)

The VECM specify the short-run dynamics of each variable in the system, and in a framework that anchors the dynamics to long-run equilibrium relationships suggested by economic theory. For instance, economic theory suggests that economic activity across regions should converge. If this convergence hypothesis is true, we might observe long run relationships between employment performances across regions. The existence of such long run conditions does not prevent the existence of stationary, though variable short run deviation from them. Phillips & Perron (1998) showed that forecasts based on a VEC model that explicitly estimates cointegrating relationships and unit roots are consistent and asymptotically optimal. If it is established that the relevant variables are cointegrated it is appropriate to estimate an ECM. Precisely in an ECM, the short-term dynamics of the variables in the system are influenced by the deviation from equilibrium.

$$\Delta Yt = \theta_1 \Delta Xt + \theta_2 (Y_{t-1} - \gamma_{xt-1}) + \mu t \text{..... ....} (4.6.1)$$

The error correction term is given by $Y_{t-1} - \gamma_{xt-1}$. The implied coefficient of X_{t-1} of one in this term suggests a proportional long run relationship between *Y* and *X*. Error correction models are interpreted as: *Y* is purported to change between *t-1* and *t* as a result of changes in the values of the explanatory variables *X* between *t-1* and *t*, and also in part to correct for any disequilibrium that existed during the previous period. The error correction term would appear without any lag for this would imply that y changes between *t-1* and *t* in response to a disequilibrium at time *t*. γ defines the long run relationship between *X* and *Y* while θ_1 describes the short run relationship between changes in *x* and changes in *y*. θ_2 describes the speed of adjustment back to equilibrium, and its strict definition is that it measures the proportion of last period's equilibrium error that is corrected for.

The ECM is important for many reasons such as that it is a convenient model measuring the correction from disequilibrium of the previous period which has a very good economic implication. In addition, ECMs are formulated in terms of the first differences which typically eliminate trends from the variables involved; they resolve the problem of spurious regressions. The other advantage of ECMs is the ease with which they can fit into the general-to-specific approach to econometric modelling, which is in fact a search for the most parsimonious ECM model that best fits given data sets. Lastly, the fact that the disequilibrium error term is stationary because the ECM has important implications such as: the fact that the two variables are cointegrated implies that there is some adjustment process which prevents the errors in the long run relationship become larger and larger.

4.7 Diagnostic checks

Diagnostic checks are vital in the examination of the relationship between business cycle and stock market performance because they validate the parameter evaluation outcomes achieved by the estimated model. These checks test the stochastic properties of the model such as residual autocorrelation, heteroscedasticity and normality, among others. The multivariate extensions of the residual tests just mentioned is applied in this study and is briefly discussed.

4.7.1 Heteroskedasticity test

In statistics, a sequence of random variables is heteroscedastic if the random variables have different variances. In contrast, a sequence of random variables with a constant variance are

said to be homoscedastic. According to Brooks (2002:148), there are a number of formal statistical tests for heteroscedasticity. One such popular test is the White's test for heteroscedasticity. The test is useful because it has a number of assumptions such as, it assumes regression model estimated is of the standard linear. After running the regression, residuals are obtained and then test regression is run by regressing each product of the residuals on the cross products of the regressors and testing the joint significance of the regression. The null hypothesis for the White test is homoscedasticity and if we fail to reject the null hypothesis then there is homoscedasticity. If the null hypothesis is rejected then there is heteroscedasticity.

4.7.2 Normality test

One of the most commonly applied tests for normality is the Bera-Jarque (BJ) test (Bera & Jarque, 1981). Results for asymptotic validity of the Bera-Jarque test in vector autoregressive (VAR) models assume stationarity. In applied work, however, researchers often work with possibly integrated and cointegrated process. The BJ uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments – the mean and the variance. We also propose the use of bootstrap critical values in stationary VAR models and in VEC models. The Bera-Jarque test statistic asymptotically follows a X^2 distribution under the null hypothesis that the distribution of the series is symmetric. The null hypothesis of normality would be rejected if the residuals from the model are either significantly skewed or leptokurtic/platykurtic (or both). Although normality is not necessary for the asymptotic validity of many statistical procedures, it is useful in many areas of forecasting and econometric inference as complements to other diagnostic tests. Normality tests can also be used to help to answer questions of substantive interest and to assess the reliability and power of statistical tests.

4.7.3 Autocorrelation – LM tests

The Lagrange Multiplier (LM) test centres on the value of the R^2 for the auxiliary regression. If one or more coefficients in an equation are statistically significant, then the value of R^2 for that equation will be relatively significant, while if none of the variables is significant, R^2 will be relatively low. The LM test operates by obtaining R^2 from the auxiliary regression and multiplying it by the number of observations, T.

The test can be done by using the following identity:

$$TR^2 \approx \chi^2(m)$$

Where, *m* is the number of regressors in the auxiliary regression (excluding the constant term), equivalent to the number of restrictions that would have to be placed under the F-test approach.

4.8 Conclusion

In this chapter, based on theory, the potential variables that influence the coincident business cycles indicator of South Africa's were specified. The coincident indicator is the best representative of business cycles. The determinants of the coincident business cycle indicator are stock market All Share Price Index (ALSI), Real Effective Exchange Rate (REER), Inflation (CPIX), Money Supply (MS) and Prime Overdraft Rate (POR). ALSI is the measure of stock market performance. The study, therefore, analyse the relationship between the coincident business cycle indicator and ALSI. The model employs the Augmented Dickey Fuller test and Phillips-Perron tests for unit root check. The Johansen (1991, 1995) cointegration technique is employed because of its several advantages over other techniques such as the Engle-Granger test. A number of diagnostic checks have been presented including among others, residual normality test, heteroscedasticity and autocorrelation LM. These diagnostic checks are used to check whether the residuals pass all these diagnostic tests.

CHAPTER FIVE

PRESENTATION AND EMPIRICAL FINDINGS

5.1 Introduction

The main aim of this section is to examine the relationship between business cycle and stock market performance using the VEC modelling technique. The model regresses the coincident business cycle indicator against inflation, interest rate, All Share Price Index, Real Effective Exchange Rate and money supply. The composite indicator is the variable for business cycle movements whilst the ALSI represents performance of the stock market of South Africa. The other variables are included only to avert misspecification of the business cycle model. Stationarity assessment is done using graphical analysis and unit root tests. Cointegration test among the variables is done with an intention to ascertain the long run relationship. The error correction model is subsequently estimated. The following section presents the empirical findings, while the last section concludes this chapter.

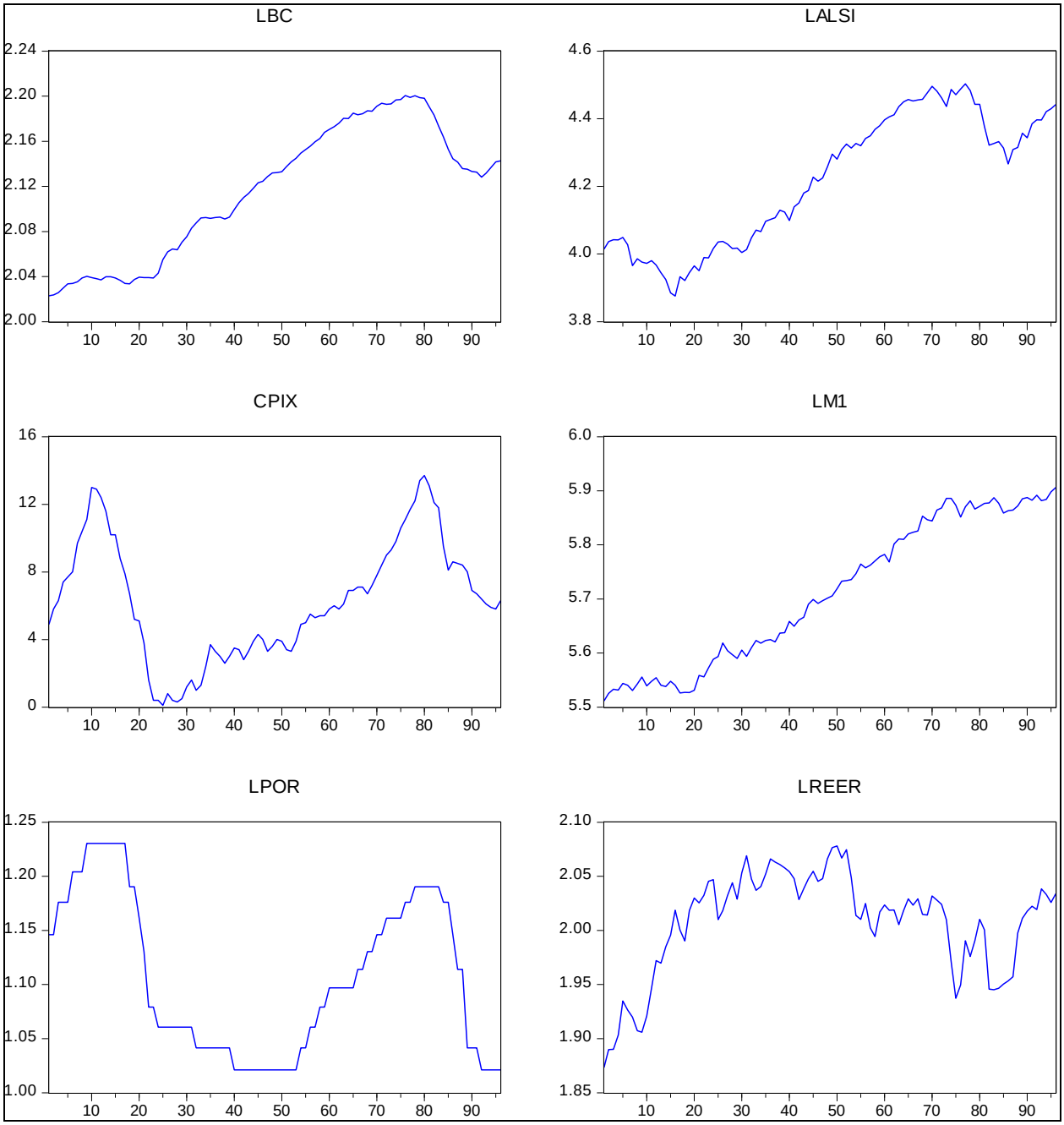
5.2 Empirical Findings

There are four sub-sections in this section. The first section presents the results of stationarity/unit root tests, the second presents and discusses the cointegration test results; the third section discusses the long run relationship of the business cycle model and the forth section presents the diagnostic checks.

5.2.1 Unit root/stationarity test results

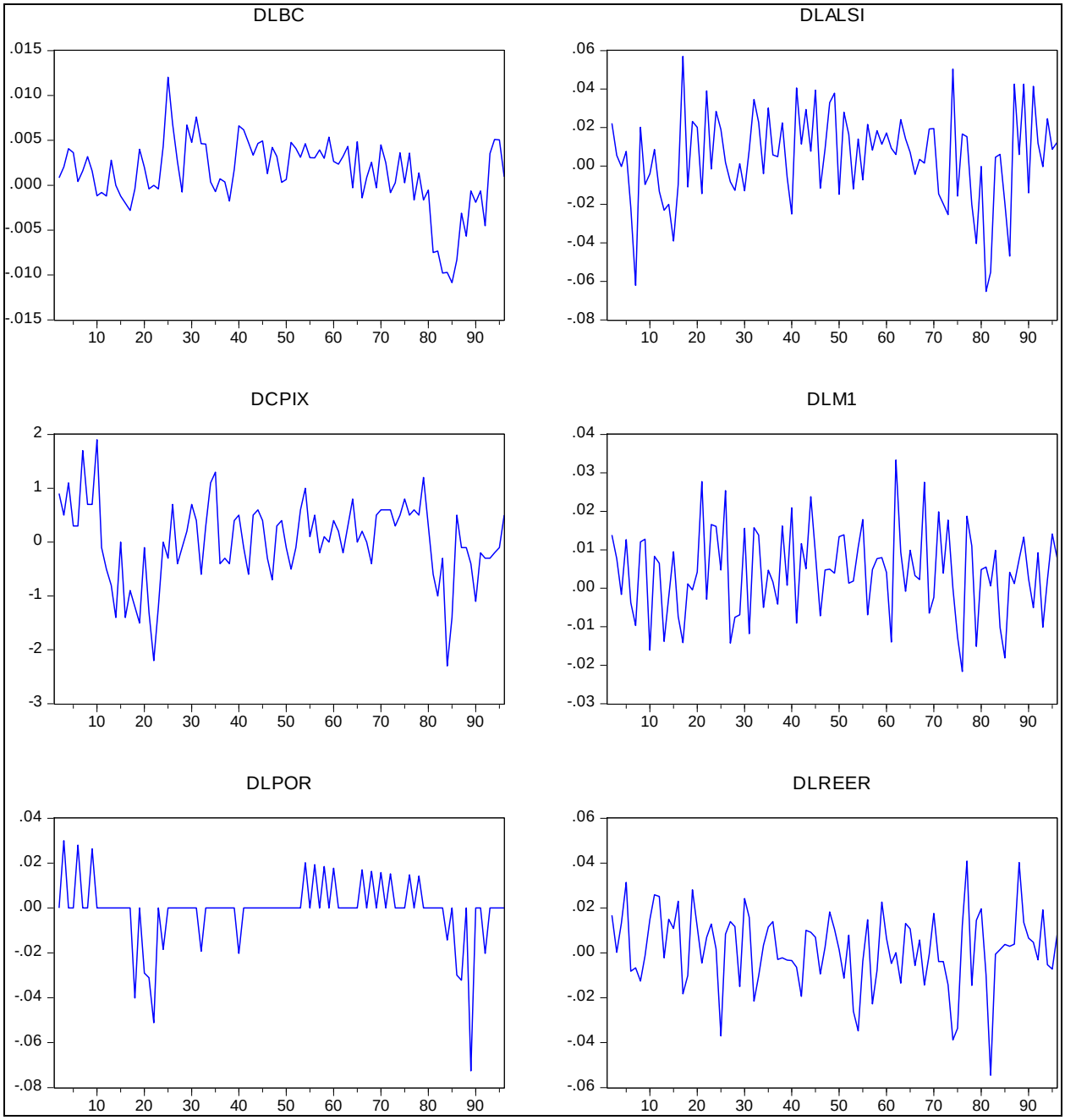
The initial stage in the Johansen procedure is to test whether the time series are stationary. In this study one informal test for stationarity and two formal tests are employed. One of the most popular informal tests for stationarity is the graphical analysis of the series. A visual plot of the series is usually the first step in the analysis of any time series before pursuing any formal tests. This preliminary examination of the data is important as it allows the detection of any data capturing errors, and structural breaks and gives an idea of the trends and stationarity of the data set. Figures 5.1 part A and part B plots the variables of the business cycle model in this study against time.

Figure 5.1 Part (A): Plots of variables at levels, 2002-2009



The graphs are generated automatically by Eviews 7 and the horizontal axis show time in months from January, 2000 until December, 2009, while, the vertical axis show the natural logarithm of the variables, except for CPIX which, the values are used as they are.

Figure 5.1 Part (B): Plots of the variables at first difference, 2002-2009



The graphs on Figure 5.1 part (A) show that, it is apparent that all the series are non-stationary. The conclusion of non-stationarity is arrived at after observing that none of the graphs fluctuates around mean zero (0). The time series data for all the variables, except CPIX, in this analysis were converted into logarithms with the aim of eliminating outliers. Graphs for LBC, CPIX, LREER, LALSI, LM1 and LPOR in Figure 5.1 Part (A) illustrate the trends of the variable from January 2002 to December 2009 at their levels. As explained in chapter two, on average, the LALSI and LBC has been trending upwards from 2002 to 2008

where it started to trend downwards and thereafter recovering its upward trend in 2009. LM1 has always been on an increase in the period under consideration. CPIX has been on a downward trend from 2002 until the first few months of 2004 where it started to rise up to the first few months of 2009 when it started to fall. The prime overdraft rate does not show a long run visible trend as the time series shows periods of increases and period of decreases. The graph for LREER illustrates that the time series had a general upward trend from 2002 up to about mid 2006 and a downward trend, on average, up to 2009.

Figure 5.1 Part (B), however, shows that all variables became stationary with first difference. Subsequent to elimination of outliers by taking logarithms, the time series data was differenced ones to obtain DLBC, DCPIX, DLREER, DLALSI, DLM1 and DLPOR. The first order integrated series ensure that economic data is stationary for the purpose of avoiding spurious regression. To identify if time series data are stationary on graphs one checks whether the plots are fluctuating around mean zero or not. If they fluctuate around mean zero, it is an indication that the data is stationary. On the graphs of differenced series, variables are fluctuating around zero and this suggests that they are stationary..

Nonetheless, we cannot precisely base our conclusions from the graphical analysis because it is an informal stationarity test. It is, therefore, important to carry out other formal tests so as to reinforce our findings from the graphical analysis. As pointed out in the prior chapter, this study employs the ADF and PP unit root tests. Tables 5.1.1 and Tables 5.1.2 shows the results for the ADF and PP unit root tests respectively. Results shown are for the test on level and after differencing once. Unit root tests are also carried out to a series when there is; no constant and trend; a constant and no trend; and both a constant and a trend.

Both the ADF and PP tests test the null hypothesis of a unit root (data non-stationary). This initial hypothesis of a unit root is rejected in favour of the no unit root alternative hypothesis in each case if the test statistic is more negative than the critical value at specified confidence levels and if the test statistic is also significant. This implies that by rejecting the null hypothesis means that the time series data do not contain a unit root, that is, it is stationary.

Table 5.1.1: Dickey Fuller stationarity test

Augmented Dickey Fuller (ADF) unit root test						
	Level			First Difference		
Variables	None	Constant	Constant and Trend	None	Constant	Constant and Trend
LBC	1.23	-1.58	-0.66	-3.91***	-4.12***	-4.39***
LALSI	1.83	-0.49	-1.38	-8.85***	-9.08***	-9.04***
LM1	3.61	-0.49	-2.05	-9.75***	-11.10***	-11.03***
LREER	0.93	-2.93	-2.73	-8.08***	-8.15***	-8.15***
CPIX	-0.36	-1.06	-1.01	-5.60***	-5.69***	-5.53***
LPOR	0.80	-2.71	-2.68	-2.72***	-2.77	-2.72
CV (5%)	-1.94	-2.89	-3.46	-1.94	-2.89	-3.46
CV (1%)	-2.59	-3.50	-4.06	-2.59	-3.50	-4.06

Notes

(1) The null hypothesis, H_0 = Variables have a unit root.

(2) *, ** and *** represent a stationary variable at 10%, 5% and 1% level respectively.

(3) The critical values are obtained from MacKinnon (1996) one-sided p-value.

(4) The appropriate lag lengths are selected by Akaike information Criteria and Eviews programme automatically selected the appropriate lag length.

(5) CV means Critical Value

The maximum number of lags for the ADF are 4 as per the formula $n = T^{1/3}$. When carrying out the test, none of the series were stationary at level even at the maximum number of lags. The series only become stationary at their first difference but could not be significant when 4 lags were employed. Lags were dropped until when the series became stationary. However, for the ADF, at their first difference, all the series were stationary with or without constants and trends save for DLPOR which was only stationary without both constant and trend.

To be certain that series enters the model to be estimated in non-explosive form and to address the issue of tests with low power the PP test is also carried out as shown in Table 5.1.2. Results of the PP test almost confirm those of the ADF test. The series according to the PP results are non-stationary in their levels and this also confirms economic theory which says most economic variables are not stationary in their levels. However, when all the

variables are differenced ones, they become stationary. The only difference on the results is that DLPOR is stationary with or without a constant and trend under the PP test, unlike in the ADF where it was stationary only without both a constant and a trend. It appears, more or less, that the results of the informal graphical analysis of stationarity agree with both the ADF and PP formal stationarity tests. It was concluded that, all the series are integrated of the same order. Therefore, we advanced with all variables for contegration tests.

Table 5.1.2: Phillips-Perron stationarity test

Phillips-Perron (PP) Unit root test						
			Level		First Difference	
Variables	None	Constant	Constant and Trend	None	Constant	Constant and Trend
LBC	1.51	-1.54	-0.21	-3.78***	-3.97***	-4.22***
LALSI	1.78	-0.51	-1.43	-8.85***	-9.08***	-9.04***
LM1	4.33	-0.43	-1.92	-9.75***	-11.10***	-11.03***
LREER	0.92	-2.94	-2.74	-8.25***	-8.27***	-8.29***
CPIX	-0.75	-1.80	-1.81	-5.55***	-5.52***	-5.48***
LPOR	-0.76	-1.02	-1.15	-8.07***	-8.08***	-8.06***
CV (5%)	-1.94	-2.89	-3.46	-1.94	-2.89	-3.46
CV (1%)	-2.59	-3.50	-4.06	-2.59	-3.50	-4.06

Notes

(1) The null hypothesis, H_0 = Variables have a unit root.

(2) *, ** and *** represent a stationary variable at 10%, 5% and 1% level of significance respectively.

(3) The critical values are obtained from MacKinnon (1996) one-sided p-value.

(4) The lag length is decided according to Newley-West's (1987).

(5) CV means Critical Value

5.2.2 Cointegration

Cointegration examines the long run relationship between the coincident business cycle indicator and its determinants in the study. It is very important to assess whether there exist, long run relationships between the business cycle indicator and its determinants, in order to come up with a viable economic conclusion about the relationships that we find. It is also important that, the cointegration approach allows researchers to integrate the long run and short run relationship between variables within a unified framework. The most crucial step is to make sure that all the variables are integrated of the same order and this was achieved through differencing all variables once. This study will employ the Johansen maximum likelihood approach to test for cointegration. The Johansen approach has been seen as the most appropriate technique that others such as the Engle and Granger residual-based methodology because of a number of reasons mentioned in chapters two and three. In addition to all of its advantages the Johansen approach is capable of detecting multiple cointegrating relationships.

There are other alternative variables that are not specified in the full business cycle model (equation 4.3.2). Testing for cointegration using models with many variables has always given researchers a difficult task, for instance, too many cointegration relationships which are difficult or rather impossible to interpret. When faced with such a scenario, the favourable option is to estimate a simplified model (parsimonious) with a few variables, but with the risk of an omitted variable bias (misspecification). One way is to apply the pairwise correlation matrix to guide the variable selection exercise. Table 5.2 presents the pairwise correlations of the variable of the full business cycle model and is obtained from Eviews 7 iterations.

To reduce the danger of an omitted variables bias, the focal point is to find a model that concurrently generates significant results and includes as many variables as recommended by economic theory. Subsequent to the remark that all the variables are correlated with the LBC and that there is no one specific variable which is correlated to all the variables, there is, thus, less likelihood of multicollineality problem. Therefore, the business cycle model is estimated with the following explanatory variable: LALSI, LCPIX, LPOR, LM1 and LREER.

Table 5.2: Pairwise Correlation matrix

	LBC	LALSI	CPIX	LM1	LPOR	LREER
LBC	1.00	0.96	0.34	0.92	-0.18	0.22
LALSI	0.96	1.00	0.37	0.94	-0.21	0.15
LCPI	0.34	0.37	1.00	0.37	0.56	-0.47
LM1	0.92	0.94	0.37	1.00	-0.17	0.13
LPOR	-0.18	-0.21	0.56	-0.17	1.00	-0.73
LREER	0.22	0.15	-0.47	0.13	-0.73	1.00

The following observations are made from the pairwise correlations in column 2 of Table 5.2:

- LALSI and LM1 are the only variables that are highly correlated with the LBC.
- LCPI, LPOR and LREER have very low correlations with the LBC.
- LALSI which is the study's stock market performance indicator is positively correlated to LBC which is the study's business cycle indicator.

In the Johansen procedure we need to indicate the lag order and the deterministic trend assumption for the VAR. Unit root tests accepted the inclusion of a constant but no trend, we choose case 3 in Eviews 7 which excludes a trend but includes a constant. For the selection of the lag order for the VAR, the information criteria approach, improved by theoretical priors, is applied as a direction in choosing the lag order. Table 5.3 confirms the lag lengths selected by different information criteria. The selection is made using a maximum of 8 lags in order to permit adjustment in the model and to accomplish well behaved residuals. Table 5.3 shows that LR, FPE and the AIC have selected 2 lags while the HQ chose 1 lag and the SC selected no lag for the VAR. The information criteria approach has therefore produced disagreeing results and no conclusion can be arrived at using this approach only. This could arise as a result of small sample bias (Brooks, 2002: 427). In order to proceed, we should consider the presentation of the model under the suggested lag orders.

Table 5.3: VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1358.786	NA	1.26e-21	-31.09852	-30.92846*	-31.03005
1	1414.726	102.8788	7.96e-22	-31.55692	-30.36648	-31.07757*
2	1455.007	68.52347*	7.30e-22*	-31.65533*	-29.44452	-30.76510
3	1483.130	43.96221	9.01e-22	-31.47425	-28.24306	-30.17315
4	1514.423	44.60150	1.06e-21	-31.36604	-27.11447	-29.65406
5	1539.557	32.35628	1.50e-21	-31.11624	-25.84430	-28.99340
6	1572.766	38.17130	1.86e-21	-31.05208	-24.75977	-28.51836
7	1609.469	37.12528	2.29e-21	-31.06825	-23.75556	-28.12366
8	1657.229	41.72164	2.41e-21	-31.33860	-23.00554	-27.98314

Notes

*indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

The Johansen cointegration test is, therefore, conducted using the assumption of no trend but a constant in the series and 2 lags for the VAR. Table 5.4 presents the cointegration test results for the specified business cycle model applying the trace and maximum eigenvalue test statistics. The upper part of Table 5.4 presents the Johansen cointegration test based on the trace test, while the bottom part presents the results of this test based on the maximum eigenvalue test. The trace statistic tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating relations. The null hypothesis of no cointegrating vectors is rejected, since the test statistic of about 115.46 is greater than the 5% critical value of approximately 95.75. Using the same interpretation, the null hypothesis that there are at most 1 cointegrating vector is rejected, however the null hypothesis that that there are at most 2 cointegating vectors cannot be rejected since the test statistic of approximately 42.61 is now less than the 5% critical value of about 47.86. All in all, the trace statistics specify 2 cointegrating relationships at 5% level of significance.

Table 5.4: Johansen cointegration rank test results

Trend assumption: Linear deterministic trend

Lag intervals (in first difference): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**5%**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.384	115.460	95.754	0.001
At most 1 *	0.258	70.382	69.819	0.045
At most 2	0.196	42.614	47.856	0.142
At most 3	0.128	22.379	29.797	0.278
At most 4	0.093	9.691	15.495	0.305
At most 5	0.0063	0.586	3.841	0.444

Notes: (1) Trace test indicates 2 cointegrating equations at the 5% level of significance

(2) The trace test tests the null hypothesis of *r* cointegrating vectors

(3) * denotes rejection of the hypothesis at 5% level of significance

(4) ** MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		**Max-Eigen**	**5%**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.384128	45.07866	40.07757	0.0126
At most 1	0.258127	27.76769	33.87687	0.2244
At most 2	0.195535	20.23478	27.58434	0.3251
At most 3	0.127532	12.68797	21.13162	0.4814
At most 4	0.093262	9.104822	14.26460	0.2775
At most 5	0.006285	0.586305	3.841466	0.4439

Notes: (1) Max-eigenvalue test indicates 1 cointegrating equation at the 5% level

(2) Max-eigenvalue test the null hypothesis of *r* cointegrating vectors

(3) * denotes rejection of the hypothesis at 5% level of significance

(4) ** MacKinnon-Haug-Michelis (1999) p-values

The maximum eigenvalue tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of r+1 cointegrating relations. The maximum eigenvalue test also rejects the null hypothesis of no cointegration, but fails to reject that at most 1 cointegrating vectors, since the test statistic of about 27.78 is now less than the 5% critical value of about 40.08. Therefore, the maximum eigenvalue test put forward that there is only 1 cointegrating relationship in the business cycle model.

The outcome from the trace test and maximum eigenvalues test produced conflicting results. However, in such a situation Johansen and Juselius (1990) advise the examination of the estimated cointegrating vector and base the choice on the interpretability of the cointegrating relations. It is also essential to use the results of each test and let a priori theoretical information guide in choosing the cointegration rank. Luintel and Khan (1999:392) showed that the trace statistics is more robust than the maximum eigenvalue test. Nonetheless, we estimated the VECMs limited to 1 and 2 cointegrating vectors independently, as selected by the maximum eigenvalue and trace test, in that order.

5.2.3 The Long run relationship (VECMs)

In order to run a VECM there is need to use the number of cointegrating relations that we found previously, collectively with the number of lags and the deterministic trend assumption applied in the cointegration test. Through the estimation of a VECM it is necessary to differentiate between the long and short run determinants of the business cycle model. There is need to initially find out the true two cointegrating relations that were recommended by the cointegration test. The outcome of the estimated VECM without any restrictions is presented in Table 5.5 for the two cointegrating relations identified by the trace test and maximum eigenvalue test.

Table 5.5: VECM results for the two cointegrating relationships

Cointegrating Eq:	LBC(-1)	LPOR(-1)	LM1(-1)	LALSI(-1)	CPIX(-1)	LREER(-1)	C
CointEq1	1.000	0.000	0.671	-0.731	0.0216	-0.016	-2.849
			(0.134)	(0.093)	(0.013)	(0.105)	
			[5.025]	[-7.854]	[1.631]	[-0.150]	
CointEq2	0.000	1.000	1.304	-0.972	-0.071	-0.274	-3.858
			(0.471)	(0.328)	(0.047)	(0.370)	
			[2.769]	[-2.962]	[-1.516]	[-0.740]	

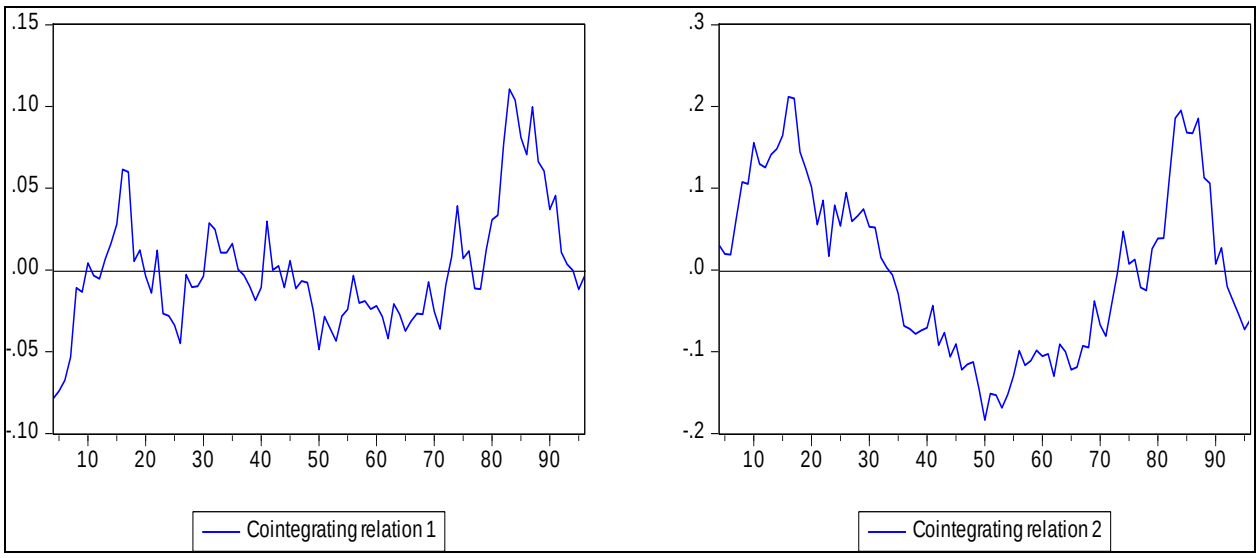
Error Correction:	D(LBC)	D(LPOR)	D(LM1)	D(LALSI)	D(CPIX)	D(LREER)
CointEq1	-0.032	-0.099	-0.059	0.234	1.271	-0.140
	(0.014)	(0.068)	(0.054)	(0.120)	(0.747)	(0.083)
	[-2.227]	[-1.463]	[-1.088]	[1.942]	[1.702]	[-1.676]
CointEq2	-0.003	-0.033	-0.044	-0.066	0.147	0.066
	(0.004)	(0.019)	(0.015)	(0.033)	(0.206)	(0.023)
	[-0.752]	[-1.745]	[-2.913]	[-1.994]	[0.715]	[2.858]

It is significant that we normalise each of the vectors on the variables with which clear evidence of error correction is observed. From Table 5.6, it is noted that four series namely LBC, LM1, LPOR and REER show evidence of error correction, on cointEq1 at the bottom of the table, as shown by the negative coefficients whilst LALSI and LCPI does not. However, only LBC has the most significant coefficient with a t-value of approximately -2.23. The other series with the correct signs have very low t-values which are less significant.

In the second cointegrating equation, there are also four series for the correct negative coefficients but three of them show a true relationship. LPOR, LM1 and LALSI have correct signed adjustment coefficients and their t-values of -1.74, -2.91 and -1.99 respectively, are relatively high. It can be concluded that the business cycle equation constitutes the true cointegration relationship in the first cointegrating vector as there is evidence of less error

correction in the variables. This result is supported by the plot in Figure 5.2 showing both the first and second vectors in the cointegration, of which the first cointegrating relation graph appears to be more stationary than the second cointegrating relation.

Figure 5.2: Cointegration graphs for the business cycle equation



The first cointegrating relation graph shows a big deviation from mean zero in between the 80th and 90th month since 2002. This period constitutes the period of the economic recession in South Africa arising as a result of the global recession of 2008/2009. The next step is to estimate the main VECM and it is important to take note of this period of outstanding economic developments. We ensure that the events of 2008/09 economic recession are included by adding a dummy variable in estimating the model. Tables 5.6 shows the results of the alternative single equation equilibrium VECM for the business cycle model.

Table 5.6: Single equation equilibrium correction model for the business cycle

Depended variable: DLBC

Coefficient of Error Correction terms							
$DLBC_{t-1}$	DLALSI	DCPIX	DLM1	$DLPOR_{t-1}$	DLREER	DUMMY	ECT_{t-1}
0.531	0.037	0.001	0.015	-0.028	-0.030	-0.002	-0.114
(0.000)	(0.001)	(0.012)	(0.025)	(0.021)	(0.017)	(0.001)	(0.011)
[6.31]***	[3.06]***	[1.85]*	[0.58]	[-1.216]	[-1.79]*	[-2.90]***	[-2.54]**

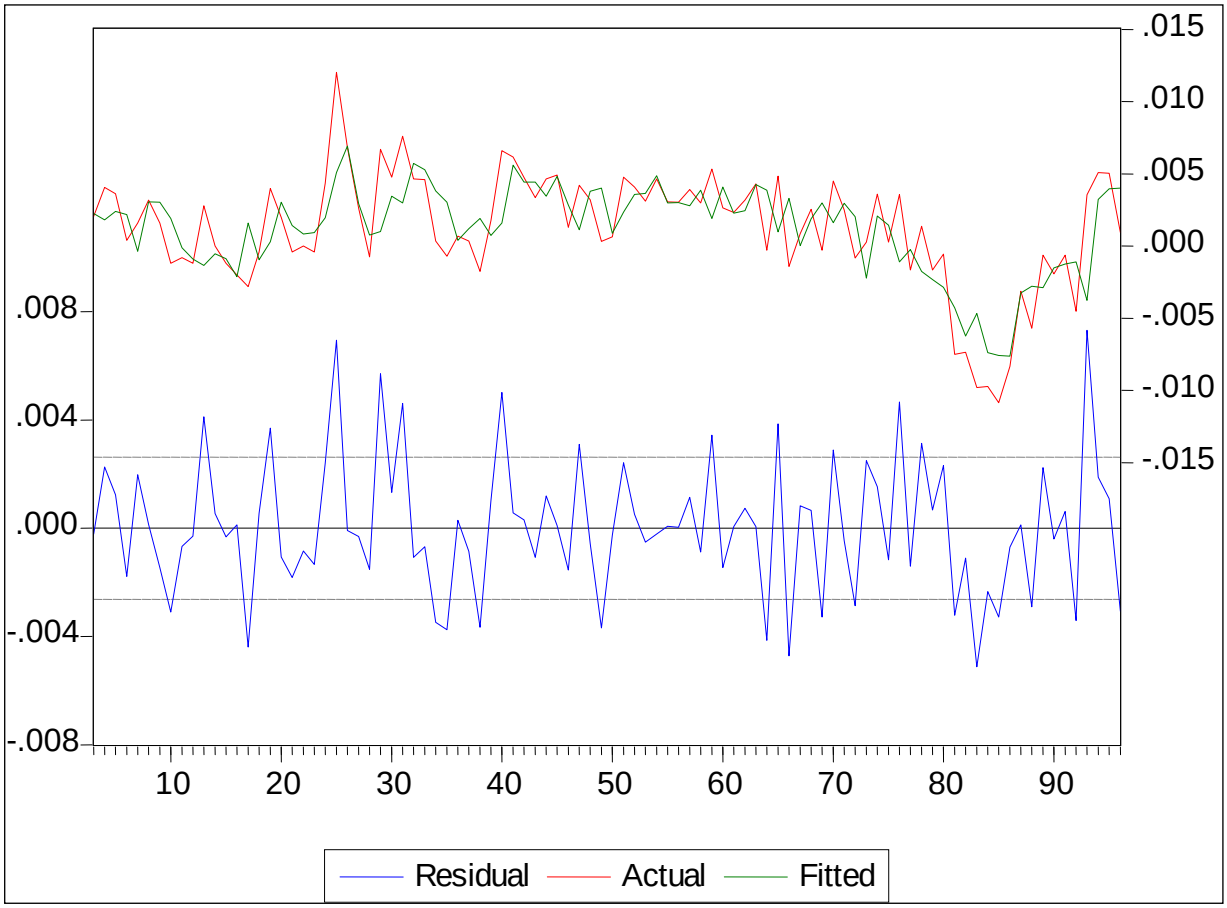
*, ** and *** represent 10%, 5% and 1% significant levels. *P*-values and t-statistics are in parentheses and brackets respectively.

R-Squared = 58%
Adjusted R-Squared = 55%
Durbin Watson Statistic = 2.12
Serial Correlation LM test = 1.095 [0.295]
Nomality (Jarque-Bera) = 3.290 [0.193]
Heteroskedasticity (White Test) = 40.287 [0.286]

5.2.4 Actual versus Fitted residuals and interpretation of the findings

The actual versus fitted residuals are presented graphically in Figure 5.3 to get a feel for the fit of the model. Using this approach, we compare the actual values to the fitted values of the business cycle model. Figure 5.3 show that the model fits the data in a fairly well, although there is still a considerable margin of error. Table 5.6 shows the outcome from the estimation of the business cycle model.

Figure 5.3: Actual versus Fitted residuals



The estimated business cycle model shows that, the coincident indicator of South Africa is determined by the previous period's indicator as shown by the inclusion of the lagged coincident indicator variable $DLBC_{t-1}$. This lagged business cycle variable is positively related to the current business cycle turning points and phases, as shown by a positive coefficient on the variable. The coefficient is also significant at one percent level of significance. Thus, the null hypothesis that the coefficient of $DLBC_{t-1}$ is zero is rejected. This is logical since, for instance, that the global recession of 2008/09 had an impact not only during the times of the recession, but also on economic activity in the subsequent periods. Businesses that were negatively affected or even those that were shutdown due to the global recession shed jobs and their participation in the economy declined and this affected economic activity in the subsequent years as well. Alternatively, business cycle booms that may be experienced now may enhance growth in economic activity, which does not only benefit the economy now, but in the future as well.

The null hypothesis that DLALSI is not significantly different from zero has been rejected, meaning that at one percent level, the *t*-statistic is significant enough to support the fact that there is a positive relationship between business cycles and stock market performance. This result is not surprising. Business cycles are determined by the performance of businesses and the performances of these businesses are determined by stock performance. If stock prices are rising investors prefer to buy more shares for anticipated capital gains. When investors sell shares at high prices they generate capital which they in turn use to finance expansion plans and this impact positively to economic activity. Conversely, if the share prices fall, investors' confidence diminishes as this is not a good sign for future capital gains. They cease to buy shares and businesses might not have the required capital to finance their day to day activity and expansion plans, which means economic activity falls as well, hence a positive relationship between stock prices and business cycles.

The consumer price index excluding interest on mortgages (DCPIX) is positively related to the business cycle coincident indicator of South Africa. Although the result might seem to be surprising, it was expected that the coefficient may be negative or positive. The CPIX can be negatively related to LBC because inflation erodes the purchasing power of the rand which implies that final consumers of goods and services are negatively affected and this affects businesses and economic activity. However, in this situation, the coefficient proves to be positive. The reason for this could be the expansion in money supply which might have pushed the inflation high. The expansion of money supply has a positive relationship with LBC as shown in Table 5.6. The null hypothesis that the coefficient of DCPIX is not significantly different from zero has been rejected and at 10% level of significance it can be concluded that CPIX is positively related to business cycles in South Africa. However, the coefficient of DLM1 is surprisingly insignificant and it might be concluded that the money supply does not influence the coincident indicator. This result needs to be accepted with great caution and probably there is need to try other definitions of money supply given the fact that most business transactions are not conducted by M1 only. There are other broad definitions of money supply such as M2, M3 and M4 which could have produced different results.

A dummy variable has been included in the business cycle model mainly to capture the extraordinary economic situation during the 2008/09 recession. A dummy is an indicator variable that takes the values 0 or 1 to indicate the presents or absence of some categorical effect that may be expected to shift the outcome of an issue. This indicator variable shows

that during the time of the recession there were unusual economic situations. In this analysis 1 is placed for all the months of 2008/09 because it is true that there was a recession during this period. The coefficient of the dummy variable has a high *t*-value and is very significant to the business cycle model. These results show that the economic recession of 2008/09 had a negative impact on business activity as indicated by a negative sign of the dummy variable coefficient. This is practically true about what happened during the recession where up to 1 million jobs were lost in South Africa due to the recession. Also, as explained in chapter 2, the recession had a negative impact on most of the coincident business cycle indicator constituents such as vehicle sale index, retail and wholesale index, formal non-agricultural employment index and production index.

The real effective exchange rate (REER) of South Africa and its major trading partners has a negative relationship with the coincident business cycle, as indicated by the significance of its coefficient at 10% level of significance. This was not expected because if the REER falls this implies that the rand gains value compared to the currencies of the major trading partners. This means that the local business find it cheaper to purchase raw material and other finished products from the trading partners cheaply, for instance, crude oil and other industrial goods. This boosts business activity in the domestic economy, which might have positive impact on business cycles. Although a fall in the REER might drive exports down, the local businesses may operate profitably by concentrating their efforts in the country alone.

The business cycle coincident indicator has a negative relationship with the Prime overdraft rate of the previous month (POR_{t-1}) as shown by a negative coefficient in Table 5.6. This result seems to be realistic because previous interest rates of South Africa have affected investment, of which the results of decrease in investments are not felt there and there but in a future period. The result is also in line with the ABC theory which is the theoretical model in this study. The only problem with this outcome is the fact that the t-value is very low that it may be significant at some level of significance greater than 10% which may not be accepted in econometric analysis.

The error correction term (ECT) for the business cycle model shows the equilibrium error which is rectified in the previous month (ECT_{t-1}). In other words, the size of the coefficient means that the speed of adjustment in the business cycle model is 11.4% within a month. The sign of ECT_{t-1} is negative and this conforms to economic theory. The coefficient of the error

term has a high *t*-statistic which is significant at 5% level of significance. This error term agrees well with the authenticity of an equilibrium relationship among the variable in the cointegrating equation. This means that neglecting the cointegratedness of the variables would have established a misspecified model.

5.2.5 Diagnostic checks

The diagnostic checks are very important to the business cycle model because they validate the parameter evaluation outcomes achieved by the estimated model. This arises because, if there is a problem in the residuals from the estimated model; it means the model is not efficient and the estimated parameters will be biased. The diagnostic test results are presented at the bottom of Table 5.6 and these assist in checking for serial correlation, normality and heteroscedasticity. These diagnostic checks are based on the null hypothesis that: there is no serial correlation for the LM test; there is normality for the Jarque-Bera test and there is no heteroscedasticity for the White heteroscedasticity test. The estimated model fits satisfactorily well with an adjusted R^2 of 55%. In addition, the DW test of 2.12 shows that there is no serial correlation among the residuals. Furthermore, the LM test, which is a stricter test for correlation is also applied in the analysis. The results for the diagnostic checks for serial correlation, normality and heteroscedasticity show that the data is fairly well behaved.

5.3 Conclusion

This chapter examined the connection between the coincident business cycle indicator of South Africa and its determinants as specified in this study. Firstly, an analysis of the time series properties of the data was carried out using the informal and formal stationarity tests. The ADF and PP unit root tests revealed that the time series were first difference stationary which means they are all integrated of the same order. Johansen cointegration analysis was employed and provided evidence that there is cointegration between the coincident indicator and the variables in the specified model. The proof of cointegration allowed the estimation of the VECMs which provided long run parameter estimates.

The variable of attention in this study, the All Share Price Index (ALSI) is positively related to the coincident business cycle indicator. The estimation also included the lagged variable of the independent variable ($DLBC_{t-1}$) which has a positive and significant relationship with the business cycle. The consumer price index excluding interest on mortgages (CPIX) is

unpredictably, positively related to business cycles. Money supply (M1) is also positively related to business cycles but the finding is statistically insignificant. A dummy variable, to indicate the unusual economic situations during the 2008/09 economic recession, was also included in the model and is negatively related to business cycles. Business cycles are negatively related to previous month's interest rates (POR_{t-1}) according to the results. The Real effective exchange rate (REER) is negatively related to business cycles and the result is statistically significant. An essential parameter in the VECM is the speed of adjustment (error correction term). The error correction term indicates that about 11.4% of the variations in the business cycle from its stability are corrected within a month.

CHAPTER SIX

SUMMARY, CONCLUSIONS, POLICY RECOMENDATIONS AND LIMITATIONS

6.1 Summary of the study and conclusions

This study sought to investigate the link between business cycles and stock market performance in South Africa. In this study, the business cycle indicators namely the coincident, leading and lagging indicators were explained using trend analysis. The coincident indicator moves simultaneously with economic cycles whereas the leading indicator signals future turning points of business cycles while the lagging indicator lags behind turning points of business cycles. The coincident indicator was observed to follow an upward trend from 2000 until 2008 when it fell due to the economic recession of 2008/09. The leading indicator also followed an upward trend from 2000 and fell in 2007 signalling the economic recession of 2008/09. The lagging indicator has been rising from 2000 and it fell during end of 2009 lagging behind the recession of 2008/09. The constituents of the business cycle indicators were also assessed using trend analysis; hence, phases and business cycle turning points were identified.

The performance of South Africa's stock market was assessed through studying the JSE. Trend analysis of the market capitalisation, ALSI and ratio analysis was also done. In addition, the WFE survey on market capitalisation of the JSE was also presented in this study. Trend analysis in both the business cycle indicators and stock market variables helped to achieve the specific objectives outlined in chapter one of this study.

The study reviewed three theoretical literatures guiding the study. The theories reviewed were the Austrian Business Cycle (ABC) theory, the Efficient Market Hypothesis (EMH) and Elliott Wave principle (EWP). The ABC theory explains the major causes of business cycles. According to the ABC theory, business cycles are influenced by the conservative macroeconomic variables of savings, investment, money supply and interest rates. Although the ABC theory did not explain the importance of stock markets, augmentation of the theory was useful so as to incorporate stock market performance, hence, the theory was set as a theoretical framework to the study.

The Efficient Market Hypothesis (EMH) is a stock market theory which helps to identify the efficiency of stock exchanges. The theory classifies stock market efficiency as weak form efficiency, semi-strong form efficiency or strong form efficiency. Most of the previous researches have indicated that the JSE is a weak form efficiency which means historical data is also included in current pricing system, but investors cannot use past data as a tool to profiteer. The EMH on one way or another helps us to identify the form of efficiency at the JSE enabling us to assess the performance of the stock market. Lastly, Elliot Wave Principle (EWP) is a stock market theory which helps explain how financial markets are traded in repeated cycles.

The connection between business cycles and stock market development reviewed in this study is very well documented in the literature for both developing and developed countries. The bulk of empirical literatures reviewed in this study argue that there is a positive relationship between stock performance and business cycles. A number of studies observed that stock market performance is a positive ingredient for economic activity growth while others assert that business cycle growth is important for stock market performance. Some studies argued that there is bi-directional causality between stock performance and business cycle/economic activity. One research, however, argues that there is no relationship between economic activity and stock market performance (Wang, 2010).

Based on review of literature on business cycles and stock performance an empirical model that links the composite business cycle indicator to its determinants was specified. The variables used in the model are the prime overdraft rate (POR), inflation (CPIX), real effective exchange rate (REER), All Share Price Index (ALSI) and money supply (M1). The composite coincident business cycle indicator was used as the best representative of business cycle trends and turning points since this index comprise constituents which move more or less with economic cycles. The ALSI at the JSE was used to measure stock market performance. Prior research concentrated on market cap as a measure of stock market development but several critics reiterated that market cap is helpful when studying stock exchange size therefore it might not be a best proxy of stock market performance. In support of the ALSI as a good proxy of stock performance, JSE (2010) did a trend analysis on the stock prices and noted that the stock prices fell in the period prior to the global economic

crisis and recovered when the recession was easing in the third quarter of 2009 and this may indicate that stock prices are linked to business cycles.

The Johansen cointegration and error correction methodology was preferred to the other techniques, such as Engle-Granger method because of its several advantages over those alternative techniques. By using this technique we initially assessed the time series properties of the data, by applying both the informal and formal tests for stationarity. The formal tests for stationarity applied are the Augmented Dickey-Fuller and Phillips Perron unit root tests. All the time series data were found to be integrated of the same order. Johansen cointegration test on alternative model specification provided evidence that there is cointegration between business cycle coincident indicator and its determinants which were included in the model. Evidence of cointegration allowed the estimation of VECMs, which provided the parameter estimates for the long run relationships. All variables have a long run relationship with the business cycle.

The business cycle model was estimated and results were obtained. The variable of interest in this study, the All Share Price Index (ALSI) is positively related to the coincident business cycle indicator. The estimation also included the lagged variables of the independent variable ($DLBC_{t-1}$) because the previous period economic activities also impacts on the current business cycle developments. $DLBC_{t-1}$ has a positive and significant relationship with the business cycle. The consumer price index excluding interest on mortgages (CPIX) is surprisingly, positively related to business cycles. Money supply (M1) is also positively related to business cycles but the finding is statistically insignificant. This finding has to be accepted with great caution because money supply induces investment which should improve economic activity. However, other type of money supply such as M2 or M3 might produce different results.

A dummy variable, to indicate the extraordinary economic situations during the 2008/09 economic recession, was also included in the model and is negatively related to business cycles. The recession had a negative impact to economic activity and the statistically significant negative sign of the dummy variable is binding. Business cycles are negatively related to previous month's interest rates (POR_{t-1}) according to the results. The results are economically correct since interest rates increase impacts negatively on investment and hence economic activity. The Real Effective Exchange Rate (REER) is negatively related to

business cycles and the result is statistically significant. Another important parameter in the VECM is the speed of adjustment, which measures the speed of adjustment in the business cycle model after a shock in the economy. The estimate of this parameter indicates that about 11.4% of the variation in the business cycle from its equilibrium is corrected within a month. The speed of adjustment might appear to be low but since it is a monthly adjustment the result is convincingly acceptable.

6.2 Policy Implications and Recommendations

The outcomes from this study raise various policy issues and recommendations, which will strengthen the connection between the stock market and business cycles in South Africa.

Since the stock market functions in a macroeconomic environment, it is essential that the atmosphere must be an enabling one so as to be acquainted with its full potential. The demand for services of the stock market is a derived demand. With the certainty of a positive relationship between stock market performance and business cycles, it is noteworthy to advise that there should be continued effort to kindle productivity in both the public and private sectors of the economy of South Africa.

The management of stock prices should be de-regulated. Market forces of demand and supply should be allowed to function devoid of any interference. Meddling in the security pricing is detrimental to the expansion of the stock market.

The stock market is identified as a comparatively low-cost source of funds when contrasted to the money market and other sources. The cost of raising funds in South Africa is however, assumed to be somewhat high. There ought to be a downward revision, of the cost, so as to improve its competitiveness and improve the attractiveness as a source of raising funds.

All the tiers of government should be supported to fund their prudent developmental programmes through the stock market. This will serve as a leeway to freeing the resources that may be used in other spheres of the economy.

6.3 Limitations and areas for further research

The unavailability and inconsistence of time series data for the actual variables that are included in the theoretical models is a major drawback that has been faced by empirical researchers on business cycle studies. In addition, a great deal of variables with which the researchers would have wanted to incorporate in their studies of business cycles may be omitted from the theoretical models. This compels the empirical researchers to augment the theoretical models, by giving economic theory reasoning why these variables should be used in the empirical models they estimate. However, augmenting or applying proxies to the variables in the theoretical models might not give accurate and consistent estimation results. This study has augmented the Austrian Business cycle theory by including the proxy for stock market performance and the objectives of the study were, however, achieved.

This study effectively identified a positive relationship between the coincident business cycle indicator and stock prices. However, future studies should advance this study by applying causality tests between these two variables to identify which variable causes the other. This helps various stakeholders in the economy to make viable economic decisions that will benefit the economy as a whole. In addition, previous empirical researchers have used GDP as proxy to business cycles when conducting business cycle related studies – using GDP as proxy to business cycles is marred with a great deal of criticisms. It is important to use the coincident business cycle indicator as a representation of business cycles when doing such researches because of its characteristic of coinciding with overall economic activity.

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APPENDICES

Appendix 1: South African data used in the regressions

DATE	BC	ALSI	REER	POR%	M1	CPIX%
2002:01	105.40	10333.52	74.68	14.00	324687.00	4.90
2002:02	105.60	10875.09	77.62	14.00	335208.00	5.80
2002:03	106.10	11015.04	77.66	15.00	341219.00	6.30
2002:04	107.10	11007.67	80.05	15.00	339964.00	7.40
2002:05	108.00	11200.85	86.05	15.00	350024.00	7.70
2002:06	108.10	10657.73	84.44	16.00	347028.00	8.00
2002:07	108.50	9239.02	83.15	16.00	339389.00	9.70
2002:08	109.30	9677.26	80.78	16.00	348923.00	10.40
2002:09	109.70	9465.33	80.54	17.00	359313.00	11.10
2002:10	109.40	9376.23	83.35	17.00	346247.00	13.00
2002:11	109.20	9563.74	88.48	17.00	352931.00	12.90
2002:12	108.90	9277.22	93.76	17.00	358251.00	12.40
2003:01	109.60	8798.35	93.29	17.00	347044.00	11.60
2003:02	109.60	8402.09	96.56	17.00	345220.00	10.20
2003:03	109.30	7679.88	99.01	17.00	352862.00	10.20
2003:04	108.80	7510.40	104.39	17.00	346970.00	8.80
2003:05	108.10	8564.33	100.09	17.00	335857.00	7.90
2003:06	108.00	8352.20	97.78	15.50	336752.00	6.70
2003:07	109.00	8809.63	104.33	15.50	336409.00	5.20
2003:08	109.50	9226.20	107.13	14.50	339693.00	5.10
2003:09	109.40	8925.69	106.03	13.50	362070.00	3.80
2003:10	109.40	9765.30	107.75	12.00	359682.00	1.60
2003:11	109.30	9729.60	110.99	12.00	373674.00	0.40
2003:12	110.40	10387.22	111.42	11.50	387788.00	0.40
2004:01	113.50	10849.25	102.33	11.50	392055.00	0.10
2004:02	115.30	10895.86	104.31	11.50	415658.00	0.80
2004:03	116.00	10692.56	107.71	11.50	402236.00	0.40
2004:04	115.80	10385.80	110.65	11.50	395294.00	0.30
2004:05	117.60	10413.81	106.89	11.50	389088.00	0.50
2004:06	118.90	10108.61	113.01	11.50	403309.00	1.20
2004:07	121.00	10305.89	117.20	11.50	392501.00	1.60
2004:08	122.30	11160.44	111.54	11.00	406987.00	1.00
2004:09	123.60	11761.00	108.93	11.00	420166.00	1.30
2004:10	123.70	11655.31	109.79	11.00	415351.00	2.40
2004:11	123.50	12490.79	112.74	11.00	419871.00	3.70
2004:12	123.70	12656.86	116.42	11.00	421494.00	3.30
2005:01	123.80	12798.55	115.64	11.00	417542.00	3.00
2005:02	123.30	13476.59	115.06	11.00	433378.00	2.60

2005:03	123.80	13298.58	114.20	11.00	434154.00	3.00
2005:04	125.70	12555.96	113.31	10.50	455563.00	3.50
2005:05	127.50	13787.02	111.66	10.50	446168.00	3.40
2005:06	128.90	14154.73	106.78	10.50	458285.00	2.80
2005:07	129.90	15143.64	109.28	10.50	463705.00	3.30
2005:08	131.30	15414.01	111.61	10.50	489831.00	3.90
2005:09	132.80	16875.65	113.41	10.50	500038.00	4.30
2005:10	133.20	16433.10	110.99	10.50	491884.00	4.00
2005:11	134.50	16774.54	111.64	10.50	497319.00	3.30
2005:12	135.50	18096.54	116.44	10.50	503053.00	3.60
2006:01	135.60	19745.16	119.28	10.50	507636.00	4.00
2006:02	135.80	19085.35	119.67	10.50	523525.00	3.90
2006:03	137.30	20351.74	116.62	10.50	540523.00	3.40
2006:04	138.60	21135.51	118.75	10.50	542149.00	3.30
2006:05	139.60	20565.46	111.86	10.50	544464.00	3.90
2006:06	141.10	21237.87	103.26	11.00	558003.00	4.90
2006:07	142.10	20885.57	102.37	11.00	581414.00	5.00
2006:08	143.10	21953.80	105.91	11.50	572261.00	5.50
2006:09	144.40	22374.58	100.51	11.50	578691.00	5.30
2006:10	145.40	23338.16	98.72	12.00	589061.00	5.40
2006:11	147.20	23949.95	103.99	12.00	599987.00	5.40
2006:12	148.10	24915.20	105.55	12.50	605679.00	5.80
2007:01	148.90	25447.73	104.41	12.50	586490.00	6.00
2007:02	150.00	25795.99	104.43	12.50	633296.00	5.80
2007:03	151.50	27267.24	101.23	12.50	647133.00	6.10
2007:04	151.40	28170.60	104.33	12.50	645933.00	6.90
2007:05	153.10	28627.79	106.92	12.50	660823.00	6.90
2007:06	152.60	28337.22	105.53	13.00	665872.00	7.10
2007:07	152.90	28561.81	106.94	13.00	669361.00	7.10
2007:08	153.80	28660.35	103.47	13.50	713234.00	6.70
2007:09	153.70	29959.19	103.33	13.50	702665.00	7.20
2007:10	155.30	31334.99	107.61	14.00	698840.00	7.80
2007:11	156.20	30307.80	106.65	14.00	731629.00	8.40
2007:12	155.90	28957.97	105.70	14.50	738317.00	9.00
2008:01	156.00	27317.14	102.29	14.50	769030.00	9.30
2008:02	157.30	30673.74	93.55	14.50	769153.00	9.80
2008:03	157.40	29587.51	86.57	14.50	747052.00	10.60
2008:04	158.70	30743.49	89.05	15.00	710741.00	11.10
2008:05	158.10	31841.27	97.84	15.00	742071.00	11.70
2008:06	158.60	30413.43	94.63	15.50	761170.00	12.20
2008:07	158.00	27719.67	97.85	15.50	735127.00	13.40
2008:08	157.80	27702.06	102.37	15.50	743441.00	13.70

2008:09	155.10	23835.97	100.10	15.50	752949.00	13.10
2008:10	152.50	20991.72	88.28	15.50	754064.00	12.10
2008:11	149.10	21209.49	88.15	15.50	771448.00	11.80
2008:12	145.80	21509.20	88.44	15.00	753628.00	9.50
2009:01	142.20	20570.05	89.22	15.00	722829.00	8.10
2009:02	139.50	18465.33	89.83	14.00	729764.00	8.60
2009:03	138.50	20363.91	90.63	13.00	731838.00	8.50
2009:04	136.70	20647.03	99.44	13.00	744651.00	8.40
2009:05	136.50	22770.62	102.59	11.00	767839.00	8.00
2009:06	135.90	22049.42	104.15	11.00	772136.00	6.90
2009:07	135.70	24258.51	105.29	11.00	763199.00	6.70
2009:08	134.30	24929.42	104.53	10.50	779597.00	6.40
2009:09	135.40	24910.85	109.24	10.50	761623.00	6.10
2009:10	137.00	26360.55	107.93	10.50	765573.00	5.90
2009:11	138.60	26894.74	106.15	10.50	790895.00	5.80
2009:12	138.90	27666.45	108.13	10.50	805451.00	6.30

(Data Sources: Statistics South Africa, SARB and JSE.)