AN EMPIRICAL INVESTIGATION ON THE RELATIONSHIP BETWEEN TRADE OPENNESS AND GDP GROWTH RATE: THE CASE OF SOUTH AFRICA (1994Q1-2008Q4).

By

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DECLARATION

I declare that *An Empirical Investigation on the causal relationship between Trade openness and GDP growth rate: The case of South Africa (1994Q1-2008Q4) is* my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Teboho Jeremiah Mosikari November 2010

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ABSTRACT

This dissertation examines the causal relationship between trade openness and GDP growth in South Africa using quarterly series data spanning the years from 1994Q1 through 2008Q4. Despite substantial economic restructuring, South Africa's post-1994 export performance is less than what might have been expected or hoped for. The study examines the trade-openness led-growth hypothesis (ELG) in the South African economy. Further, the study uses both conventional cointegration approaches such as Engel-Granger and Johansen cointegration techniques to determine the long-run relationship between trade openness and GDP growth. Both cointegration tests show that there exists long-run relationship between trade openness and GDP growth at 1 per cent significance level. Therefore, the study also applies an error correction model to determine the speed of adjustment and the short-term determinants of economic growth in South Africa. The estimated models tracks the historical data well and satisfies various specifications and stability tests. In considering trade openness measures, it indicates that they are generally less pivotal and have an even smaller effect than had been anticipated. The study also adopts Granger causality tests and impulse response functions to examine whether growth in trade openness stimulate economic growth (or vice versa). The results suggest that in all trade openness measures that are used, there is weak evidence suggesting causality from GDP to exports or vice versa. The study recommends that openness trade policy will be beneficial strategy for South Africa in the long-run. Therefore, it is suggested that the South African government continue the policy of trade openness.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADRL	Autoregressive Distribution Lag
AGOA	African Growth and Opportunity Act
BTI	Board of Trade and Industry
BTT	Board on Tariffs and Trade (previously BTI)
DME	Department of Minerals and Energy
DTI	Department of Trade and Industry (South Africa)
ELG	Exports led Growth
EU	European Union (European Community in the WTO terminology)
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
i.e.	That is
IDC	Industrial Development Corporation of South Africa
ILG	Imports Led Growth
IMF	International Monetary Fund
LDCs	Less Developed Countries
MIDP	Motor Industry Development Programme
OEDC	Organisation for Economic Cooperation and Development
PGSA	Pocket Guide of South Africa
SACU	Southern African Customs Union
SADC	Southern African Development Community
SARB	South African Reserve Bank
TFP	Total factor productivity
TIPS	Trade and Industrial Policy Secretariat
TLG	Trade openness led Growth
UNCTAD	United Nations Conference on Trade and Development
VECM	Vector Error Correct Mechanism

WTO World Trade Organisation

CHAPTER 1: INTRODUCTION

1.1 Introduction

The current study conducts an investigation on trade openness and GDP growth in South African context. In an attempt to discuss that, this chapter is structured as follows: section 1.2 is the background of the study, section 1.3 highlights the problem statement and section 1.4 presents the purpose of the study. Section 1.5 it looks at the main and specific objectives of the study. Section 1.6 contains the research questions. Section 1.7 explores the significance of the study and section 1.8 the research methodology. Whereas section 1.9 outlines the scope and delimitations of the study, section 1.10 gives the definitions of concepts. Section 1.11 discusses the deployment of the study. Lastly, section 1.12 presents the summary of the study.

The end of apartheid in the early 1990s dramatically expanded the trade openness of South Africa (S.A). Trade openness has been measured in various ways in studies investigating the issue; they commonly express trade in terms of its share of Gross domestic product (GDP) for a given country (Squalli and Wilson, 2006). The most popular and traditional measures are imports ratio, exports ratio and exports plus imports over GDP. In 2000, trade openness constituted 16 percent of (GDP). South Africa's total exports for 1994 were R92 million. This figure had increased to R396.5 million by 2006 (van der Walt, 2007). South Africa's economy is still largely reliant on the export of primary and intermediate commodities to industrialised economies. Relative to GDP, exports increased from 18.7 percent of GDP in 1994 to 23 percent of GDP in 2006. This provides evidence that South Africa's trade and industrial policy is moving away from a highly protected, inward looking economy towards an internationally competitive economy.

South Africa has seen a significant increase in exports figures, but when compared to international trends, the country's exports are not growing fast enough. In reference, Srinivasan (2004) indicates that China continues to outpace the world economy in trade openness. In 2002, it was the world's fifth largest exporter of merchandise with a share of 5 percent of the world exports. It is clear that South Africa has much catching up to do to stimulate the growth rates of exports in order to boost the GDP.

1.2 Background of study

Since 1994, the South African economy has been through a process of structural transformation. The country implemented macroeconomic policies that seek to make the economy more outward orientated in order to promote domestic competitiveness, growth and employment (Flatters and Stern, 2007). The country has embarked on a series of trade negotiations such as Free trade agreement (FTA). Lewis (2001) and Andriamananjara and Hillberry (2001) indicate that these FTA initiatives are beneficial to South Africa and the region. In recent years, many emerging economies such as India and Brazil in Latin America have experienced major macroeconomic and trade policy reforms with emphasis on trade openness.

Trade openness is often considered in the sense of an increase in the size of the country's traded sector in relation to total production; it is an acceptable proxy for trade liberalisation (Yanikkaya, 2003). In fact, increasing trade openness often reflects the success of trade liberalisation policies (Sarkar, 2007). Due to the difficulty of measuring openness, different studies have used different measures to examine the effects of trade openness on economic growth. Emma and Samman (2005) argue that reliance on the share of trade in GDP as an indicator of trade openness is highly misleading. Despite the debate on what exactly are measures of trade openness, internationally the work of Mbabazi, Milner and Morrissey (2004) indicates that trade openness is positively associated with the growth of 44 developing countries over 1970-95. Moreover, Anderson (2007) states that over the past 40 years since 1965, there is a

one-to-one correlation between trade and GDP growth in Asian countries. This, in short, is export-led growth. International trade plays a significant role in the Asians economies while, in South Africa, this is less so.

According to Rankin (2001), the trend growth rate for South Africa's real exports has been increasing since 1994 by about 5 percent. The author points out that although this is poor in comparison with countries such as Malaysia and Indonesia, it is at least an improvement on the previous period. In 2001, the value of merchandise exports increased by 20.3 percent. The higher rand value of merchandise exports in the first half of 2002 was related to the sharp depreciation of the external value of the rand in the last quarter of 2001. Reports by South African Reserve Bank (SARB) (2008, 2009) indicates that South Africa's exports increased by 8.1 percent in 2008 from 2007. Imports also increased by 7.1 percent in 2008 from US$ 81.9 billion in 2007 to US$ 87.7 billion in 2008. Total exports and imports of goods and services in 2007 amounted to 31 percent and 35 percent of GDP, respectively.

South Africa's real economic growth rate averaged 3.1 percent during the period 1995 – 2004 (Du Plessis and Smit, 2007). This represented a substantial improvement. Although this was a welcome improvement, South Africa's growth performance remained relatively low by world standards. According to SA Yearbook (2002/03), during 1997 and the first half of 1998, the growth in total real GDP slowed down and subsequently turned negative in the third quarter of 1998. It recovered again slightly in the fourth quarter of 1998 and throughout 1999 and 2000. However, it is difficult to understand this performance with a change in the long-run growth potential of the economy. In order to understand the nature of this improvement in South Africa's growth performance, the behaviour of trade openness may be considered to determine whether it has an impact on the overall GDP growth.

1.3 Problem statement

The South African export sector has been characterised by low and fluctuating export growth and exports earnings for the past years. Despite substantial economic restructuring, South Africa's post-1994 export performance is less than what might have been expected or hoped for. Flatters and Stern (2007) indicate that a decade since 1994, South Africa's average export growth fell marginally from 6.2 to 5.6 percent. On the import side, Lewis (2001) states that during 1993 and 1997 Import penetration accounted between -43 and -52 percent of the rise in GDP. He further indicates that relatively low import penetration since 1993 suggests that trade openness has remained relatively resilient in the face of domestic production. For this reason, this study intends to understand how South African GDP growth has responded to trade openness.

Ukpolo (1998) undertook a study in South Africa on GDP growth as a function of exports. The evidence of the study indicates that exports failed to stimulate GDP growth. A similar study by Loots (2002) was undertaken in South Africa; the study period was from 1990 to 2001. The findings of the study show that trade openness has a positive but relatively small impact on GDP growth. Consequently, there have been glaring contradictions in the current studies on trade openness and GDP growth, prompting the need for further research in order to identify plausible effects of trade openness on GDP growth.

1.4 The purpose of the study

The purpose of the study is to examine the causal relationship between trade openness and GDP growth for S.A. More specifically, this study examines and determines the relationship between GDP growth and various trade openness measures such as imports/GDP ratio, export/GDP ratio, the average share of total trade (imports plus exports) and absolute values of merchandise and service export and also merchandise and service import.

1.5 Main and specific objectives

The main objective of this study is to investigate the causal relationship between trade openness and GDP growth in the Republic of South Africa for the period 1994Q1 to 2008Q4 so as to relevant policies. Specific objectives are:

1.5.1 To evaluate the sensitivity of GDP growth to changes in trade openness.

1.5.2 To determine the degree of the relationship between GDP growth and trade openness.

1.5.3 To establish a dynamic error correction model in order to determine a long run relationship as well as a short run equilibrium model between trade openness and GDP growth.

1.5.4 To recommend policies as informed by the results of the study.

1.6 Research questions

This study intends to find solutions to the following questions:

1.6.1 Is there a positive relationship between exports and GDP growth in South Africa?

1.6.2 Is there a positive relationship between imports and GDP growth?

1.6.3 Does causality exist between exports and GDP growth?

1.6.4 Does causality exist between imports and GDP growth?

1.6.5 Do exports and imports have any significant effect on GDP growth?

1.7 Significance of the study

Investigating the causal relationship between trade opennes and GDP growth since the post democracy period is important because; firstly, the findings of the study will assist the South African government in establishing appropriate trade policies in order to encourage institutions to promote their exports. The importance of the study hinges on

its ability to help the Department of Trade and Industry (DTI) in their policy making with regard to export promotions and import tariffs. The findings from this study could also be useful to Board on Tariffs and Trade (BTT), as trade is regarded as one of the elements of growth. Policy makers can also learn about the different trade policies which can help to reduce trade deficit without interference in the global market. The study also explores the costs and benefits of trade de-regulation since the ushering of democracy in the country in 1994.

1.8 Research methodology

The methodological and analytical basis for this study is drawn from the empirical literature focusing on trade openness and GDP growth. To determine the relationship between trade openness and GDP growth data is based on quarterly form from 1994Q1-2008Q4. The study uses secondary data collected from the South African Reserve Bank (SARB), an official statistical and economic data provider. Following Jin (2003), various sets of measures of trade openness are employed in this study: the first set consists of imports/GDP ratio, and the export/GDP ratio. The second set follows Awokuse (2008) and consists of the absolute values of merchandise and service export and also merchandise and service import.

The study employs the Granger causality test which was developed by Granger (1969) where he defines the "arrow of time" to help us identify the difference between cause and effect. According to this approach, a variable Y is caused by X if Y is better predicted from past values of Y and X together rather than from past values of Y alone. Prior to estimation of the model adopted, an Augmented Dickey-Fuller (ADF) test will be employed to check for first order unit roots. A cointergration test is also applied to determine whether the variables are cointergrated or not and an error correction model for short run analysis. The study uses computer programme Eviews version 3.1 for statistical data analysis.

1.9 Delimitations of the study

It should be noted that trade openness is a broad concept. Therefore, this study confines itself to using the following measures of trade openness: total export, total imports, ratio of exports, ratio of imports and the dependent variable which is GDP growth. The study uses quarterly data series and this precludes it from being generalised to annual data series.

1.10 Definitions of concepts

Deficit in the balance of payment

The excess of debts over credits in the current and capital accounts, or autonomous transactions; equal to the net credit balance in the official reserve account, or accommodating transactions.

Current account

The account that includes all sales and purchased of currently produced goods and services, income on foreign investments, and unilateral transfers.

Trade policy

The regulations governing a nation's commerce or international trade.

Gross Domestic Product

The gross domestic product is defined as the value of all final goods and services produced within the geographic boundaries of a country in a particular period.

Closed economy

An economy in autarky or not engaged in international transactions.

1.11 Deployment of the study

Chapter 1 states the background of the study and problem statement. It also explains the objectives and the main objective of the study, the research questions, and the significance of the study. The research methodology and the deployment of the study are also explained in this chapter. It also includes all operational definitions of all the key concepts that are relevant to the study.

Chapter 2 discusses the South African economy and the geographical position and climate of South Africa followed by an analysis of the population of South Africa. It also explains the democratic South Africa in 1994. In the last section, the study explores the growth in gross domestic product (GDP) since 1994, the structure of the South African foreign trade sector and South Africa's major trading partners. Finally, a summary and some concluding remarks are offered concerning South African's macroeconomic performance during the period of study (1994Q1-2008Q4).

Chapter 3 examines the literature review. It includes the critical evaluation of all previous research works involving trade openness in current literature. The chapter defines the concepts used, and also critically reviews the theories and hypotheses that have been considered previously. The chapter also critically evaluates developing and developed perspectives of the research topic.

Chapter 4 looks at the research methodology and the in-depth analysis of the method that the study uses.

Chapter 5 provides the analysis of data and interpretation.

Chapter 6 presents the summary, the conclusions of the study and makes the recommendations for further study.

1.12 Summary

Chapter 1 of this dissertation concentrates on the background of the study, the development of problem statement and the main and specific objectives of the study. The chapter also pays attention to the significance, the methodology and the deployment of the study as well as the research questions which guide the study throughout its evolution. The following chapter is devoted to analysing the South African economy as a whole, with a specific focus on trade sectors of the economy; the import and export sector and the major trading partners of the South African economy.

CHAPTER 2: AN OVERVIEW OF THE SOUTH AFRICAN ECONOMY

2.1 Introduction

Before commencing with the empirical work of the study, it is important to take a closer look at the main characteristics of the South African economy. South Africa is ranked as an "upper middle income economy" by the World Bank, which makes the country one of only four countries in Africa represented in this category (World Bank, 2009). Real GDP has grown annually by about 2.6 percent between 1995 and 2000 (Cassim, Onyango and Van Seventer, 2002). The South African economy is therefore a dynamic and industrialised economy that shows various characteristics linked with developing countries, including a division of labour between formal and informal sectors, and uneven distribution of wealth and income. The formal sector, based on mining, manufacturing, services, and agriculture, is well developed. The South African economy is divided into two structural periods, that is the prior and post democracy. Prior to 1994, government introduced and institutionalised various policies commonly referred to apartheid. Demands were made through punitive measures including political and economic sanctions against South Africa. This limited foreign demand for South African goods. Apartheid also hampered the development from the supply-side since it systematically and purposefully restricted the majority of South Africans from meaningfully participating in the economy. However, since the ushering in of democracy, participation has been increased.

This chapter is divided into the following sections. Section 2.2 discusses the democratic South Africa in 1994. In section 2.3 the study explores GDP growth during 1994 and 2008. Section 2.4 explains the structure of the South African foreign trade sector on export sector and imports sector. Sections 2.5 to 2.8 explore the economic sectors on trade openness. Section 2.9 discusses the South Africa's major trading partners. Finally, section 2.10 gives a summary and some concluding remarks are offered concerning South Africa's macroeconomic performance during the period of study.

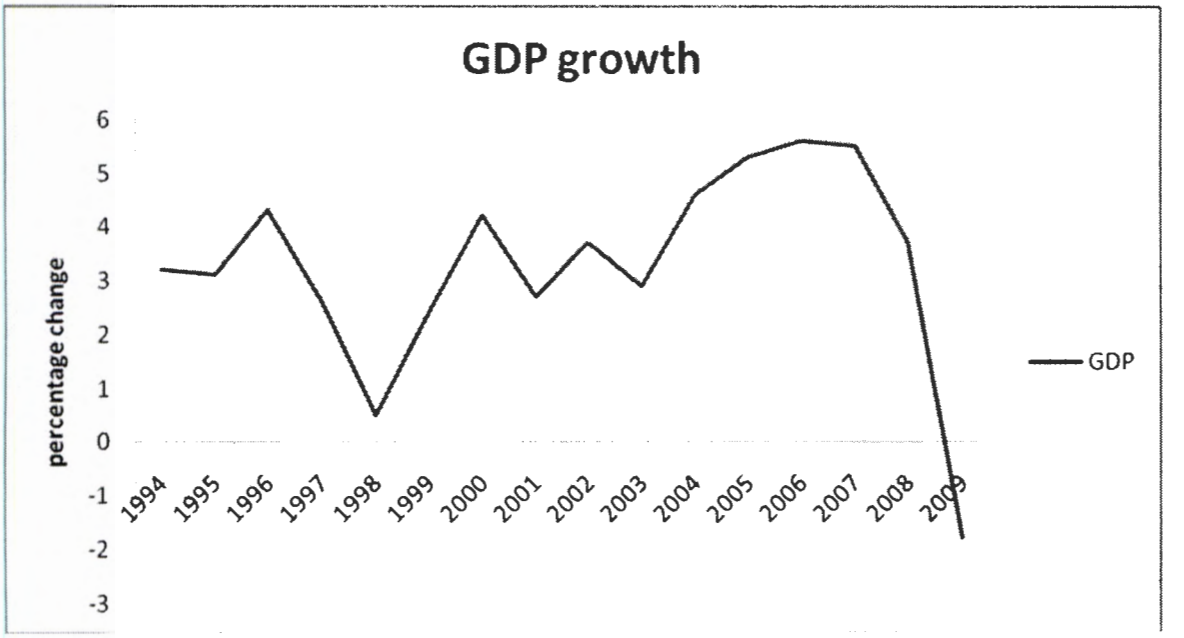
2.2 Democratic South Africa (1994)

Following the apartheid regime that ruled South Africa from 1948 to 1993, independence was established in 1994. Bozzoli (2004) indicates that following the 1994 elections, South Africa was governed under an interim constitution establishing a Government of National Unity (GNU). A long series of negotiations ensued, resulting in a new constitution promulgated into law in December 1993. The country's first nonracial elections were held on April 26-28, 1994, resulting in the installation of Nelson Mandela as President on May 10, 1994. During Nelson Mandela's 5-year term as President of South Africa, the government committed itself to reforming the country. The government focused on social issues that were neglected during the apartheid era such as unemployment, housing shortages, and crime. Mandela's administration began to reintroduce South Africa into the global economy by implementing market-driven economic plans.

2.3 Gross Domestic Product (GDP) during 1994-2008

South Africa has experienced strong economic growth since the dismantling of Apartheid in the early 1990s. A thoughtful reformation of the economy has borne fruit in the form of macro-economic stability. Du Plessis and Smit (2007) state that South African's democratic transition in 1994 shaped expectations of a turnaround in economic performance. The economic performance of post apartheid South Africa has been improving gradually, from an average real GDP growth rate of about 3 percent between 1993 and 1995. The statistical data used in this part are expressed in 2005 constant prices and have been collected from the South African Reserve Bank (SARB).

Figure 2.3.1 Trends on Gross Domestic Product during 1994-2008



Source: own compilation using data from SARB

Figure 2.3.1 shows the trends on GDP growth, it indicates that between 1994 and 1997 South African GDP growth grows with an average of 2.6 percent. It also indicates that in GDP growth in 1998 was growing at 0.5 percent. In 2006 the trends shows that GDP growth was higher at 5.6 percent. The South African economy grew by 1.9 percent in 2003, as compared to 3.6 percent growth in 2002, and also to 4.5 percent in 2004 and 4.9 percent in 2005. Real GDP of South Africa registered a growth of 3.1 percent in 2008 compared to 5.1 percent in the year 2007, due to sharp deterioration in consumer and business confidence.

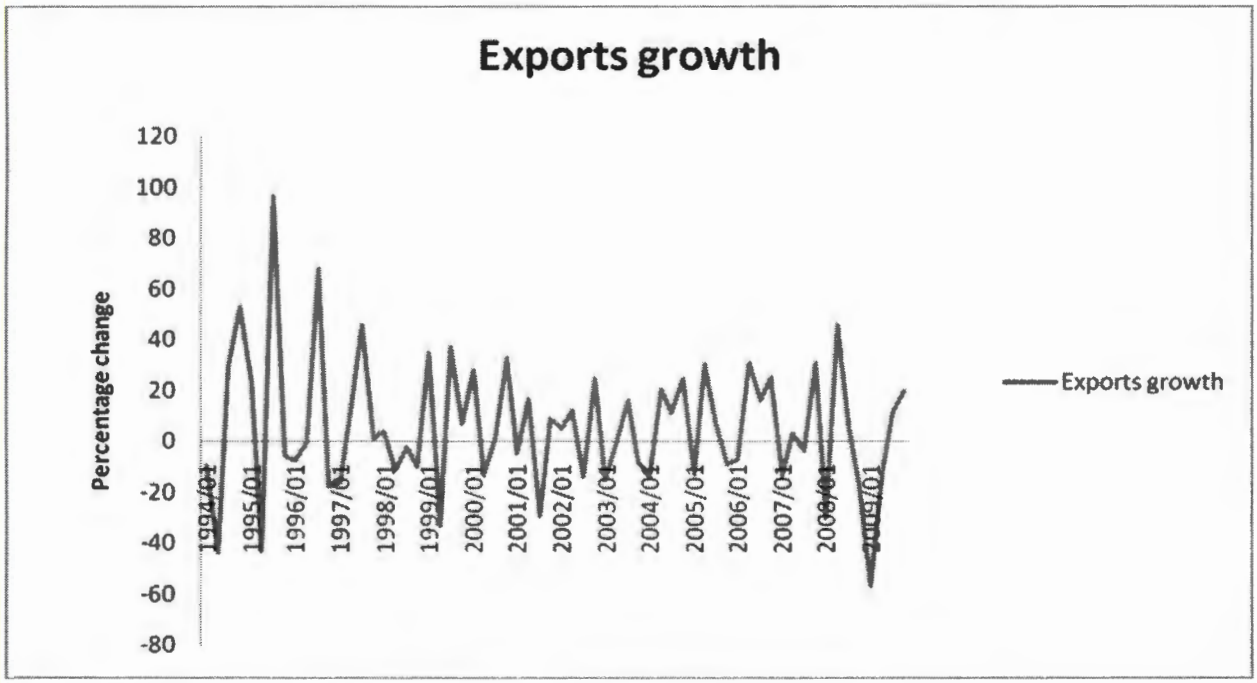
2.4 Structure of the South African foreign trade sector

This section sheds light on the structure of the South African foreign trade sector. It analyses the structure of South Africa's foreign trade sector on export and imports and assesses some major exports compositions.

2.4.1 Export sector

Moritz (1994) points out that the rationale for export promotion in South Africa is that it would help to overcome some of the short-term growth constraints in the formal sector of the economy. The country experienced considerable growth in foreign trade. In the five year period of 1997 to 2002, merchandise exports increased by 131,3 percentage from R122,8 billion in 1997 to R284,1 billion in 2002. The South African economy escaped the world unstable economic conditions in 2002/03. This was evidenced by the improvement in the Balance of Payments on the current account, which reverted from a deficit of R2,9 billion in 2001 to a surplus of R3,3 billion in 2002. Figure 2.4.1.1 shows trends of export growth in quarterly over the period 1994/Q1 to 2008/Q4. During 1995/Q2 percentage change on export growth was at 90 percent. The visual on the graph below shows that export was volatile throughout the period.

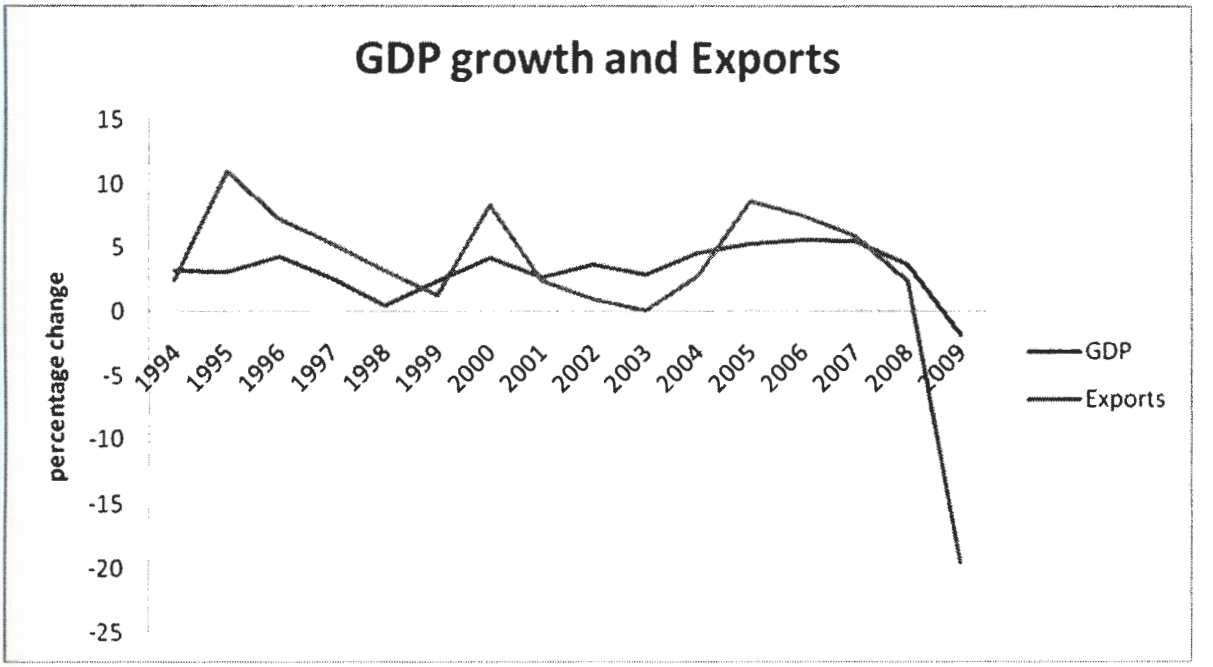
Figure 2.4.1.1 Quarterly trends on export growth during 1994-2008



Source: own compilation using data from SARB

Rangasamy and Visser (2009) indicate that the growth in world exports has outpaced the growth in South African exports over time. In 2008, the volume of world trade was five times as high as in 1980, but for South African export volumes only two-and-a-half times. However, the SARB (2008, 2009) indicates that during the boom in the economy, South Africa's exports increased by 8.1 percent to US$ 82.4 billion in 2008 from US$ 76.2 billion in 2007, benefiting from the continued strength of metal demand. In 2006, South African exports were dominated by platinum with 12.7 percent of the total exports and gold with 7.4 percent.

Figure 2.4.1.2 Trends on GDP growth and exports during 1994-2008



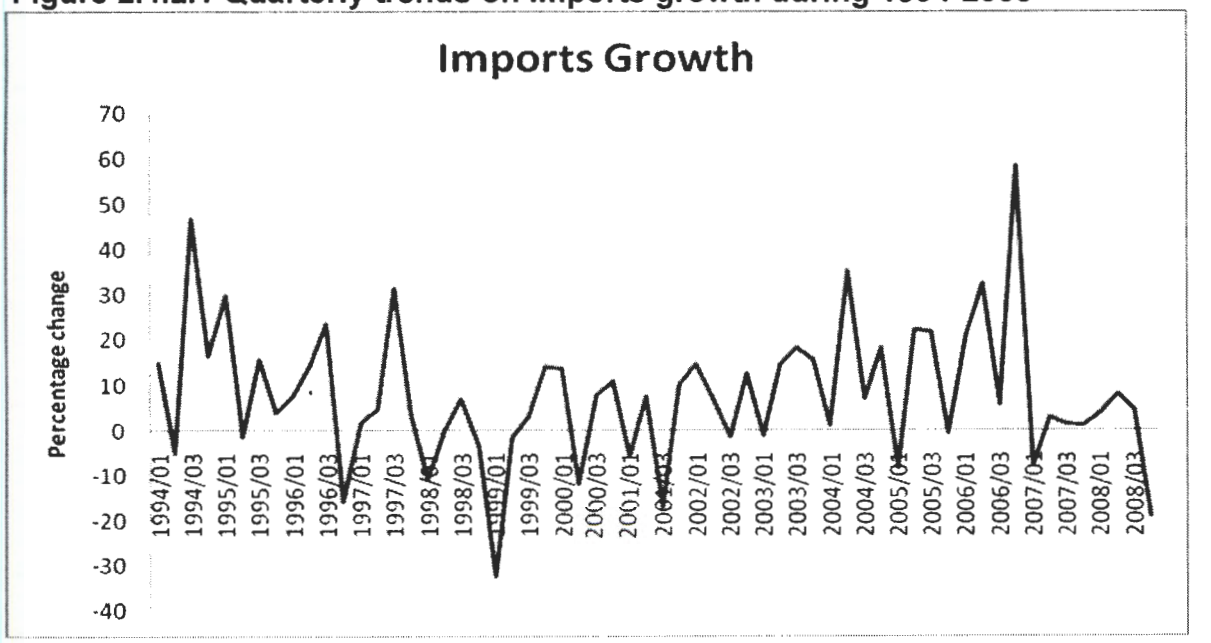
Source: Own compilation using data from SARB

Figure 2.4.1.2 shows the combination of GDP growth and export growth between 1994 and 2008. The figure indicates that from 1994 to 1999 export growth was above GDP growth. Between 2001 and 2004 GDP growth was higher than export growth.

2.4.2 Imports sector

While South Africa produces many products of world-class quality for export, it is also a major importer of diverse products from most countries. Brussels (2006) notes that reducing trade barriers bring great variety of products, inputs and quality, but also lower prices. This welfare effect for consumers is often the strongest element in the impact of liberalisation, particularly for highly protected industries, like agriculture and clothing. In the end, it is almost always the consumers who pay the price of protectionism through lower quality goods and higher prices. According to SA Yearbook (2002/03), in 2001 merchandise import volumes declined by 1,5 percent but the fall was particularly large in the categories for transport and electrical equipment and machinery. From 2003 to 2004 all the main categories of imports registered increases of more than 10 percent. South Africa's import penetration ratio rose from 21,7 percent in the first quarter of 2004 to 23,9 percent in the fourth quarter. The strong rise in the import penetration ratio partly reflected the substitution of imported goods for domestically produced goods in response to the decline in the relative prices of imported goods.

Figure 2.4.2.1 Quarterly trends on imports growth during 1994-2008



Source: own compilation using data from SARB

See *figure* 2.4.2.1 above on trends on imports on goods and service. It indicates that imports growth in 1994/Q3 was at 46.9 percent. In 1996/Q3 imports growth was 23.6 percent whereas in 1997/Q3 it picked up at 31 percentage change. Between the year's 1999/Q1 and 2003/Q it shows that import growth performed worse at -32 and -1.3 percentage. In the last quarterly in 2008 import growth indicates that it was at -19 percentage change.

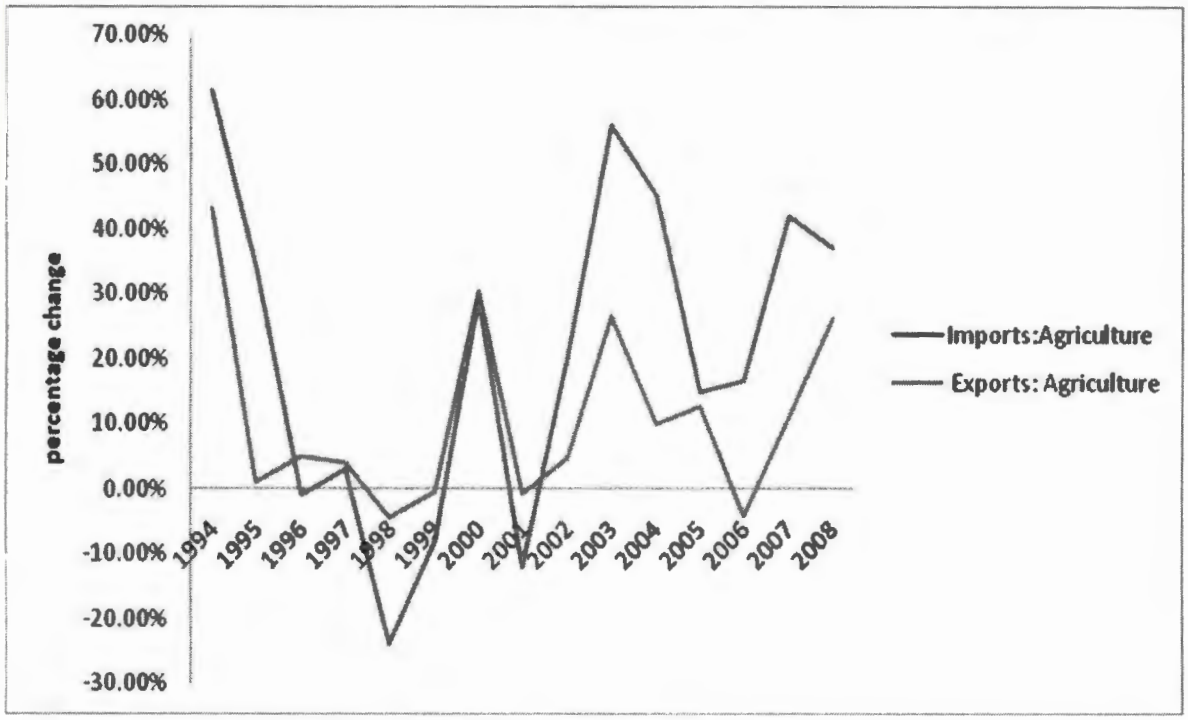
South Africa's principal imports during 2006 comprised of petrochemicals (13.7 percent of total imports), equipment component of cars (7.1 percent), cars and other components (5.8 percent), petroleum oils and other products (4.3 percent), and telecom components (2 percent). Imports also increased by 7.1 percent in 2008, up from US$ 81.9 billion in 2007 to US$ 87.7 billion in 2008.

2.5 Agricultural sector

The Republic of South Africa has developed a recognised and diversified agricultural sector that has revealed its flexibility and potential to contend in the international market. Since the post 1994 period the preferential trades agreements such as the Africa Growth and Opportunity Act (AGOA) for the US market and a FTA's with the European Union have stimulate benefits for South Africa.

In order to clearly understand the trade openness performance of agricultural sector in South Africa, a starting point would be to examine figure 2.5.1 below. The figure presents exports and imports of agricultural products. It indicates in 1994 agricultural exports growth was at 43.25 percent, whereas between 1995 and 1999 the average growth of exports was 0.98 percent. Then in 2000, exports increase to 30.33 percent which then decreased to 26.36 and 26.27 percent in 2003 and 2008 respectively. The figure below also shows that agricultural imports in 1995 were at 33.56 percent. Between 1996 and 2001 it indicates that the average imports growth was negative at 7.69 percent.

Figure 2.5.1 Imports and exports of Agricultural products during 1994-2008



Source: Own compilation using data from WTO

In providing the statistical information to policy makers in the agricultural sector it helps improving the policies implemented since 1994. During this year, the strategic direction of the agricultural sector was shaped by three main policy documents: the White Paper on Agricultural Policy, the Agricultural Policy in South Africa discussion document and the Strategic Plan for South African Agriculture.

These policies were drafted to recognise the need to develop commercial production, profitability and international competitiveness while ensuring equitable access to the sector. The South African economy has in actual fact a dual agricultural market, comprising of well-developed commercial sector and a mostly subsistence-oriented sector in the rural areas. Pocket Guide SA (2009/10) indicates that primary agriculture contributes about 3 percent to the GDP of South Africa and about 8 percent to formal employment. The total contribution of agriculture to the economy increased from R38 billion in 2002 to R68 billion in 2008. The total South African agricultural exports since 1998 to 2002 have experienced an average growth of 8.3 percent.

Exports of processed agricultural products have increased faster than exports of unprocessed agricultural products: their share has increased from 40 percent to 60 percent with the sharpest increase occurring from 1990 to 2005. Agricultural imports have grown faster than agricultural exports, and agriculture's share of total imports has remained relatively stable. However, the greater import propensity of the rest of the economy has meant that agriculture's share of total imports declined from 6.6 percent to 5.2 percent after 1999. The total contribution of agriculture into the economy increased from R27 billion in 2001 to R36 billion in 2007 (Pocket Guide SA, 2008/09). In 2007, trade in both raw and processed agricultural products accounted for approximately 6 percent of total EU trade in goods with non-EU countries.

2.6 Fuels and Mining products

The underpinning of the South African economy is mining as it is upon the mining industry that the economy of South Africa was and is built. The South African mining industry, which is by far the most important part of African mining, has been diversifying out into Africa following a long period during which most of its investments were confined mainly to South Africa. South Africa is the world leader in mining and minerals, with a massive share of global reserves and production. South Africa is the world's third-largest diamond miner by value, with its annual production of around 15-million carats; making it the fifth largest producer of carets. The mining sector was growing fast in the first five years after the first democratic elections but in the mid 2000s growth slowed down and investment into the mining sector fell. South Africa holds the world's largest reserve of manganese ores (80 percent of total world reserves), chromium (68 percent), PGMs (56 percent), vanadium (45 percent) and gold (35 percent) DME (2008).

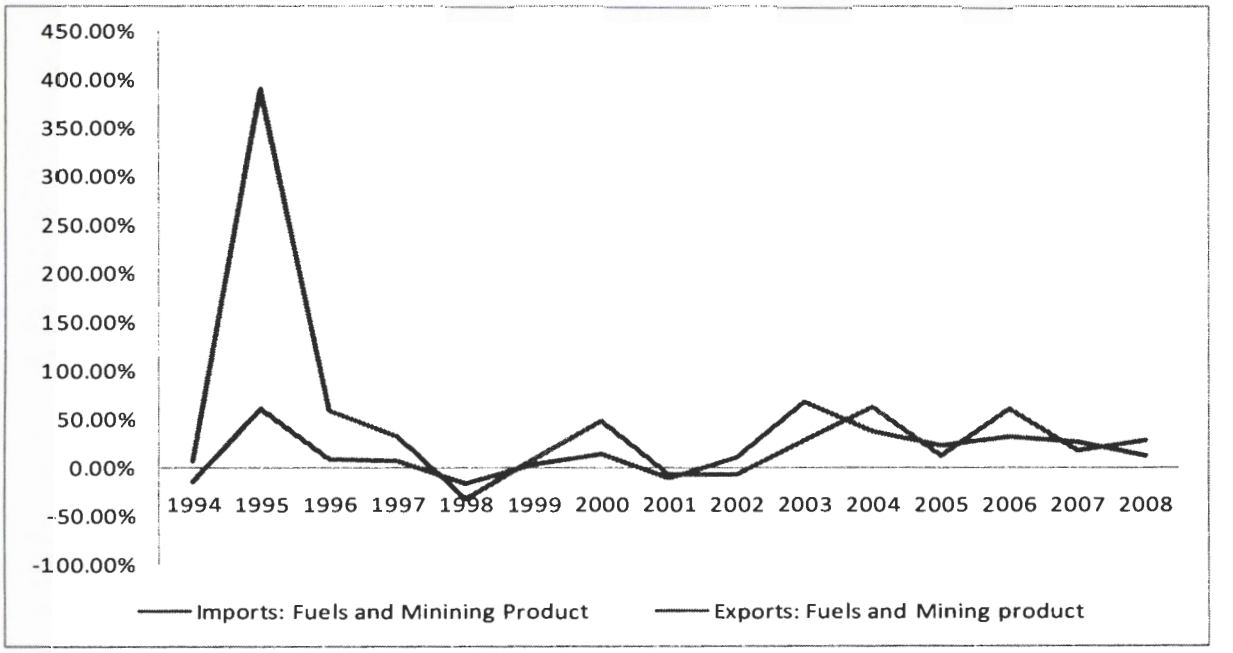
In 2001, mining contributed R66,8 billion to gross domestic product compared with R59,1 billion in 2000, a 13 percent increase (Pocket Guide SA, 2001/02) . Mining remains an important contributor to the country's economic growth, with an average of 50 percent of the country's export earnings being derived from this sector. Mining

exports are important in South Africa with minerals and metals South Africa's most important primary export goods. The contribution of primary mineral export sales to South Africa's total export revenue during the period from 1992 to 2008 decreased from 53 to 32 percent (Pocket Guide SA, 2009/10).

In South Africa, a number of companies in the mining sector have geared their entire operations to exports. South Africa's primary industrial mineral exports have gradually increased over the past five years from R 1,1 billion in 1997 to R 1,5 billion in 2001 with a slight 3 percent dip in 2000 (Mokaila, 2003). Export increases should further assist the economy in the attainment of healthy growth levels. While gold still accounted for 22 percent for total South African exports in 1996, gold exports, as a percentage of the total South African exports, have been declining in relative contribution (TIPS, 1999).

Figure 2.6.1 presents imports and exports of fuels and mining products during 1994 and 2008. It indicates that in 1995 South African fuels and mining imports growth was at 390.15 percent. This was the highest percentage experienced within the period of the study. In 1996, mining imports moderate to 59.25 percent. During the period 1997 and 2003 mining imports averagely grow by 10.07 percentages, whereas in 2006, they peak at 60.85 percent.

Figure 2.6.1 Imports and exports of Fuels and Mining products during 1994-2008



Source: Own compilation using data from WTO

2.7 Manufacturing sector

In the early 1990s, South Africa had a sizeable manufacturing sector, due to an import substitution policy and a strategic industrial policy of the past. The Manufacturing sector is a robust supporter of the South African economy in stimulating GDP growth with a potential to compete with the best in the international markets. A steadily declining share in South Africa's GDP since the early 1990s has resulted in the manufacturing sector being overtaken by the financial and business services sector as the largest sector in the economy in 2003 (IDC, 2009). The South African manufacturing sector is dominated by industries such as agric-processing, chemicals and textiles, clothing and footwear. South Africa's full participation in the global market since 1994 presented a number of trade opportunities, with the manufacturing sector playing an important role in terms of exports (IDC, 2009).

Figure 2.7.1 presents the imports and exports of manufacturing sector between 1994 and 2008. It indicates that in 1995 exports manufacturing was 24.50 percent and peak to 50.37 percent in 1997. Between 1998 and 2001 exports manufacturing growth it's on an average of negative 0.78 percent. In 2002, export manufacturing gained pace to 11.17 percent to 22.40 percent in 2003 and 2004 respectively.

In terms of imports manufacturing in 1994 it was 21.64 percent and decreased to 17.95 percent in 1995. During 1996 and 2001 import manufacturing experience an average growth of negative 2.52 percent. In 2002, imports manufacturing gained momentum to 12.59 percent and 34.93 percent in 2004. In 2005 imports fell to 16.65 percent and further decreased to 4.89 percent.

Figure 2.7.1 Imports and exports of manufacturing sector during 1994-2008

Source: Own compilation using data from WTO

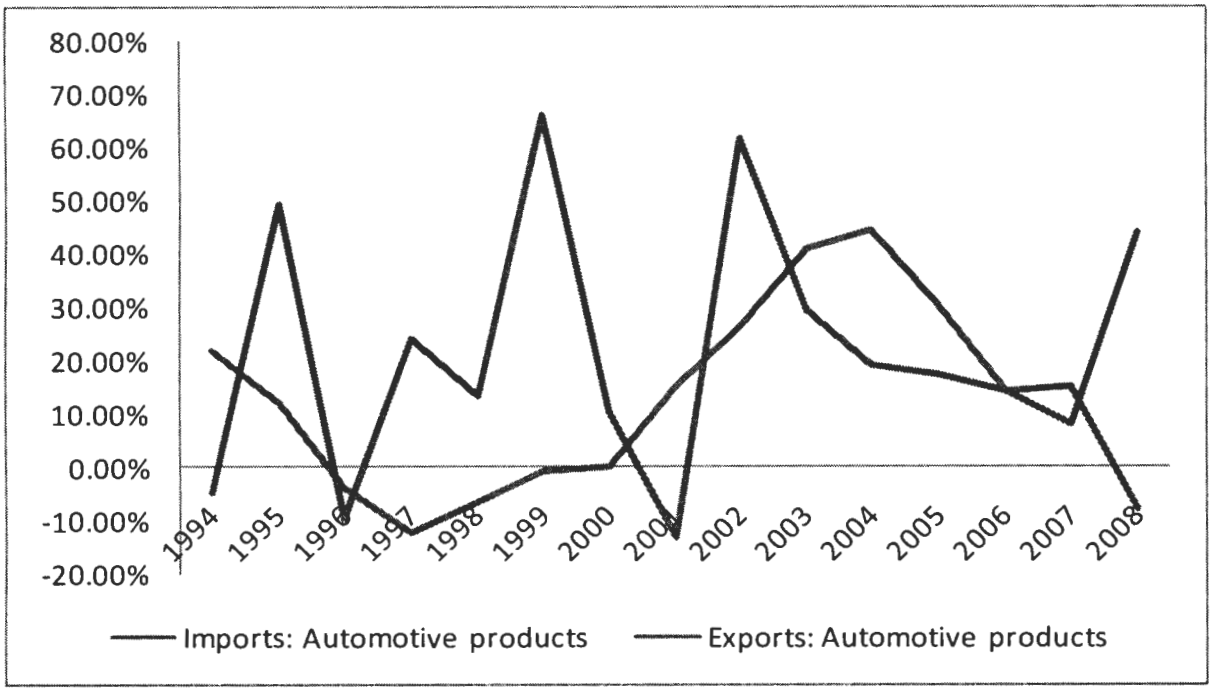
The export manufacturing basket is highly concentrated on sectoral perspective. There are the basic iron and steel sub-sector, the motor vehicles, parts and accessories, and the machinery and equipment sub-sector. In combination these three export sub-sectors represent just over 40 percent of all manufactured exports. The beginning of the 1990s, during the financial crisis, the manufacturing sector even negatively affected total growth. After 1994, manufacturing up pace again, although its share in total GDP diminishing (van Dijk, 2002). From 1994 to 1997, GDP increased again by 3.24 percent of which manufacturing contributed more than 20 percent. Manufacturing growth decreased from 3.45 percent to 1.40 percent over 1997-2001, which caused a downfall in contribution to total GDP growth of about 10 percent. Manufacturing remains a significant sector in the South African economy, accounting for approximately 18 percent of GDP, and as much as 50 percent of exports (DTI, 2009).

2.8 Automotive sector

When the South African automotive industry emerged, it was highly inward looking and not internationally competitive. In the post 1994 period government established an autonomous automotive industry, which was necessary because of increasing isolation as a result of South Africa's apartheid policy. It is for this reason that this study has chosen the automotive industry for analysis, as it is one of the fastest growing and most dynamic sectors in the South African economy with considerable potential for growth. The industry is regulated by the Motor Industry Development Programme (MIDP). The automotive industry comprises vehicle and component manufacturers. The automotive sector is one of the most vibrant. It contributes 5,7 percent of GDP and is the third largest sector in the South African economy, accounting for 28,5 percent of the country's manufacturing output. Meyn (2004) indicates that in 2002, the automotive manufacturing industry contributed 6.3 percent to the country's GDP and is currently the third largest economic sector.

The figure 2.8.1 below shows imports and exports of automotive sector during the year 1994 to 2008. The visual inspection on the figure it shows that growth of export automotive product is irregular over the years. Contrary, in terms of imports: automotive products it shows growing line which first was below zero growth between 1996 and 1999. The growth in imports: automotive products emerged since 2000 and reach peak in late 2004 at 40 percent growth. Then in 2004 the growth of imports automotive started to diminishes.

Figure 2.8.1 Imports and exports of Automotive sector during 1994-2008



Source: Own compilation using data from WTO

The automotive industry has developed promisingly since the introduction of the MIDP and performed better than the average manufacturing in South Africa. Judging by the performance of the automotive manufacturing industry since 1995, it can be stated that the industry was very successful in exporting and creating new value addition. Since 1995, vehicle exports have increased at an average annual rate of 37 percent, exceeding 100 000 units in 2001, from only 18 000 in 1997. In 2004, for the first time the auto industry's export earnings equaled those of gold, strengthening the position of the automotive industry as the backbone of the South African Economy, (Tralac news,

2003). Vehicle imports have grown from 18 000 units in 1995 to approximately 57 500 units in 2000, and are expected to account for 25 percent of vehicle sales by 2007. It would be fair to conclude that the goal of improving the international competitiveness of the South African vehicle and component industry, to attract investment and to encourage exports has been reached with the MIDP.

2.9 South Africa's major trading partners

Democracy in South Africa has attempted to enlarge the sphere of South Africa's trading partners; its vital trading partners still remain the advanced industrialised economies. South Africa's most important trading partner is European Union, which is the largest source of investment for South Africa and accounts for almost half of South Africa's total foreign trade. Both bilateral development co-operation and multilateral development programmes through the European Union (EU) form a substantial element of South Africa's reconstruction and development. Relations with the EU are economically crucial for South Africa with regard to exports. The United Kingdom (UK), with its historic links with South Africa, is South Africa's third-largest trading partner and the largest foreign investor in South Africa. Ligthelm (2002) indicates that in 2002, the distribution of South Africa's export by world region, Europe attracted just more than a third of South Africa's exports of 34,6 percent followed by Asia with 19,8 percent. Africa occupies third position with a share of 15,3 percent, South Africa experiences negative trade balances with all the key regions of the world except with Africa. The positive trade balance with Africa amounted to R34,1 billion in 2002. In 2006, South Africa's exports were mainly destined to the EU, followed by Japan and the US amounting to 54 percent share of exports. In 2007, U.S.A was the most important export destination accounting for 12.1 percent of total exports, followed by Japan by 10.0 percent of total exports, China 8.5 percent and UK 8.3 percent (Ligthelm, 2002).

Alternatively, South Africa's imports are much more technology-based. In 2006, the EU accounted 35.1 percent, followed by china and U.S.A at 10.1 and 7.6 percent respectively. During 2007, Germany accounted for the bulk of South Africa's imports, accounting for 13.4 percent of the total imports. China (10.4 percent of total imports), the US (7.6 percent) and Japan (6.4 percent) were the other major origins of the country's imports.

2.10 Summary

This chapter has presented an overview of the South African economy in terms of GDP growth and trade openness during 1994 to 2008. The South African economy has undergone two structural changes that is apartheid and democracy, but since the new democratic order of 1994, it has shown that the economy is steadily becoming stronger compared with the previous era. It is evident that this was due to the development of good outward-oriented policies designed to sustain the economy. The chapter has also attempted to explain structure of South African's foreign sector over the period under investigation.

CHAPTER 3: LITERATURE REVIEW

3.1 Introduction

This chapter presents the literature review on the relationship between trade openness and GDP growth. The chapter is divided into two sections. In the first section, the study reviews the theoretical foundation of trade theories. The second section reviews the contributions of existing researchers contributed in the study of trade openness and GDP growth in order to recommend informed trade openness policies.

3.2 Theoretical foundation

This section briefly outlines the main theories of trade. This is done by analysing the contribution of classical economists in the development of theory of trade.

International economics is concerned with the flow of commodities, services and production factors (i.e. capital and labour) across national boundaries. Trade in commodities refers to the import and exports of merchandises. Service transactions involve such activities as insurance and tourist service performed by institutions of one country for the residents of another (Salvatore, 1995). There are a number of reasons why countries are engaged in trade. Since nations are not equally suited to produce all goods, all will benefit if each specialised in what it could do best and then obtained its other needs through exchange.

Growth theory is an ancient branch of economics. As early as the eighteenth and nineteenth centuries, some economists made salient contributions to the theory of growth. Their contributions to the growth theory are still used today as a solid foundation to modern theories of growth. According to Fontagné and Guérin (1998) new theories of growth have widely dealt with the relationship between openness and GDP growth. They also pointed that openness is certainly a prerequisite, not the engine of growth. It simply fuels the engines of investment, reform and credibility.

3.3 Historic development of theories of trade

International trade is the oldest branch of economic study, dating back to David Hume 1752, and David Ricardo 1817. Interest in this field has expanded in recent years as a result of the vast growth of international transactions. The historic development of theories of trade emerged with mercantilists' views on trade during 1500-1750, absolute advantage (Adam Smith), comparative advantage (David Ricardo) and comparative advantage endowments (Heckscher-Ohlin).

3.3.1 The mercantilists' views on trade.

Specifically, during the seventeenth and eighteenth centuries, essay on international trade were written under a branch of philosophy known as mercantilism. Mercantilists maintained that one way for a nation to become rich and powerful, it has to export more than it imported. The resulting export surplus would then be settled by an inflow of the precious metals: primary gold and silver. They believed that the more gold and silver the nation had, the richer and powerful it was. The government of that era had to do all in its power to stimulate the nation's export and discourage and restrict imports. However, since all nations could not simultaneously have an export surplus and the amount of gold and silver was fixed at a particular point in time, one nation could gain at the expense of the other nations (Salvatore, 1995).

Mercantilism is different from the present economic system where the wealth of a nation is measured in stock of precious metals it possesses. Today wealth is measured in terms of stock of human, man-made, and natural resources available for producing goods and services. The more the stock, the greater the flow of goods and services to satisfy the human wants.

3.3.2 Absolute advantage

According to Adam Smith, trade between nations is based on absolute advantage. Smith demonstrated that when one nation is more efficient than another in the production of one commodity, but is less efficient than the other nation in producing a second commodity, then both nations can gain by each specialising in the production of the commodity of its absolute advantage and exchanging part of its output with the other nation for the commodity of its absolute disadvantage (Salvatore, 1995).

3.3.3 Comparative advantage

Following the theory of absolute advantage as propounded by Adam Smith 1937 is the theory of comparative advantage. The classical economists showed that beneficial trade was possible even without absolute advantage and developed the theory of comparative advantage. The theory of comparative advantage is the most important theory to emerge from the classical period (Salvatore, 1995). David Ricardo explains this in his 1817 book On the Principles of Political Economy and Taxation. This theory shows how it is possible for all countries to benefit from trade without having an absolute advantage in any product. One of the most important points made by Ricardo 1817 is that it will be beneficial for each country to specialise in the production of the goods in which it has the highest absolute advantage. In so doing, each country will eventually enjoy the benefits of comparative advantage and this will facilitate trade between them. Each country will then be able to export the good to where its comparative advantage is highest (Deardorff, 1980).

3.3.4 Advantage endowments

According to Dean (2002) the Heckscher-Ohlin model was produced as an alternative to the Ricardian model of basic comparative advantage. In 1933, Bertil Ohlin published an article from the basis of the work of Eli Heckscher in 1919. Ohlin named the model Heckscher-Ohlin theory since the work incorporates his work and Heckscher's. The

Heckscher-Ohlin theory explains why countries trade commodities and services with each other. One condition for trade between two countries is that the countries differ with respect to the availability of the factors of production. According to the Heckscher-Ohlin theory, a country specialises in the production of commodities that it is particularly suited to produce. Countries with more capital specialise in production of goods that are capital intensive. Specialisation in production and trade between countries operate according to this theory (Flam and Flanders, 1991).

3.4 Summary

This section introduced the theories of trade. A succinct historical background of the trade theory was presented. From a theoretical point of view, free trade is likely to allocate resources to those areas where countries have comparative advantage, which will promote specialisation and growth. Growth theory postulates that even though there are many factors that influence growth, trade openness is one of an important determinant of GDP growth. This makes the investigation of the relationship between openness and growth very important. The following section reviews the empirical studies that explore this relationship further.

3.5 Empirical studies on growth and openness

3.5.1 Introduction

This section reviews the existing literature on GDP growth and openness by analysing the important empirical studies and thereby presenting the fundamental elements of the relationship between trade openness and economic growth. This section is divided into two parts. The first reviews studies in developed countries (DCs) which are categorized into cross sectional studies and time series studies. The second part reviews studies in less developed countries (LDCs) which are divided into cross sectional studies and time series studies.

3.5.2 Developed countries (DC's)

3.5.2.1 Cross sectional studies

Trade openness exerts a positive influence on economic performance (Awokuse, 2008). Despite numerous studies finding evidence of a positive link between trade and growth, the controversy is far from settled. Economidou and Murshid (2007) investigate the impact of trade on total factor productivity (TFP) growth in the manufacturing sector across twelve Organisations for Economic Cooperation and Development (OECD) countries over the period 1978-1997. The results from cross-sectional analysis reveal that trade have a positive effect on productivity growth. However, the study also suggests that an increase in outward orientation and increased exporting has little or no influence on productivity growth. Instead, industries seem to benefit from increased imports.

Trade theory provides plausible explanations in favour of trade led growth. For instance, export promotion directly encourages the production of goods for exports. This may lead to further specialisation in order to exploit economies of scale and the nation's comparative advantages. Kónya (2006) investigates Granger causality between the real exports and GDP in twenty-four OECD countries between 1960 and 1997. The approach applied is based on Wald tests with country specific bootstrap critical values. The results indicate a one-way causality from exports to GDP in Belgium, Denmark, Iceland, Ireland, Italy, New Zealand, Spain and Sweden, one-way causality from GDP to exports in Austria, France, Greece, Japan, Norway and Portugal, two-way causality between exports and growth in Canada, Finland and the Netherlands, while in the case of Australia, Korea, Luxembourg, Switzerland, the UK and the USA there is no evidence of causality between these variables (Kónya, 2006).

László (2004) investigates the possibility of export-led growth and growth-driven export by testing for Granger causality between the logarithms of real exports and real GDP in twenty-five OECD countries. The study employs Wald tests on appropriate parameter restrictions in bivariate VAR models in levels and first differences. The results indicate

that there are only eight countries where different methods and specifications lead to unanimous conclusions that exports cause GDP growth. They are Canada, Iceland, Japan, Korea, Luxembourg, the Netherlands, Sweden and the UK. For all other countries the causality test results are mixed.

It is evident from the findings in the OECD countries that trade openness on GDP growth plays a significant role. In considering the study by Kónya (2006) who studied twenty four OECD countries, it emerges that exports is the main factor in GDP. On the contrary, the study by László (2004) in twenty five OECD countries did not show a clear impact of exports to GDP. These studies somehow use the same methodology that is Wald test and vector auto regression (VAR). A similar study in OECD countries was undertaken by Economidou and Murshid (2007). This study did not indicate the number of countries included in the analysis. The study uses relatively similar variables for analysis, that is, trade and productivity. It can be argued that productivity can be a proxy for GDP since in the long run the higher the productivity, the more GDP is encountered by a country.

The argument whether countries should promote the export sector to obtain economic growth culminated into what is known as the export-led growth (ELG) hypothesis. According to this hypothesis, countries which adopt an outward orientation tend to obtain better economic performances (Jordaan and Eita, 2007). Supporters of export promotion point out that the development of the export sector permits countries to have access to higher levels of technology and technologically rich capital. Such inflow of foreign capital and transfer of technology would not be possible without the export sector providing the means for payment since exports constitute the main source of foreign exchange. Zestos and Tao (2002) investigate causal relations between the growth of GDP, exports, and imports for Canada and the United States. The study finds that there is a positive relationship between Canadian GDP and both exports and imports. The study investigates causality by comparing the Canadian and the U.S Granger causality tests. Strong causality is supported for Canada, but not an equally strong relation is supported for the United States. This is consistent with the fact that

Canada is more trade dependent and has a more open economy than the United States.

In many economies, stringent regulations prevent certain firms from entering, others from exiting, and labour from moving across sectors or across firms. In such countries, trade may be less able to serve as a force of growth. Bolaky and Freund (2006) examine whether the effect of trade on growth is dependent on the regulatory environment. The study finds strong evidence that increased trade does not stimulate growth in economies with high regulation, and some evidence that trade may even hamper growth in those countries with excessive regulation. Bolaky and Freund (2006) suggest that increased trade is often good for growth. It is also show that this relationship breaks down in the most heavily regulated economies. Results from cross-sectional analysis imply that the effect of trade on growth in the long run is at best absent and at worst negative in heavily regulated countries.

Trade performance of individual countries tends to be a good indicator of economic performance since well performing countries tend to record higher rates of GDP growth. Empirical literature suggests that there is disagreement regarding the causal direction of the effects of trade openness on economic growth. Some analysts argue that causality flows from exports to economic growth and view this as the export-led growth (ELG) hypothesis. Awokuse (2007) examines the impact of export and import expansion on growth in transition economies, that is, Czech Republic, and Poland. The study reveals that in the case of Czech Republic, empirical evidence exists that Granger causality flows from both exports and imports to economic growth, thus providing empirical support for both ELG and ILG hypotheses. However, only the ILG hypothesis is supported in Poland.

Trade theory posits some clear links between exports and growth or total factor productivity especially via the export-led growth hypothesis. Morley and Morgan (2008) investigate the causal relationship between exports and productivity and exports and agricultural support within the European Union. The study uses the autoregressive

distributed lag (ARDL) approach. The evidence is found of exports within the European Union being determined by incentives in Ireland and France, as well as gains in productivity contributing to export growth in Germany and the UK.

The apparent success of export-led growth policies on developed countries is a reason for the interest in debate between productivity and exports. Developed countries would like to stimulate productivity growth and need to know whether export promotion will lead to success. Xiao and Reed (2007) investigate the relationship between export and production growth for three major wheat exporters: Australia, Canada and the United States from 1966 to 2000. The study employs four-variable vector autoregressive moving average models (VARMA) to examine the casual relationships between the export of wheat and wheat flour and domestic wheat production for these three major wheat exporters. The study reveals that in Australia, export leads to production growth. The ARMA model, the impulse response export and production growth function and the variance decompositions consistently shows that Australian wheat causality is uni-directional. Moreover, Granger causality results show that Canada and the USA have bi-directional effects between exports and production.

Cortés-Jiménez, Pulina, Riera-i-Prunera. and Artis. (2009) study the role of exports disaggregated into traditional exports and tourism as a potential extra factor. The authors argue that the Tourism-Led Growth (TLG) hypothesis postulates that the economic growth of countries can be generated by expanding international tourism as a non-traditional export. The study uses annual data covering the time span 1964-2000 for Spain and 1954-2000 for Italy. Firstly, the study finds that the ELG and TLG hypotheses are confirmed for Spain. A bidirectional relationship exists between economic growth, exports and international tourism expansion, reinforcing each other. Secondly, the ELG and TLG mechanisms are also confirmed for Italy within a bidirectional temporal relationship. The study further suggests that development strategies in each area are required in order to encourage free trade, international visitors and industrial growth. It is from this perspective that private entrepreneurs and the government should increase the level of resources allocated to exports and tourism.

3.5.2.2 Time series studies

Giles and Williams (2000) attempt to provide comprehensive information on the empirical research that investigates the export-led growth hypothesis, and to indicate the range of methods applied to examine this hypothesis. Their study indicates that cross-country research is possibly flawed; in particular, the positive association that is taken as evidence of ELG is as compatible with GLE or feedback effects. The subsequent time series research attempts to rectify some of the issues with the cross-country work, but is itself fraught with problems.

Cumulative exports and imports of goods and services of Slovenian enterprises declined in real terms by 48.3 percent and 32.5 percent from 1990 until 1993. However, development in foreign trade also affected the growth of GDP. In the period 1991–92, Slovenian GDP fell cumulatively by 14.4 percent. Beko (2003) examines the nature of Granger causality between exports, both aggregate and at the sectoral level, and output growth in Slovenia for the period 1992–99. The reason for the study to be conducted is the deficiency of empirical studies with the absence of a detailed examination of the effect of exports on output growth in individual transition countries. The study reveals that by using the conditional causality technique to explore the nature of the relationship between exports and real output from the analysis, a predominant pattern of a bidirectional nature between GDP and various export variables emerges.

Guttmann and Richards (2005) state that trade openness is an integral part of Australia's economic activity and, among Australians at least, it is widely perceived that Australia is a very open economy. Australia's 2003 openness ratio of 39 percent was substantially below the median for OECD countries of 70 percent. In addition, of the 136 countries and territories for which the Penn World Tables have data for 2000, Australia was the 20th least open economy. A country's level of trade is clearly influenced by a variety of factors, including its location in the world and other geographic attributes. Guttmann and Richards (2005) observe five explanatory factors which seem to be particularly important for Australian's openness over 1971–2000: a country's population,

its location in the world, the degree of its trade policy liberalisation, its stage of development and its geographic size.

The endogenous growth theory emphasizes the role of exports on economic growth, highlighting that exports can increase long-run growth by allowing innovations growth in sectors of research and development (Brussels, (2006). The export-led growth theory postulates that exports consist of the principal channel through which the liberalization process can affect the output level and eventually the rate of economic growth. Dritsaki, Dritsaki and Adamopoulos (2004) investigate the relationship between Trade, Foreign Direct Investment (FDI) and economic growth for Greece over the period 1960-2002. In the study the method of vector autoregressive model (VAR) is adopted to estimate the causal relationship between variables. Granger causality test result indicates that there is a bilateral causal relationship between exports and economic growth, and also a unidirectional causal relationship between foreign direct investments and exports with direction from foreign direct investments to exports.

Exports can be viewed as an engine of economic growth in a variety of ways. Export growth can affect growth indirectly through efficient resource allocation, greater capacity utilization, exploitation of economies of scale, and stimulation of technological improvement due to foreign market competition. Prior to the 1960s, the Japanese market was relatively closed to foreign competition. During the 1937–1952 period, the economy experienced relatively low growth and Japan followed protectionist economic policies via tools such as tariffs, import quotas, foreign exchange controls, and directed credits. In the 1960s export promotion policies were instituted in Japan. As Japan introduced export promotion policies, the nation's exports grew tremendously and the economy also grew at a much faster rate. This experience drew the attention of Awokuse (2006) to explore the causal relationship between real exports and GDP growth in Japan using data set on a quarterly basis which covers the period 1960:1 to 1991:4. The empirical evidence from Granger causality tests, directed acyclic graphs, and forecast error variance decompositions (FEVD) analyses suggest that the causal relation between exports and productivity was bi-directional for the period 1960–1991.

Export expansion can be a catalyst for output growth directly as a component of aggregate output. An increase in foreign demand for domestic exportables can cause an overall growth in output via an increase in employment and income in the exportable sector. Balaguer and Cantavella-Jorda (2004) study structural changes in exports and economic growth in Spain. The analysis uses annual data. The sample period spans from 1961 to 2000. The study finds that there is a long-run relationship among output, aggregate export expansion, and export structural change. The results also indicate that exports are a determinant factor for Spain's real output. Moreover, it becomes apparent from the study that economic growth also reinforces export expansion. The study concludes that there exists a reverse causality between export expansion and economic growth.

Over the last three decades the role of exports in stimulating economic growth has been the subject of debate among development scholars. The major question in the export-growth debate is whether an export-led outward oriented trade policy is preferable to an inward oriented trade policy in stimulating economic growth. Awokuse (2005) investigates the causality between exports and economic growth in Korea. The study uses data set on a quarterly basis and covers the period 1963:1 to 2001:4. The study employs two methodological procedures to test for Granger causality: VECM and the augmented levels VAR model with integrated and cointegrated processes. Empirical evidence from the study in using Granger causality tests on both alternative models indicates that there is a bi-directional causal link between real exports and real GDP growth.

Sato and Fukushige (2007) investigate the causal relationships between GNP, exports, and imports by estimating a vector autoregression (VAR) model. The study investigates two hypotheses relating to Korea's economic growth: the export-led growth hypothesis and the import-led growth hypothesis. The study also applies the causality test proposed by Toda and Yamamoto (1995). This test is applicable whether or not there are unit roots or cointegrating relationships between the time series. The study finds

that after splitting the sample into periods, there is evidence of import-led growth for the first sub-period, but not for the second sub-period.

3.5.3 Less developed countries (LDCs)

3.5.3.1 Cross sectional studies

Honkapohja and Turunen-Red (2002) explain that expansion in international trade in capital goods can be a source of favourable large effects in growth; that is, the growth acceleration may sometimes be much larger than one would expect on the basis of well known small effects of trade on growth. This general possibility is demonstrated by developing a symmetric open economy version of the recent endogenous growth model of Evans, Honkapo- hja, and Romer (1998) (i.e. EHR). The analysis indicates that the small effect is that usually more trade means faster growth, but that positive effects may be reversed if the opportunity cost of aggregate capital in terms of consumption responds strongly to faster growth and expanding investment.

Emma and Samman (2005) explains that policies designed to liberalise trade – that is, the lowering of tariff and non-tariff barriers, does not automatically increase trade, while the relationship between increased trade and growth seems to depend to a great extent on country-specific circumstances. Mbabazi, Milner and Morrissey (2004) engage in empirical analysis using the cross-section to investigate the link between growth, inequality and openness for a sample of 44 developing countries over 1970-95. The study finds consistent evidence that openness is positively associated with growth.

In the process of the free play of international market forces, countries would enjoy the fruits of industrial revolution through favourable terms of trade. It is shown that outward oriented trade policies have been more successful in promoting growth than inward oriented trade policies (Edwards, 2001). Sarkar (2007) examines the relationship between openness (trade-GDP ratio) and growth. The study uses the Autoregressive Distributive Lag (ARDL) approach. The approach does not require such pre-testing and

'data-mining'. This technique can be used to test the existence of a long run relationship between two variables irrespective of whether they are stationary or not. The findings indicate that the majority of LDCs, including the East Asian countries experienced no positive long-term relationship between openness and growth during 1961-2002. Extending this study to cover various regions and groups shows that only the Middle Income group experienced a positive long-term relationship.

Awokuse (2008) argues that most previous investigations have only focused on the effect of export expansion on economic growth while ignoring the potential growth-enhancing contribution of imports. The study employs the Granger causality testing framework. The results show that the ELG hypothesis could not be supported in any of the three countries which are Argentina, Colombia and Peru. In contrast, the study finds empirical evidence in support of a bi-directional causal relationship between imports and GDP growth for Argentina and Colombia. Furthermore, there is also evidence in support of the ILG hypothesis for Peru.

The Malaysian economy launched the New Economic Policy (NEP) in 1971. This New Economic Policy had led Khalafalla and Webb (2001) to determine whether the change in policy emphasis and the subsequent rapid increase in the relative size of the manufacturing sector produce the same causal relationships for shorter sub-periods as for the entire post-independence period. The study uses two sub-samples in which the first period was chosen to coincide with a time frame during which primary exports were dominant components of Malaysian exports. The second period is a period of heavy industrialization and a surge in manufactures exports. The study undertakes a systems cointegrating analysis and examined Granger causality tests based on the vector error correction model. The study indicates that economic growth, total exports, and total imports are cointegrated, implying that there is a long-run relationship between them. The results further pin point evidence from the VEC model suggesting that the export-led growth hypothesis for two sub-periods is valid.

Policy makers in developing countries are mystified whether they should concentrate on formulating economic policies that are designed to promote export or import substitution oriented. Bahmani-Oskooee, Economidoe and Goswami (2005) undertook a study to establish the relationship between exports and output using annual data from 1969-1999 periods from developing countries. The results of the study indicate that there is a long term relationship between export and output, when export is a dependent variable. However, the cointegration disappears when output is estimated. The study further suggests that developing countries must aim for policies that promote economic growth.

Regional events of the last two decades have fundamentally changed the economic landscape of Asia and its relationship to the global economy. The People's Republic of China (PRC) has moved from a command and control economy to a model of global resource allocation based on comparative advantage. At the same time, sustained growth by this economy has also shifted attention from its export competitiveness to the new basis for Asian regional growth. Roland-holst, Verbiest and Zhai (2005) examine the future of the region, projecting long-term trade and growth scenarios for Asia over the next decade using a global forecasting model. The study reveals that regional integration is the way forward for rapid and sustainable growth in Asia.

The realisation of export earnings stability and reduced dependence on the export of a single major or few agricultural commodities to increase economic growth remain a major goal of all Caribbean countries. The Caribbean's, like most contemporary developing regions, has been interested in bringing about enhanced and fuller cooperation among member states in pursuing the diversification and transformation of their agricultural sectors. Francis, Iyare and Lorde (2007) analyse the causal relationship between agricultural export diversification and economic growth in eight selected Caribbean countries using annual data from 1961 to 2000. The study shows a long term relationship between agricultural export diversification and economic growth in all the countries except Barbados. The study also indicates that in the long run, agricultural export diversification causes economic growth in the Dominican Republic. On the contrary, agricultural export diversification is the outcome of the economic

growth process in Belize, Costa Rica, Haiti, and Jamaica, in the long run. Further analysis shows no evidence of bi-directional causality in any of the countries in either the short or long run.

A key aspect concerning early studies is related to both the methodology and data set used. The theoretical benchmark in general can be considered weak and based on bivariate and ad hoc production functions, while the empirical results derived from traditional econometrics have been highly criticized for being spurious. Gutie´rrez de Pineres and Cantavella-Jorda (2007) study the relationship between export and economic growth in Latin American. The study applies Granger-Causality tests to perform on the corresponding error correction model for sixteen Latin American countries varying the data source and the deflator. The study does not attempt to answer the question of whether export led growth or growth led export are valid hypotheses but rather takes that as a given in the light of the extensive research on the topic. But the study focuses on the robustness of the models and their sensitivity to methodology and data selection. The analysis reveals inconsistencies in the results, both by choice of data, by level of deflation and methodology employed. The study suggests that much of the debate regarding export led growth, at least for Latin America, could be fuelled by both data choice and methodology. Furthermore, the study indicates that the ELG hypothesis receives weak support in Latin American countries.

The study by Love and Chandra (2004) is the first to adopt a multivariate framework for South Asia as a region; and by including the terms of trade as an additional variable, it attempts to correct the misspecification bias of earlier studies. The study investigates the issue of causality in selected South Asian countries such as India, Pakistan and Sri Lanka using Johansen's multivariate cointegration framework. The study uses the 1950–98 periods for India and for Pakistan and Sri Lanka the 1970–2000 and 1965–97 periods respectively. According to the Johansen multivariate approach, the study reveals that real exports, real GDP and terms of trade are cointegrated in all countries of the sample: India, Pakistan and Sri Lanka. This implies that a long-term relationship has emerged between all these variables. The study further shows bidirectional

causality between real exports and real income in India, export-led growth in Pakistan and no causality in either direction for Sri Lanka.

The relationship between openness and economic growth has been fully analysed in many empirical studies. Primary attention has been given to the advantages of an outward oriented strategy and to the role of exports in economic performance. The study of Cuadros, Ana, Orts, Vicente Alguacil and Maite (2004) contributed in the debate of trade openness by considering both trade and financial liberalisation as indicators of openness. Their study attempted to jointly analyse the ELG hypothesis and the FDI growth nexus. It is argued that openness involves more than just trade, pointing out that FDI seems to be another relevant element of the liberalisation process. Therefore, omitting this variable can result in a spurious rejection of the ELG hypothesis. The study adopted a multivariate VAR approach to investigate the causal relationship between trade (exports), inward FDI and output in Latin American countries. The study reveals that by using two different causality methods, openness seems to be a significant factor in Mexico and Argentina. Both the estimation of the VECM and the results of the augmented VAR model confirm the applicability of the ELG hypothesis in these economies.

Audrey and Evan (2007) investigate the relationship between export, inflation, investment and economic growth for three Asean countries namely, Indonesia, Malaysia and Thailand. The study uses a sample size that covers the period of 1976 to 2005. The results show that there is a positive and significant relationship between export and GDP for all the countries. It shows that export has a positive sign where the elasticity is 2.056, which implies that the Indonesian GDP is elastic to the export changes. For Malaysia and Thailand the elasticity was 0.942 and 0.182. The positive sign on the export variable implies that an increase in export leads to increase in economic growth in the long run. The study further suggests that in order to enhance economic growth in those countries, the government can take positive steps to increase export base diversification. It also points out that liberalisation of the trade policy will promote greater competition for these countries in the globalised world.

In Southern Africa, many countries are initiating economic reforms such as increasing trade within the region as well as increasing multi and bilateral trade agreements with other countries. Sinoha-Lopete (2006) examines the validity of the Export-Led Growth (ELG) hypothesis in nine Southern African countries using annual data for the period 1980-2002. The study shows strong and positive correlation between exports and GDP growth in most Southern African countries, but in Zambia the results show a positive but not a significant correlation between GDP and exports. The causality tests results show that in South Africa, Botswana and Namibia exports do not cause GDP either in the short-run or long-run, which implies that there is no evidence supporting the ELG hypothesis. The study further shows that in South Africa, GDP does not cause exports, either in the short-run or in the long-run.

3.5.3.2 Time series studies

Openness to imports increases efficiency and reduces costs for industry. Brussels (2006) states that exposure to foreign competition forces domestic institutions to become more efficient and competitive. Trade openness also aids by reducing the cost of key foreign inputs and enabling access to cost saving and quality enhancing new technologies. Brussels further states that many developing countries have used trade, together with sound domestic policies, as a key element for their development and have seen significant reductions in poverty and increases in welfare. The hope is that these emerging growth economies can bring a new wave of developing countries into the globalisation process. To achieve this, trade restrictions need to be reduced both in the developing and in the developed countries.

The association between exports and growth is often attributed to the possible positive externalities for the domestic economy arising from participation in world markets, for instance from the reallocation of existing resources and economies of scale. Medina-Smith (2001) investigates the relationship between exports and output using time series

1950 to 1997 data on Costa Rica. The study finds that the export-led-growth is valid in this particular case; however, the empirical result shows that physical investment and population mainly drove Costa Rica's overall economic performance from 1950 onwards.

Economists have focused exclusively on the foreign sector, particularly on the relationship between exports, imports, and GDP growth. Emphasis on international trade dates back to the mercantilists more than two centuries ago. As pointed out earlier mercantilists were firm believers that trade surpluses were the only favourable outcome for the domestic economy from international trade relations. Mercantilists supported export promotion and protection of domestic industries, since they were preoccupied with the accumulation of gold reserves and not necessarily with the standards of living or the growth and economic development of the country (Salvatore, 1995).

The Namibian government set up export processing zones (EPZ) in 1995. The aim of the EPZ is to attract investment that is geared towards the production of exports and the encouragement of transfer of skills and technology to Namibians. The policy led Jordaan and Eita (2007) to analyse the causality between exports and GDP in Namibia and to evaluate the relationship of these variables for the period 1970 to 2005. The results revealed that exports Granger cause GDP and GDP per capita. This suggests that the export-led growth strategy, through various incentives has a positive influence on growth.

Siddiqui and Iqbal (2005) study the relationship between trade openness and growth in Pakistan during 1972 to 2002. Their study is fuelled by trade liberalization policy after 1988, when the government accepted the first international monetary fund (IMF) structural programme. The study estimates regression equation using various variables in the model such as investment, population growth and trade. The study estimates cointegration equation and finds that there is a long run negative relationship between trade growth and GDP growth. When the study separates the total trade volume in

export and import, the result finds insignificant positive relationship between GDP, and export and import.

Exports of goods and services represent one of the most important sources of foreign exchange income that eases the pressure on the balance of payments and create employment opportunities (Awokuse, 2008). An export led growth strategy aims to provide producers with incentives to export their goods through various economic and governmental policies. The role of exports in the economies of developing countries has been subject to a wide range of empirical and theoretical studies. In 1991, Egypt witnessed a radical shift from a central planning philosophy that dominated economic policy since 1952. One of the main elements of the reform program was to embark on an export led growth (ELG) strategy. Abou-Stait (2005) examines the effectiveness of Egypt's export driven strategy but also evaluates the effectiveness of various economic policies adapted since 1975, aiming at the promotion of exports of goods and services. The results support the hypothesis that exports, imports and GDP are not cointegrated, and that exports Granger cause GDP growth, but they do not support the Granger causality between exports and capital formation.

The fundamental economic question is the issue of how a country can achieve economic growth. According to Bahmani-Oskooee, Economidoe and Goswami (2005) export-led growth hypothesis states that exports are a key to promote economic growth which provides one of the answers to this fundamental question. Botswana adopted an export-led growth strategy during the colonial era (1885-1966) when the country was a British protectorate. This led Jordaan and Eita (2007) to analyse the causality between exports and economic growth in Botswana and to evaluate the relationship of these variables for the period 1995 to 2005. The results show that there is evidence that GDP causes export, and evidence of bidirectional causality between export and economic growth in Botswana.

In Chile during the 1980s, some policies were adopted to favour export growth: tariff drawbacks for exporters, a subsidy for new exports, and foreign direct investment policies which ultimately favoured non-mining exports. Ffrench-Davis (2002) examines the relationship between Chilean exports over the last two decades and the high economic growth rate of the country since the mid-1980s. The study finds that in the long run, an increase of 3 percent in exports or investment is reflected to increase GDP growth by 1 percent.

In recent years India's percentage share in world exports has been increasing. Sharma and Panagiotidis (2004) study the relationship between exports and economic growth in India. The study uses a time series for the period 1971-2001. The study examines a robust data set for a period of ten years after trade reform and thus it is better able to capture the effects of liberalisation on exports and output growth. The causality test indicates that no evidence is found to suggest that real exports granger cause GDP. But there is weak evidence suggesting that the direction of causality runs from GDP to exports.

Exports earnings in Nigeria makes earnings up over 25 percent of the country's gross domestic product and domestic industrial production is highly dependent on imported inputs. This instance automatically makes Nigeria a suitable sample African country to test the trade-led growth hypothesis. Deme (2002) examines the trade-led growth hypothesis by applying the cointegration and Granger causality tests. The study uses time series data from 1970 Q1-1997 Q1. The results indicate bidirectional causality between some measures of trade openness which is exports ratio and imports plus exports ratio and economic growth. When these latter trade openness variables are scaled by GDP, the results suggest a unidirectional causality running from trade openness to economic growth.

Love and Chandra (2005) explains that the Bangladesh economy has come a long way since independence; the proportion of trade or exports to GDP has considerably increased. It has opened up significantly, particularly during the 1990s as compared to

any time in the past. Authors investigated export-led growth in Bangladesh using a multivarate VAR framework. The study uses annual data for the period 1972–2000 from the Government of Bangladesh. The results indicate that the direction of short-term and long-term causality runs from real income growth to real export growth. The reverse causality is insignificant in the short as well as in the long-term. The study points out that these results are hardly surprising as Bangladesh followed an import-substitution model of growth since its birth in 1971. Exports in Bangladesh as a proportion of GDP have more than doubled during the 1990s, but the contribution of exports to GDP is not reflected in the long-term causality analysis either in bivariate or in multivariate framework.

Brussels (2006) explains that free trade is likely to allocate resources to those areas where countries have comparative advantage, which will promote specialisation and growth. Free trade will also accelerate investment by allowing access to bigger markets, permitting scale economies, and encouraging imports of cheaper capital goods and intermediate inputs. Nath and Mamun (2007) examine the causal relations among trade, growth, and wage inequality in Bangladesh using time-series during1971 to 2000. The study uses real exports plus imports as a share of real GDP to define trade openness. Like other measures of openness, trade share is not a perfect measure. In particular, trade share may suffer from endogeneity bias when used as an explanatory variable in a regression framework. But Nath and Mamun's study uses the VAR framework which mitigates that potential problem. The results of the study find the strongest evidence in favour of trade Granger causes growth and evidence to support growth Granger causes trade.

In the 1970s, Bangladesh was a strongly inward-oriented economy ranking among the top in price distortions caused by high tariff barriers. Progressive trade liberalisation and domestic deregulation were the foci of trade and industrial policies since the 1980s. Policies were implemented that promoted exports and several measures were undertaken. For example, in the 1980s the government established the first export processing zone in Chittagong. This structural change has led Al-Mamun and Nath

(2005) to investigate the link between exports and economic growth in Bangladesh. The study uses time series data set comprised quarterly for a period from 1976:1 to 2003:3. The study reveals that there is a positive long-run equilibrium relationship between exports and industrial production. There is no evidence of a short-run causal relationship between these two variables. Furthermore, the study indicates that there is long-run causality running from exports to industrial production.

According to Love and Chandra (2004), there has been over the past thirty years an extensive debate on the relationship between trade policy and economic growth in developing countries. Love and Chandra indicate that most time series studies have the difficulty of measuring 'trade policy'. They further indicate that given the problem of measuring trade orientation and the paucity of time-series studies, their study was to develop an index of outward orientation. After Love and Chandra (2004) developed an index, they examined its relationship with growth in India. Their study uses data that covers the period 1950-1992. The study employs cointegration test and error-correction modeling in examining the relationship between trade policy and growth. It is found that greater openness exercises a positive influence on growth.

Chile experienced a pattern of high economic growth, which was accompanied by a significant increase in manufactured exports both in relative and absolute terms. The success of Chile in growing exports was fuelled by a comprehensive programme of economic stabilisation and restructuring that was initiated after 1974. The study was conducted by Siliverstovs and Herzer (2007) to examine the separate effects of mining and manufacturing exports on the Chilean economic growth. The study employs VAR model and uses annual time series data spanning from the period 1960 until 2001. The study finds that manufactured exports Granger causes output but not vice versa. This supports the export-led growth hypothesis for Chile. The study further indicates bidirectional Granger causality between the non-export GDP and mining exports.

Minh-Ngoc, Phuong-Anh and Thuy-Nga (2003) examine the long-run impact of exports on GDP growth in Vietnam in the period 1975-2001. The study concludes that, despite the fact that the export sector has been very robust in recent years as represented by the large and increasing export share in the Vietnamese economy, there is no firm econometric evidence to suggest that exports are an engine of the economic growth and development for Vietnam.

Chandra (2003) criticizes the work of Dhawan and Biswal (1999) they have used a small sample size, so it can be argued that a small sample size is not sufficient to obtain reliable results. Chandra reinvestigates the study by using a substantial larger sample size to find the causality between incomes and export growth in India. The study uses a time series period from 1950-1996. The study finds that in using Johansen multivariate approach to contegration, there is an indication that real exports, real GDP and terms of trade are cointegrated. The study further indicates that there is a bi-directional causality between real exports and real income in the model. However, the study shows that the long run causality running from income to exports is much stronger than that running from exports to income, and in the short run only terms of trade changes are significant in explaining export growth.

Richards (2001) provides an analysis of a particular case of Latin American economic growth within the context of the export-led growth (ELG) using the case of Paraguay. The study applies Granger causality tests, error correction modeling, and vector autoregression to examine the phenomena. Annual time series data was used in the study and covers the period from 1966 to 1996. The results of the study reached the conclusion that ELG does not have much relevance to the Paraguayan economic growth.

Pakistan's export mainly consists of agricultural commodities from which a major proportion is of raw material which is transformed into the finished goods within the home country. Memon, Baig and Ali (2008) investigate the causal relationships among agricultural gross domestic product (GDP) and exports in Pakistan by using time series

data for the period between 1971 and 2007. The study applies cointegration tests, ARDL techniques, and granger causality test. The study finds that there is a long-run relationship between the two major sectors of the economy. The results are robust, indicating that agricultural GDP is an important factor for enhancing exports in the country. The study also confirms the bi-directional causality among the variables under consideration. Whereas in short run analysis, there is no short run causality among the variables.

There is a growing body of literature examining the ELG in developing countries in empirical terms. Karagöz and Sen (2005) investigate the dynamic relationship between export growth and economic growth (in terms of output growth) in the Turkish economy using cointegration and error-correction models. The study is based on quarterly series data of export and GDP for Turkey during 1989Q1-2004Q4. The study shows that the error-correction model confirms a short-run relationship, that is, it gives evidence for short-run Granger causality running from export growth to economic growth, and evidence of short-run causality running from economic growth to export growth. The study also reveals that there is uni-directional causality from export growth to economic growth in Turkey. This implies that there is evidence for long-run Granger causality running from economic growth to export growth in Turkey.

3.6 Panel data studies

Rattso and Stokke's (2008) main contribution is to identify important channels of effects of reduced trade barriers based on econometric evidence regarding key parameters of investment and productivity determination. Their study identifies the effect of trade openness on long-run GDP growth through two channels. First, more openness reduces the cost of adopting foreign technology by limiting the trade barriers to technology transfer, and productivity growth increases. Secondly, lower tariffs imply less expensive foreign capital goods, which generate more capital accumulation.

A number of empirical studies support the notion that trade causes economic growth. A significant number of them demonstrate the existence of a positive correlation between openness and economic growth. Ngozo (2006) investigates the relationship between openness and growth by testing the hypothesis that openness causes growth. The study uses panel estimation of five different panel groups. The results show that there is a positive relationship between openness and growth in the first three groups. However, the fifth group reflected a negative relationship between openness and growth.

David Ricardo acknowledges the importance of the gains from trade: it is much more efficient that each country specializes in producing goods for which it has technical comparative advantages and imports the other goods. Mansour (2003) considers a number of sector specialization indicators and examines if they indeed affect the link between openness and growth. The study uses both cross-section and panel date techniques focusing upon the period 1970-2000 and a set of 48 countries. The study's investigation has reached conclusive results with the cross-section specification. As in most of the previous literature on trade and growth issues, openness comes out with a significantly positive coefficient, which implies that outward orientation is good for growth.

Rose (2004) estimates the effect of multilateral trade agreements that is (WTO) on international trade. The main concern of the study is to answer the question "does the WTO increase trade?" The study uses a standard gravity model of bilateral merchandise trade and a large panel data set covering over 50 years and 175 countries. The results indicate that there is a positive significant effect of GATT/WTO membership on trade, if sensitive analysis is made; the data from the 1950's show positive and significant effects of GATT membership. However, these coefficients shrink in the 1960's with the large expansion of the GATT and turn negative in the 1970's. The effects are also small in the 1980's and unstable in the 1990's.

Sinha and Sinha (1999) argue that openness is a better measure than export alone. The study indicates that by using export alone, it is implicit acknowledgement that import contributes nothing to growth. They also acknowledge the measure used by Summers, Robert and Heston (1991) where they use sum of imports and exports to GDP as a measure of openness. Sinha and Sinha (1999) examine the relation between openness and economic growth in 124 countries. The study shows that time series analysis of the 124 countries around the world indicates that there is a significant and positive relationship between openness and economic growth. Causality tests show that growth and openness does Granger cause growth of GDP for 11 countries. On the other hand, the study rejects the null hypothesis that GDP growth does not granger cause openness for 18 countries.

The meaning of "openness" has become similar to the notion of "free trade", that is, a trade system where all trade distortions are eliminated. It is therefore, important to understand this defining problem because various openness measures have different theoretical implications for growth and different linkages with growth. However, the study by Yanikkaya (2003) defines openness as a measures of trade volumes and measures of trade restrictions. Yanikkaya applies regression to a panel of over 100 developed and developing countries observed from 1970 to 1997. The results of the study support the hypothesis that countries with higher trade shares are likely to grow faster than countries without trade shares.

Lloyd, Morrissey and Osei (2001) employs the autoregressive distribution lag (ADL) model, which is particularly attractive when conducting cointegration analysis in small samples since it avoids the finite sample bias that beleaguers static estimators. The study is concerned mainly with the examination of the effects of aid, exports and growth in Ghana. In the pre-1983 period, exports had a negative impact on short-run growth whilst aid had no significant impact. Results for the post-1983 period suggest that policy reform enhances the effectiveness of exports and aid, all of which had a significant positive impact on short-run growth.

Some of the "new" endogenous growth theories suggest that trade policy affects long run growth through its impact on technological change. In the models of this tradition openness to trade provides access to imported inputs embodying new technology and increasing the size of the market. Sarkar (2008) examines the relationship between openness (trade- GDP ratio) and growth. The study use two forms of analysis, that is, cross-country panel and time series period from 1961-2002. The study uses a cross-country panel for a sample of 51 LDCs over a uniform time period of 1981-2002. The results of the study shows that a country with a higher trade share tends to experience higher real growth. The time series analysis of individual country's experiences shows that the majority of LDCs, including the East Asian countries experienced no positive long-term relationship between openness and growth during 1961-2002.

Medina-Smith (2001) explains that open trade policies have been perceived as an important mechanism for growth through a country's expansion of exports and imports. While exports provide for an improvement of the current account balance, imports usher in new technologies and physical capital which is essential to economic growth. However, criticism draws on the concentrated adverse effects of such openness in a given economy, particularly the effects of trade on domestic producers, who face competition from foreign industries. Rruka (2002) engages in a Cross-Country investigation on the effects of trade volume and trade policies on economic growth. Through utilization of recent cross-section data on 99 developing as well as developed economies, the study finds that there is a positive relationship between trade volumes and economic growth, and an unexpected positive relationship between trade restrictions and economic growth.

Niyongabo (2004) examines trade openness policy, quality of institutions and economic growth. The study intends to answer whether more open countries to trade have high economic performance. It also uses panel data estimation in 102 countries. The study indicates that trade policy is associated with the natural openness and constitutes significant parameter to gain high economic growth rates. The implication is that global

openness depending on the natural endowments and economic policies are good to reach high growth rate.

3.7 South African context

Edwards and Lawrance (2006) argue that trade liberalisation in the 1990s not only increased imports but, by reducing both input costs and the relative profitability of the domestic sales, also boosted exports. Their study also indicates in particular that gross fixed investment is about fifty percent more import intensive than consumption expenditure. Thurlow (2006) assesses the impact of recent trade liberation on the distribution of incomes and poverty in South Africa. The study employs a dynamic general equilibrium and microsimulation model to assess the effects of trade liberalization. The results indicate that trade policies have not contributed to increasing poverty and that trade-induced technological change has accelerated growth.

Since international trade includes both the trade and financial dimensions, Loots (2002) tested its effect on the South African economy using the period 1990 to 2001 on a quarterly basis. The regression results of trade openness shows a positive, but relatively small (less than one per cent) impact on GDP. De Jager (2004) conducted a study on aspects of growth empirics in South Africa during 1949 to 2000. The study analyses many variables but for specification on the current study only openness of trade and GDP growth is considered. The question of causality and its direction is best answered by the test for granger causality. The result indicates that all measures of openness are indicative of a causal relationship running from openness to economic growth. In cases where openness is measured as the sum of exports and imports as a percentage of GDP, there is an indication of bidirectional causality.

There are many trade openness measures but Loots (2002)'s study considers only one measure. The study is thus deficient compared to measures used in De Jager (2004)'s study. The other problem with the study is that it includes two structural changes prior

and after 1994. Again, the study only tested the one-way effect of trade openness and not granger causality.

The gains from globalisation are not equally distributed and whereas some industries and consumers have benefited from higher output or lower prices, others have lost out to more competitive foreign industries or lost their jobs. Flatters and Stern (2007) identify the likely winners and losers from trade and trade reform over ten years. The focus of the study is on the broader trade policy challenges and choices that are faced by South Africa in an increasingly global and competitive world economy. The study indicates that there are all signs of highly successful structural adjustment. Whatever the reasons, there can be no doubt that economic reform and the dropping of sanctions have played a key role and the South African economy appears to have become much better integrated with the global economy.

Loots (2000)'s study indicates that trade volume is positively related to economic growth in South Africa. Despite these apparently positive growth aspects of international trade, the empirical verification on the effects of trade on economic growth appears to be mixed. In contrast, Roberts (2000) demonstrates that over the period 1992 to 1997, trade liberalisation increased South Africa's trade ratio but a direct relation between this and economic growth appears to be doubtful. This mixed results on trade and growth led Strydom (2003) to revisit the analysis on trade-led growth and determine the transmission mechanism through which trade and economic growth are linked. The analysis shows that the channels through which trade generates growth have dissimilar growth effects.

Although trade openness plays a significant role in determining GDP growth, it has its costs and benefits. In determining the causality between trade openness and GDP growth, there is still a lack of literature concerning the causality between two variables in South Africa. In this study, we examine the causal relationship between trade openness and GDP growth during 1994Q1-2008Q4. However, the central contribution of the study is to attempt to augment to the existing literature. In addition, from the South African

perspective, studies that have been conducted such as those by Edwards and Lawrance (2006) and Thurlow (2006) are more concerned with trade policy rather than determining the causality between trade openness and GDP growth.

3.8 Summary

This section has critically examined the empirical literature on the relationship between openness and growth. It would appear on balance, that there seems to be more empirical evidence of a positive relationship between trade openness and GDP growth. However, the analysis of this phenomenon is still subject to debate and further empirical research. The most controversial issue is the measure of openness. Measuring openness is absolutely vital in empirical research because the way it is measured is a key in the specification of the econometric methodology.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

In chapter one, a brief overview of the research methodology, as applied to this particular study, is provided. In this chapter, the research methodology and all the procedures applied to determine the causal relationship between trade openness and GDP growth are discussed in more specific detail. The chapter consists of the following sections namely, data description and model description. Data description explains the form of data that the study uses, including the duration of the study. Model description explains the model that the study intends to use to determine the relationship between trade openness and GDP growth. The purpose of this chapter is to present the data and methodology that is used in this study.

There are several reasons for choosing South Africa as a case study. Firstly, during the period of investigation, the country has had an enviable record of political stability as one of the LDCs, therefore the political factor can be excluded from the analysis. Secondly, the country is considered to some extent as a success story in Southern Africa because of its promising growth in GDP, which has led to substantial improvements in most economic and social development. Several questions therefore arise. What are the main engines of growth? What is the role played by trade openness since the country's independence?

4.2 Variables and data description

Various sets of measures of trade openness are employed in this study. Following Jin (2003), the first set consists of imports/GDP ratio, export/GDP ratio and the average share of total trade (imports plus exports) in GDP. Following Awokuse (2008), the second set comprises of the absolute values of merchandise and service exports and also merchandise and service imports.

4.2.1 Variables description

Table 4.2.1 The variables which are used in this study are as follows:

Abbreviation	Variable description	Expected sign
GDP:	The Gross domestic product is defined as the total market value of all final goods and services produced annually within the boundaries of a country, using both domestic and foreign-supplied resources. The study uses Gross domestic product at market prices (GDP) measured in Rand millions.	
Xra:	Ratio of exports of goods and services to gross domestic product which is measured in Percentage.	positive
Mra:	The import/GDP ratio is used as proxy for openness of an economy. The import share in GDP then reveals import penetration that represents the degree of a country's openness: the more open economy will have fewer restrictions in the world trade and higher import shares in GDP. The study uses ratio of imports of goods and services to Gross Domestic Product, which is measured in percentage.	negative
X:	Represents real exports of goods and services measured in million Rands.	positive
M:	Represents real imports of goods and services measured in million Rands.	negative
Kinv	Represents gross capital formation measured in million Rands.	positive

The values of these variables are transformed into natural logarithms for analysis. The source of these data is obtained from the South African Reserve Bank (SARB), the official statistical and economic data publishers. The study uses secondary data for analysis. The sample period for the study is the period spanning 1994Q1-2008Q4. The reason for this sample period is that South Africa embarked on market restructuring as their economies changed from being apartheid planned with the state playing a major role to market oriented economies dominated by the forces of the markets. Finally, it is appropriate to state that all the empirical estimations in this study will be carried out using the eviews econometric package.

4.2.2 Rational for choice of data

South Africa has undertaken market and trade reforms since the country's independence in 1994. These reforms have resulted in the change of the trade patterns in South Africa and other countries. Moreover, the agreement signed by South Africa in joining the World Trade Organization (WTO) it is believed that it has improved trade openness in South Africa. It is, therefore, of major interest to study the relationship between trade openness and GDP growth.

4.3 Model specification

From the empirical literature and the theoretical exposition in the previous chapters, a number of possible proxies to measure trade openness have been suggested. These include ratio of imports, ratio of exports, sum of imports and exports over GDP, real exports of goods and services and real imports of goods and services.

To commence with, variables that have been found to be considerable in the previous studies in South Africa are chosen De Jager (2004) and Loots (2002). The two variables are exports and exports ratio. The base model is then extended by adding other variables for which data is available. This exercise yielded two possible models which will produce results that are economically meaningful. The reason for estimating two regression equations is to capture various ways of explaining trade openness, and to avoid multicollinearity since the measures of trade openness are manipulated using export and import values.

$$GDP_t = a_0 + \beta_1 M_t + \beta_2 X_t + \beta_3 Kinv_t + \mu_t \quad (4.1a)$$

$$GDP_t = a_0 + \beta_1 Mra_t + \beta_2 Xra_t + \beta_3 Kinv_t + \mu_t \quad (4.1b)$$

where GDP_t is gross domestic product in levels, α and β are parameters to be estimated, M_t, Xt, $Kinvt$, Mra_t, Xra_t and $Kinv_t$ which are defined as observable variables

representing factors affecting gross domestic product in South Africa in year t, and ε_t is a random error term with a mean of zero, representing measurement error and unmeasured and immeasurable factors.

4.4 Unit root test

Prior to estimation of the time series model, the first step is to check the stationarity of the variables to be used as regressors in the model. The aim is to verify whether the series had a stationary trend, and, if non-stationary, to establish orders of integration. To explain the preceding statement, let Y_t be a stochastic process of a time series variable as:

$$Y_t = (t = 1, 2, 3.....)$$

for each Y_t will have its own mean, variance and covariance between different Y_t then we define such time series as stationery if over time, its mean, variance and covariance remains constant that is :

$$\begin{aligned} \textit{Mean}: \ & E(Y_t) && = \text{constant} \\ \textit{Variance}: \ & \text{var}(Y_t) && = \text{constant} \\ \textit{Covariance}: \ & \text{cov}(Y_t, Y_{t+k}) && = \text{constant} \end{aligned}$$

The problem with time series data is that independent variable can appear to be more significant than they actually are if they have the same underlying trend as the dependent variable. This causes the non-stationary variables to appear to be correlated even if they are not. Suppose from both GDP_t and $OPEN_t$ are non-stationary to the same degree; that is, suppose that ΔGDP_t and $\Delta OPEN_t$ are both stationary. In such situation there is reasonable possibility that the non-stationarity in the two variables will cancel each other out. Therefore, the study needs to test for stationarity conditions of variables in order to avoid spurious regression results.

The study first examines the stationarity in the time series by using graphical inspection on series which are in their real values. Thereafter all the variables will be expressed in logarithms to see whether after first differencing if the series will still exhibit non-stationarity. Scholars also argue that although graphical evidence is useful as the first approximation to decide whether the variables are non-stationary, most econometricians agree that this is clearly an unreliable method to use to make inferences about unit roots. Therefore, they advise the use of a formal testing procedure in order to examine each of the variables under scrutiny (Medina-Smith, 2001).

To test the level of integration of the variables that will be employed in the model, the study will also use the formal well known Augment Dickey-Fuller (ADF) test. The aim is to determine whether the variables follow a non-stationary trend and are in fact of the order of 1 denoted as $I(1)$ or whether the series are stationary, i.e. of the order of 0 denoted as $I(0)$. The Augmented Dickey Fuller (ADF) tests are based on the estimation of the following regression.

$$\Delta X_t = \alpha_0 + \alpha_1 + \alpha_2 X_{t-1} + \Sigma \Delta X t_{-i} + \Phi_t \quad \text{..... (4.2)}$$

Where Δ is the first difference operator, t is a linear time trend and Φ_t is a normally distributed error term. In (3), the null hypothesis that H_o: $a_2 = 0$ against the alternative hypothesis H_1: $a_2 \neq 0$ is tested by comparing the calculated t- ratio of aX_2 with Mackinnon critical values, which are essentially adjusted t values. If the absolute value of the calculated t-ratio is greater than the critical value, then the null hypothesis of a unit root (non-stationarity) is rejected, and the time series X_t can be characterised as integrated of order zero, i.e. $I(0)$, in levels.

However, first differencing is not an appropriate solution to the above problem and has a major disadvantage: it prevents detection of the long-run relationship that may be present in the data, .e. the long-run information is lost, which is precisely the main question being addressed (Gujarati, 1995).

The study also applies Phillips and Perron unit root test in order to verify ADF unit root results are accurate. It is important to perform a second unit root test, which is the one developed by Phillips and Perron (1988). This method utilises a nonparametric approach to control serial correlation in the error term. Basically, the choices are the same as those explained in the ADF test. Therefore, whichever assumption is used in the ADF test is used for the P-P test. The next section is the contegration test; here the study explains whether the series under scrutiny are cointegrated.

4.5 Cointegration test

The study also follows the cointegration test as proposed by Engle and Granger (1987). The question behind this test is to answer whether there is some long-run equilibrium relationship between trade openness and GDP growth. A linear combination may exist between two or more economic variables which converge to long-run equilibrium, even though the series tend to move randomly over time. In other words, they are cointegrated when each individual variable demonstrates stationarity only in first differences, but a linear combination of their levels may result in stationarity.

Recent economic progress has made achievements in contegration methodology to examine the long-run stable relationship between time series. Granger (1986), Engle and Granger (1987) pioneered the area of cointegration tests. They proposed a two-step procedure to identify cointegrating vectors. Firstly, this approach runs an ordinary least square (OLS) regression to produce residuals. Secondly, it conducts a unit root test for the null hypothesis of no cointegration relationship and against the alternative of a cointegration relationship between them.

However, it is important to mention that Engle-Granger contegration procedure has a distinct advantage and also that the test has several defects. This approach may suffer a bias since the results are subject to arbitrary normalisation, and may also fail to distinguish the number of cointegrating vectors. Moreover, literature holds that it is very important for empirical studies to carry out several tests for cointegration instead of

using one single procedure (Medina-Smith, 2001). Alternatively, the study also applies the Johansen approach (1991). The generalisation of the Johansen procedure is as follows:

$$\Delta y_t = \Sigma \Pi_i \Delta y_{t-1} + \Pi y_{t-n} + \varepsilon_t \quad \text{..... (4.3)}$$

Where y_t = (Kx1) vector of variables ($\beta_1 y_{t-1}$, $\beta_1 y_{t-2}$,..... $\beta_n y_{t-n}$), ε_t is independent and identically distributed n-dimensional vector with mean zero and variance equal to matrix $\Sigma\ \varepsilon, \Pi(\alpha\beta)$ is the number of independent co-integration vectors, and Πy_{t-n} is the error correction factor. The Johansen procedure relies on the rank of Π and its characteristics roots. If rank (Π) =0, the matrix is null (no cointegration) and equations in vector y_t are a common VAR in first differences. If Π has full rank (Π = k), the vector process is stationary and the equations in y_t are modeled in levels – *I(0)*. If rank (Π)=1, there is evidence of a single cointegrating vectors in Johansen's cointegration procedure is applied to this study. These tests are:

Trace test

$$\lambda_{trace}(r) = -T \Sigma\ ln(1 - \lambda_i) \text{ , and } \quad \text{.....(4.4)}$$

Maximum eigenvalue test

$$\lambda_{max}(r, r+1) = -T \Sigma\ ln(1 - \lambda_{r+1}) \quad \text{.....(4.5)}$$

Where λ_{r+1} ....,λ_n are the (k-r) smallest estimated eigenvalues. In both tests, λ represents the estimated values of the characteristics roots obtained from the estimated Π matrix, and T is the number of observations. The trace test attempts to determine the number of cointegrating vectors between the variables by testing the *null hypothesis* that r = 0 against the alternative that r > 0 or r ≤ 1 (r equals the number of co-integrating vectors). The maximum eigenvalue tests the *null hypothesis* that the number of co-

integrating vectors is equal to r against the alternative of r+1 co-integrating vectors. If the value of the likelihood ratio is greater than the critical values, the null hypothesis of zero cointegrating vectors is rejected in favor of the alternatives.

4.6 Error-correction Model (ECM)

An Error Correction Model (ECM) is an application of combining the long run, cointegrating relationship between the levels variables and the short run relationship between the first differences of the variables. It also has the advantage that other variables in the estimated equation are stationary; hence there is no problem with spurious correlation. The error correction model can be expressed as:

$$\Delta GDP_t = a + \sum \alpha \, \Delta GDP_{t-i} + \sum \beta \, \Delta OPEN_{t-j} + \Omega_1 ECT_{t-1} + \mu_t \quad \text{..... (4.6)}$$

Where Δ is the first difference operator, GDP_{t-l} is lagged gross domestic product and $OPEN_{t-j}$ is lagged trade openness measures, respectively. The term ECT_{t-1} is all the residuals from the spurious regressions estimated by OLS. This represents the short-term adjustment mechanism from the equilibrium point, which is always significant regardless of the specifications employed. The significance of the lagged residuals provides strong evidence of the adequacy of an error correction framework.

4.7 Granger-Causality Tests

In examining the cause and effect on the variables, the study adopts the econometric methodology followed by many time series studies such as Zestos and Tao (2002), and Beko (2003). The study employs the granger causality test which has been developed by Granger (1969) where he defines the "arrow of time" to help us identify between cause and effect. According to this approach, a variable Y is caused by X if Y is better predicted from past values of Y and X together rather than from past values of Y alone.

For a simple bivariate model, the pattern of causality can be identified by estimating regressions on Y and X using current and past values of Y and X and by testing appropriate hypotheses. In using the following model, causality between two variables will be tested.

$$GDP_t = a + \sum \alpha\, GDP_{t-i} + \sum \beta\, OPEN_{t-j} + \mu_t \quad (4.7)$$

$$OPEN_t = a + \sum \alpha\, OPEN_{t-i} + \sum \beta\, GDP_{t-j} + \acute{\varepsilon}_t \quad (4.8)$$

Where *GDP* is Gross domestic product and *OPEN* is all trade openness measures mentioned above, μ_t and $\acute{\varepsilon}_t$ are serially uncorrelated white-noise residuals.

Ngozo (2006) explains that the test itself is just an F-test of the joint significance of the other variable in a regression that includes lags of the dependent variable. The study tests whether the null hypothesis trade openness does not causes GDP growth, where the alternative hypothesis is that trade openness causes GDP growth. Given that the study has opted for $\alpha = 0.05$ level of significance, the null hypothesis of no Granger causality must be rejected if the p-value is smaller than the level of significance, that is, if $(P > (F)) < 0.05$. Otherwise, H_0 cannot be rejected.

4.8 Impulse Reponses Functions (IFRs)

Using the VAR system the study intends to extend the analysis and generate impulse response functions. A shock to the *i*th variable not only directly affects the *i*th variable, but it is also transmitted to all the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function (IRF) traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. If the innovations are contemporaneously uncorrelated, the interpretation of the impulse response is straightforward. The *i*th innovation □*i,t* is simply a shock to the *i*th endogenous variable *yit*. The generalized IRF (GIRF) can be defined as:

$$GIRF\ (n, \square_t\ \square_{t-1}) = E[\ y_{t+n}/\square_{j,t,}\square_{t-1}] - E[y_{t+n}/\acute{\omega}_{t-1}] \quad \text{.....(4.9)}$$

where y_t is a random vector, $\square_{t+i}$ is a random shock, $\acute{\omega}_{t-1}$ a specific realization of the information set Ω_{t-1}, and n is the forecast horizon. The GIRF is a random variable, given by the difference between two conditional expectations, which are themselves random variables (Sharma and Panagiotidis, 2005).

4.9 Diagnostic tests

The final stage of this study is to test for the appropriateness of the estimated coefficients; the use of various diagnostic tests is common in empirical studies. This study focuses on the Portmanteau test for autocorrelation also known as the Jarque-Bera test for normality. This statistical test has been proposed to find out whether a sample is drawn from a normal distribution or not, whereas the heteroskasticity test is designed to find out whether the variance of the disturbance is not constant. The study also uses other tests such as Cusum tests and Ramsey Reset.

4.10 Summary

The focus of this chapter is to present the data and methodology that are employed in this study. The presentation of the data encompasses, the description of the model, and the variables as well as the sample period. In addition, this chapter also includes the rationale for the choice of data, as well as techniques used to test the reliability of the data. The central role of this chapter is to provide the information needed for interpreting the results from the econometric analysis.

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION

5.1 Introduction

This chapter presents the results on causal relationship between trade openness and GDP Growth in South Africa for the period 1994Q1-2008Q4. Prior to doing any cointegration or Granger causality analysis, it is essential to check the smoothness of the data. In other words, because the majority of the macroeconomic variables are non-stationary, testing for random walk is needed as a first step. It is therefore, prudent to begin any time series work by first checking the variables for trends.

The structure of the rest of this chapter is as follows: section 5.2 briefly discusses conventional unit root tests and presents empirical results based on the Augmented Dickey-Fuller (ADF) and Phillip-Perron unit root test. Initially, this part begins by graphical inspection before the formal ADF and P-P tests. Section 5.3 presents the results for the Long run Cointegration. In section 5.4, the study estimates cointegration by using two methods: Engel-granger cointegration and Johansen cointegration to determine the cointegration between trade openness measures and GDP growth. Section 5.4 looks at the results for Granger causality test. This is followed by graphical results for impulse responses function in section 5.5.

5.2 Unit root results

Empirical literature suggests that the typical and well conventional method of detecting nonstationary behaviour is to examine the tests for the existence of unit root (Sharma and Panagiotidis, 2005). For this purpose, all the variables are examined through graphical check of their time series plots. The variables are real gross domestic product (GDP), gross capital formation (Kinv), real imports of goods and service (M), import ratio (Mra), real exports of goods and service(X), and exports ratio (Xra) (*see the graphs below)*.

Figure 5.2.1 Graphical inspection on gross domestic product at levels

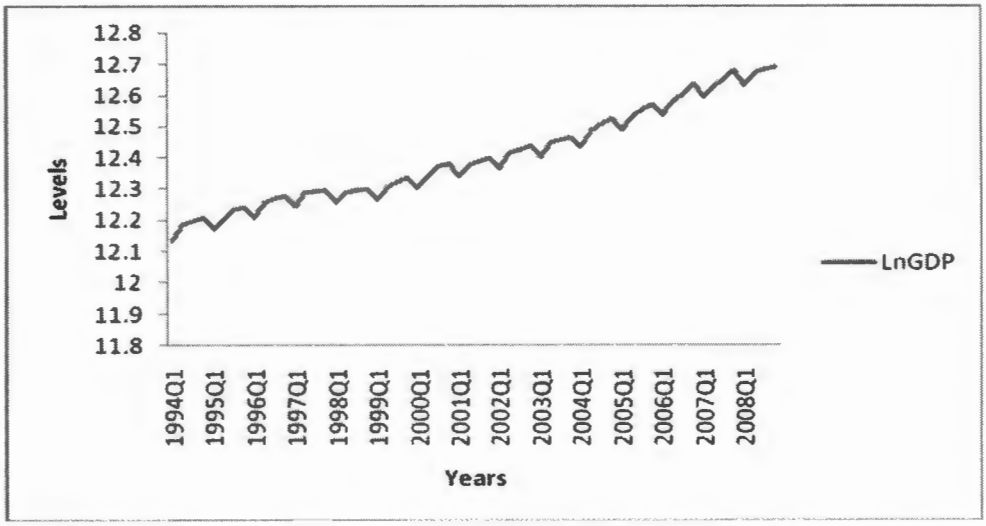
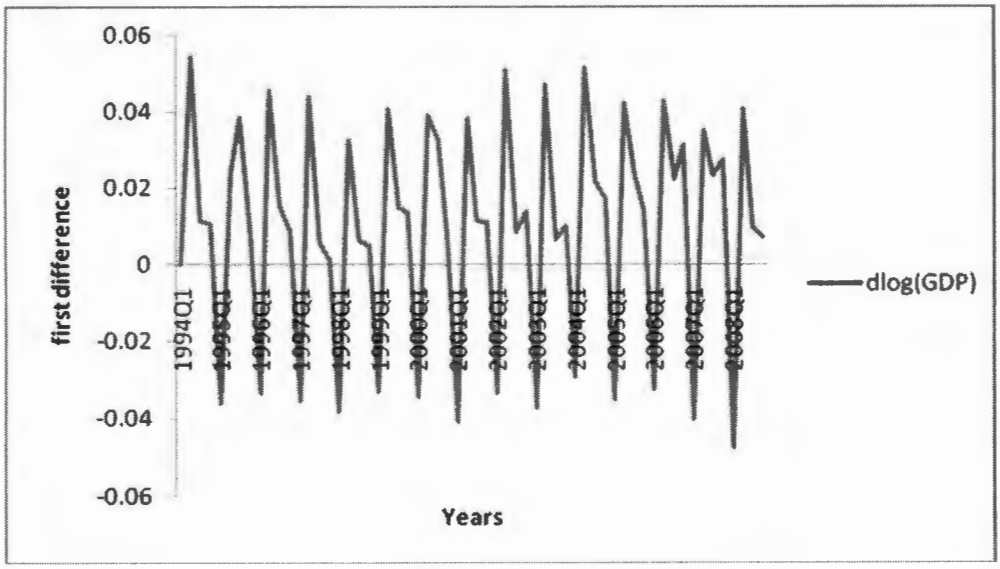


Figure 5.2.2 Gross domestic product in first difference



Source: own compilation

The visual inspection of the data on gross domestic product (GDP) in figure 5.2.1 above shows that GDP is non-stationary in level forms. Visual inspection on the plot of the variable in levels suggests that the series are linearly trended implying that they are potentially non-stationery. The plot on figure 5.2.2 is gross capital formation in first difference; the series indicates a more stationary shape, which means that the series' mean and its variance are constant over time.

Figure 5.2.3 Graphical inspection on gross capital formation at levels

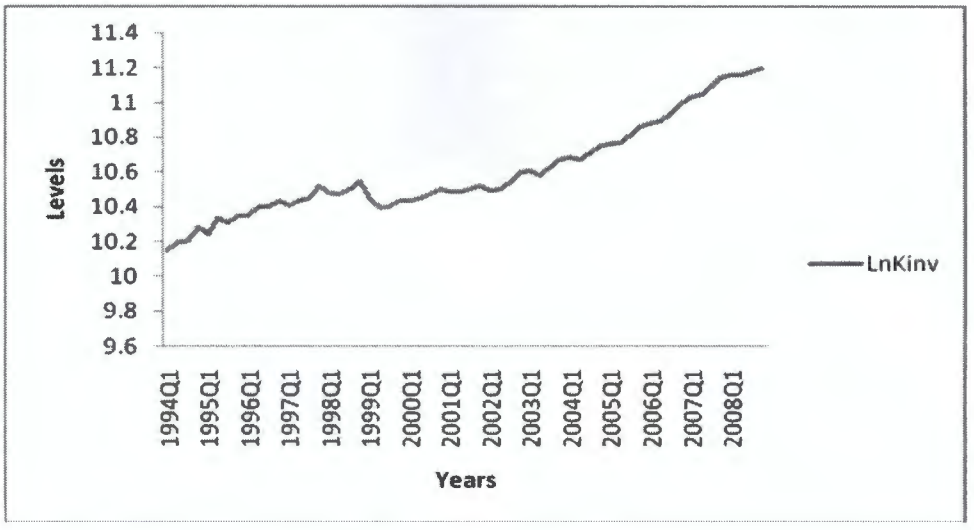
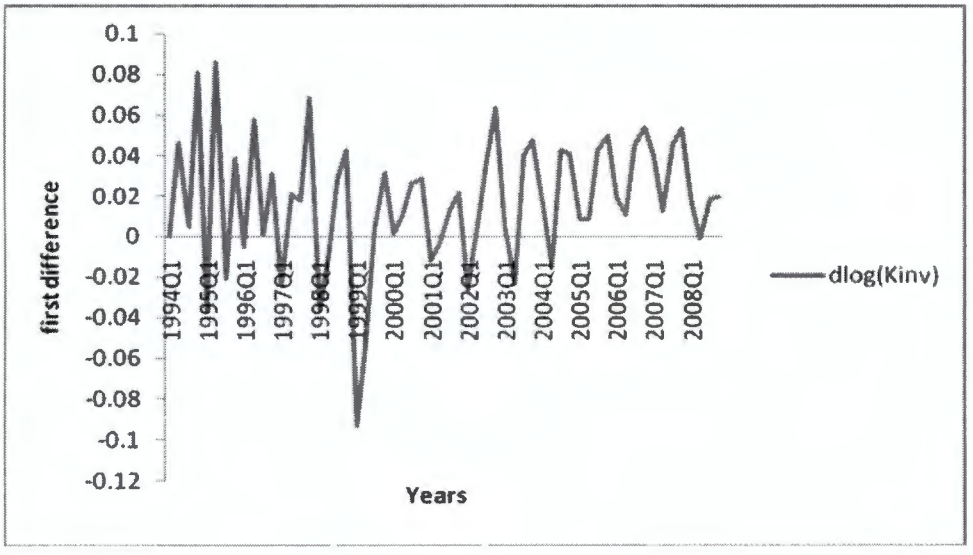


Figure 5.2.4 Gross capital formation in first difference



Source: own compilation

The above figure 5.2.3 representing gross capital formation in levels suggests that the variable is non-stationary, as it can be observed on the figure that it follows an upward trend and exhibits significant time dependence. However, figure 5.2.4 of the same variable in first difference exhibits a more stationary shape, indicating that the series in this form might be stationary.

Figure 5.2.5 Graphical inspection on imports of goods and service at levels

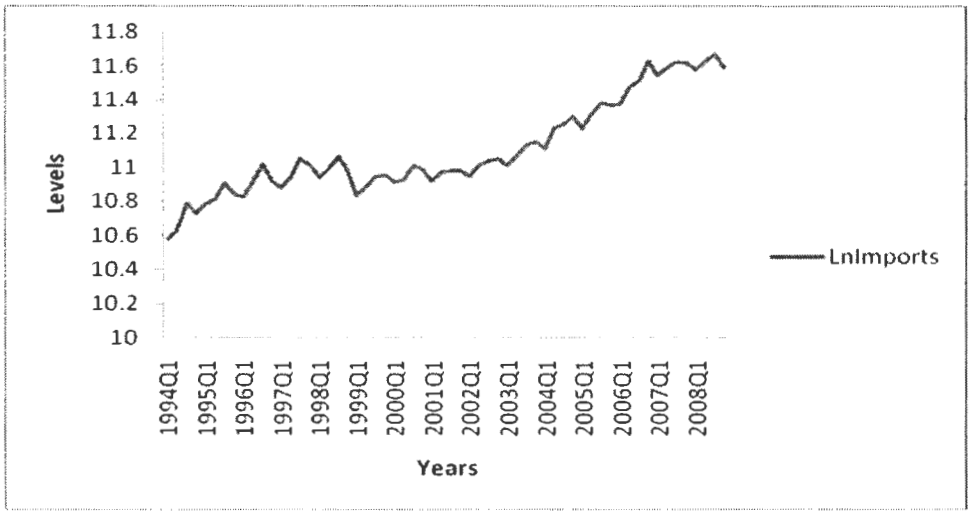
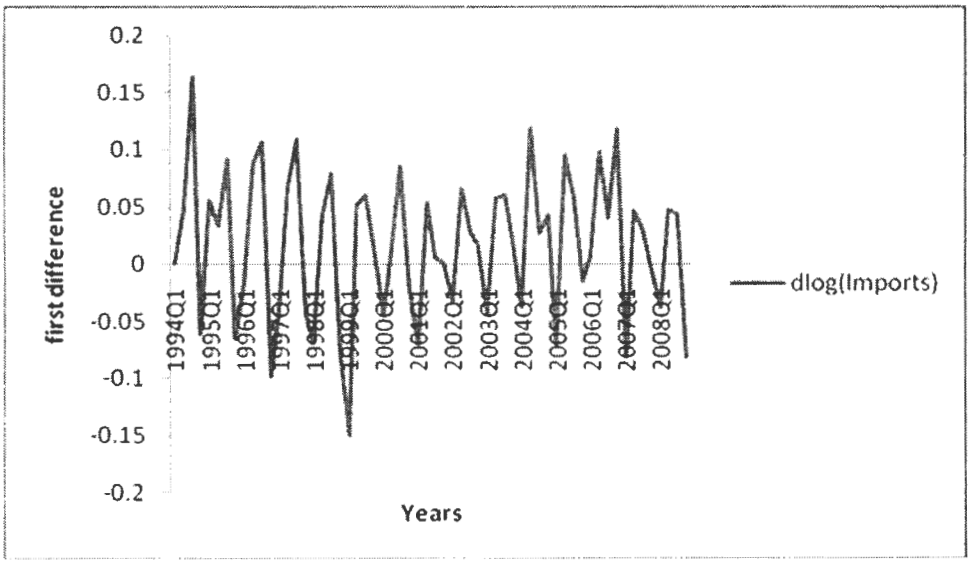


Figure 5.2.6 Imports of goods and service in first difference



Source: own compilation

The above are plots of import of goods and service which are presented in Figure 5.2.5 and 5.2.6. The visual inspection of the plot in levels suggests that the series is linearly trended implying that it is potentially non-stationery. However, in figure 5.2.6 if the series is expressed in first difference the series shows that it is stationary. This implies that its mean is constant over time.

Figure 5.2.7 Graphical inspection on ratio of imports on goods and service at levels

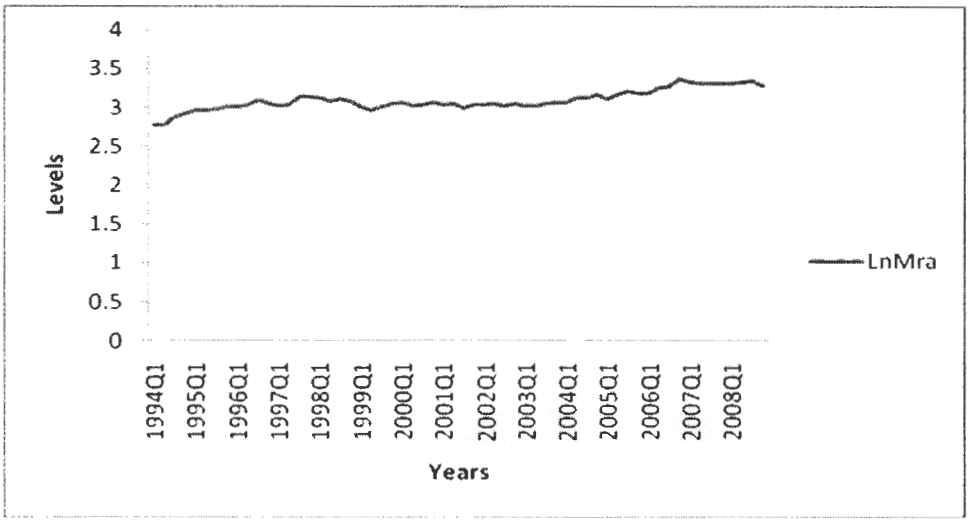
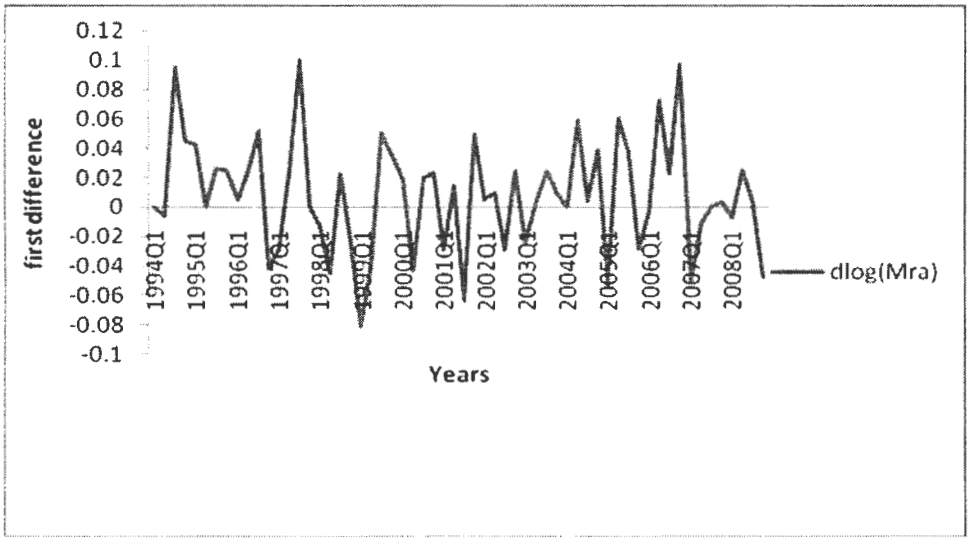


Figure 5.2.8 Ratio of imports on goods and services in first difference



Source: own compilation

The visual inspection of the data on imports ratio in figure 5.2.7 above shows that import ratio is non-stationary in levels form. The visual inspection of the plot in levels suggests that the series is linearly trended implying that they are potentially non-stationery. The plot figure 5.2.8 in first difference the series indicates a more stationary shape, which means that the series its mean and variance are constant over time.

Figure 5.2.9 Graphical inspection on exports of goods and service at levels

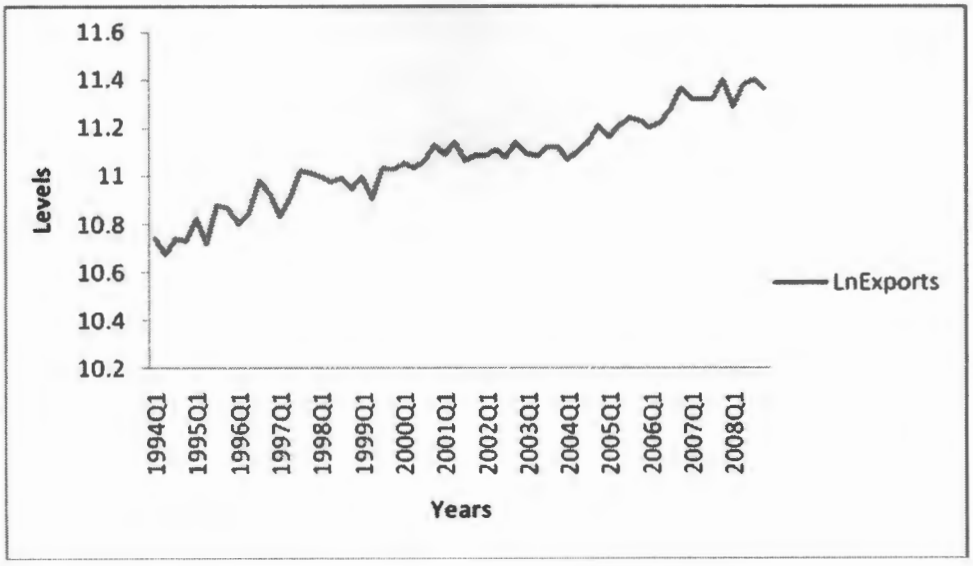
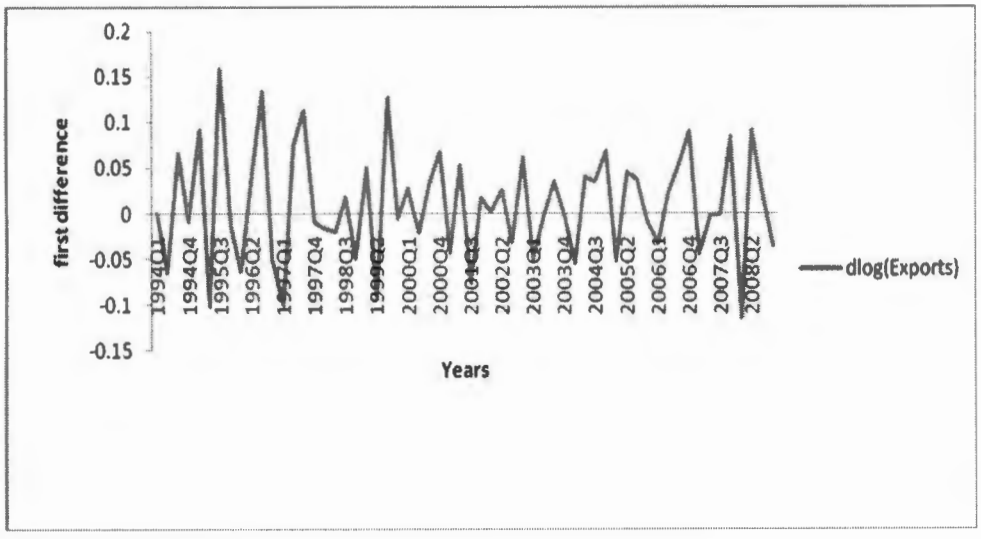


Figure 5.2.10 Exports of goods and services in first difference



Source: own compilation

The above figure 5.2.9 represents exports in levels and suggests that the variable is non-stationary, as it can be observed on the figure that it follows an upward trend and moreover exhibits significant time dependence. However, in figure 5.2.10 of the same variable in first difference exhibits a more stationary shape, indicating that the series in this form might be stationary.

Figure 5.2.11 Graphical inspection on ratio of exports on goods and service at levels

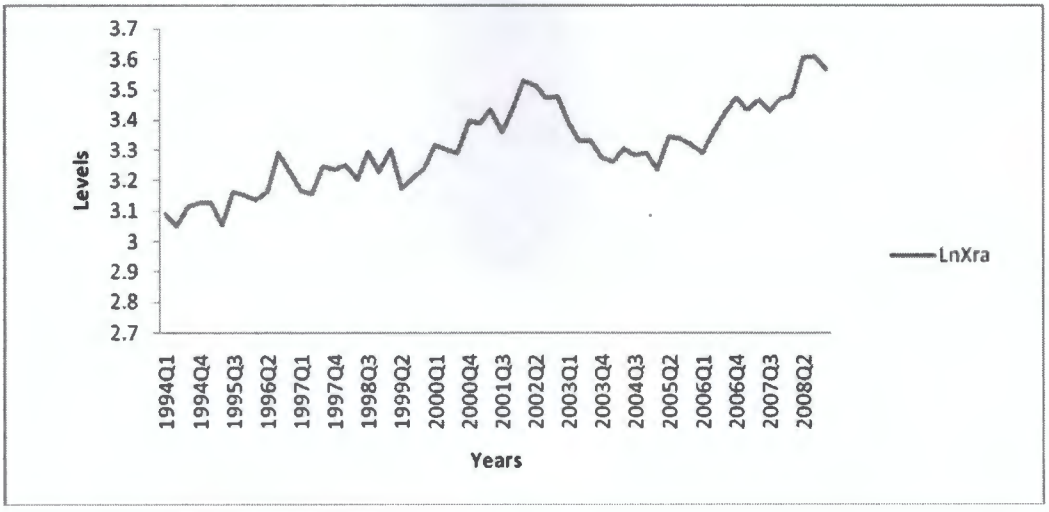
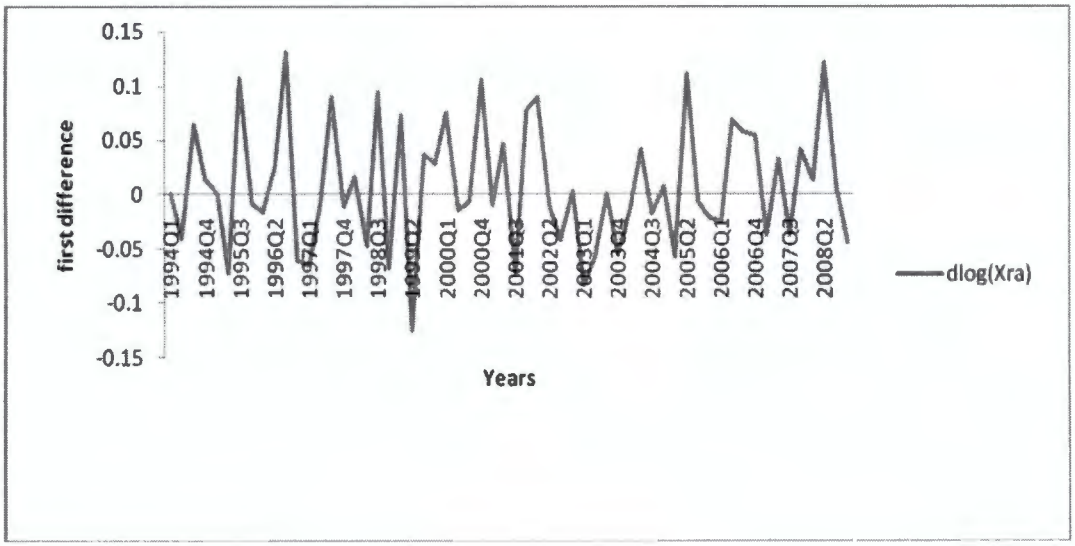


Figure 5.2.12 Ratio of exports of goods and services in first difference



Source: own compilation

The visual inspection of the data on ratio of exports in figure 5.2.11 above shows Xra in levels form. The visual inspection of the variable in levels suggests that the series are linearly trended implying that they are potentially non-stationery. The plot on figure 5.2.12 in first difference of the series indicates a more stationary shape, which means that the series its mean and variance are constant over time.

In summary the above are plots of variables under scrutiny which are presented in Figure 5.2.1 to 5.2.12. The visual inspections of plots of the variables in levels suggests that the series are linearly trended implying that they are potentially non-stationery. Variables in first differences, in contrast, show no evidence of trending time series, different mean values at different points in time or considerable changing variances. The visual evidence provided by the diagrams in first difference is consistent with the variables being integrated at an order of 1 *I(1)*. Therefore, at this stage the formal testing procedures currently available are used to examine each of the variables. To determine the integrating order of time series variables, the Augmented Dickey-Fuller (1981) is used to test each variable for unit root in levels, and then in the first difference form. Table 5.2.1 presents results for all variables in levels and Table 5.2.2 presents results at first difference using ADF test and further detect unit roots by using Phillip-Perron test in Table 5.2.3 and 5.2.4.

This part of the study is dedicated to testing the order of integration. In other words, each variable is tested for stationarity. The hypothesis that is tested is the null hypothesis of the existence of a unit root (non- stationarity) against the alternative of stationarity (no unit root). Note that two different tests for stationarity are performed in this study namely, the ADF and the PP tests. Tables 5.2.1 and 5.2.2 below present the results of running ADF tests on the variables in logarithmic form with trend and intercept, intercept and none. It is vital to note at this point that the order of lag length is determined by using the final prediction error (FPE) criterion, suggested by Akaike in applying the Akaike Information Criterion (AIC). The lag orders have therefore been determined by choosing the smallest lag length such that the residuals of the ADF regression yield empirically white noise.

Table 5.2.1 ADF *Unit root test of all variables at Levels*

Series *levels*	**Model**	**ADF** Lags	**ADF** τ_τ τ_μ τ	**ADF** Φ_3 Φ_1
GDP	Trend and intercept	2	-3.00	4.70
	Intercept	3	5.38	54.01
	none	3	12.31	--------
X (export)	Trend and intercept	0	-5.04***	12.73***
	Intercept	0	-1.15	1.34
	none	3	3.94	--------
M (imports)	Trend and intercept	0	-1.74	1.62
	Intercept	3	1.33	3.45
	none	3	3.67	-------
Xra	Trend and intercept	0	-2.66	3.60
	Intercept	0	-0.53	1.63
	none	3	1.51	---------
Mra	Trend and intercept	0	-2.22	2.55
	Intercept	1	-1.66	1.54
	none	3	1.67	---------
Kinv	Trend and intercept	3	1.25	2.86
	Intercept	3	3.54	3.49
	none	0	5.46	----------

* Statistically significant at 10% level ** Statistically significant at 5% level *** Statistically significant at 1% level

The results from the above table in 5.2.1 indicate that the null hypothesis of non-stationarity cannot be rejected for most of the variables in levels form with trend and intercept. Hence, all the variables when tested for stationarity under the assumption of intercept and none are non-stationary in levels form.

Table 5.2.2 ADF *Unit root test of all variables at first difference*

Series *First difference*	**Model**	**ADF** Lags	**ADF** τ_τ τ_μ τ	**ADF** Φ_3 Φ_1
ΔGDP	Trend and intercept	3	-8.55***	811.54***
	Intercept	3	-8.51***	1005.525***
	none	3	-8.60***	-------
ΔX (export)	Trend and intercept	3	-7.81***	105.10***
	Intercept	3	-7.90***	134.03***
	none	3	-7.98***	---------
ΔM (imports)	Trend and intercept	3	-8.08***	99.40***
	Intercept	3	-8.17***	126.75***
	none	3	-8.20***	---------
ΔXra	Trend and intercept	3	-6.82***	76.37***
	Intercept	3	-6.92***	97.45***
	none	3	-6.99***	----------
ΔMra	Trend and intercept	3	-6.95***	46.42***
	Intercept	3	-7.02***	59.12***
	none	3	-7.06***	---------
ΔKinv	Trend and intercept	3	-5.18***	101.47***
	Intercept	3	-5.20***	128.76***
	none	3	-5.24***	--------

* Statistically significant at 10% level ** Statistically significant at 5% level *** Statistically significant at 1% level

Table 5.2.2 shows that when the ADF test is applied to variables in first differences, under the same assumption of a constant and deterministic time trend, most of the variables become stationary at 1 percent level of significance. Overall, the results from the ADF test suggest that the variables are integrated of order zero. This implies the possibility of cointegrating relationships among the variables.

Table 5.2.3 *Phillips-Perron Unit root test of all variables at levels*

Series Levels	**Model**	**Lag**	**P-P Statistics**
GDP	Trend and Intercept	3	-2.41
	Intercept	3	1.48
	None	3	8.54
Kinv	Trend and Intercept	3	0.81
	Intercept	3	3.23
	None	3	5.88
M	Trend and Intercept	3	-1.33
	Intercept	3	0.05
	None	3	3.02
Mra	Trend and Intercept	3	-2.15
	Intercept	3	-1.53
	None	3	1.61
X	Trend and Intercept	3	-5.08***
	Intercept	3	-0.52
	None	3	2.68
Xra	Trend and Intercept	3	-2.56
	Intercept	3	-1.07
	None	3	1.28

* Statistically significant at 10% level ** Statistically significant at 5% level *** Statistically significant at 1% level

The above table 5.2.3 shows the results for second test that the study is performing for stationarity. The test is performed in order to verify and confirm the results obtained from the ADF. The results from the table above indicate that most of the variables are non-stationary in levels.

Table 5.2.4 *Phillips-Perron Unit root test of all variables at first levels*

Series First difference	**Model**	**Lag**	**P-P Statistics**
ΔGDP	Trend and Intercept	3	-53.80***
	Intercept	3	-53.52***
	None	3	-55.20***
ΔKinv	Trend and Intercept	3	-25.88***
	Intercept	3	-26.16***
	None	3	-26.46***
ΔM	Trend and Intercept	3	-22.44***
	Intercept	3	-22.65***
	None	3	-22.74***
ΔMra	Trend and Intercept	3	-18.66***
	Intercept	3	-18.83***
	None	3	-18.89***
ΔX	Trend and Intercept	3	-32.12***
	Intercept	3	-32.51***
	None	3	-32.85***
ΔXra	Trend and Intercept	3	-24.46***
	Intercept	3	-24.77***
	None	3	-25.05***

* Statistically significant at 10% level ** Statistically significant at 5% level *** Statistically significant at 1% level

Tables 5.2.4 summarise the results for unit root tests in first differences of the data. Overall, the results from the Phillips-Perron unit root test suggest that the variables are integrated of order zero. Indeed, all the variables appear to be stationary in first differences form, with most of them rejecting the null hypothesis of non-stationary at 1 percent level of significance. This implies the possibility of long run relationships among the variables.

5.3 The Long run Cointegration results

Cointegration determines the long run relationship between GDP, exports and export ratio in which the economic theory predicts a positive relationship amongst them. The study applies two models by using convetional ordinary least square (OLS) methods for cointegration test. Hence the estimate of equation (4.1a) and (4.1b) is run at levels and the residuals obtained will be tested for stationarity. It is acknowledged that estimation of variables in levels may lead to spurious results. The estimation enables us to find out if the residuals obtained from the co-integration regression is a white noise process.

It is extremely important to note that the customary diagnostic tests have not been reported. Even though the coefficients reported in the spurious regression could be interpreted as approximations of partial elasticities, they do not provide any kind of basis for sensible and valid inferences at this stage. Furthermore, they cannot be used to draw any kind of inferences without confirming in prior that the variables are in fact cointegrated. In estimating the OLS equation, the first procedure the study have done as in any time series data is to stationarise the variables. All variables were found to be intergrated of order one *I(1)*.

Table 5.3.1 Dependent variable: *GDP growth equation (4.1a)*

Variable	Coefficient	Std. Error	t-statistics
C	75515.36	7198.300	10.490
Kinv	0.834976	0.387399	2.155339
M	0.443804	0.239010	1.856839
X	1.605282	0.223485	7.182950
Sample period = 1994Q1-2008Q4 R-squared = 0.965705 Adjusted R-squared = 0.963868 S.E of regression = 7391.090			

Table 5.3.2 Dependent variable: *GDP growth equation (4.1b)*

Variable	Coefficient	Std. Error	t-statistic
C	97751.58	18595.88	5.256626
MRA	-324.3242	1195.981	-0.271178
XRA	1561.742	514.5383	3.035230
KINV	2.677274	0.297699	8.993228
Sample period = 1994Q1-2008Q4 R-squared = 0.933990 Adjusted R-squared = 0.930454 S.E of regression = 10254.09			

In estimating equation (4.1a) the results are presented in table 5.3.1, it shows that all the independent variables have a positive impact on GDP growth. There is a positive indication of trade openness measured that is, exports and imports, where exports seem to be more significant than import.

By introducing a second equation (4.1b) the results are presented in table 5.3.2, trade openness measures by means of import ratio (MRA) and export ratio (XRA), the results seem different from the previous equation. The import ratio has a negative impact on GDP growth where export ratio has a positive impact on GDP and the effect is statistically significant. The main aims in regressing equation (4.1a) and (4.1b) was not to find the significance of any because they are spurious results. The residuals obtained from the long run cointegration regression results above will be used in the next sub-section to establish if the cointegration model is valid.

5.3.1 Engle-Granger cointegration

The test first runs an ordinary least square (OLS) in levels to produce residuals (see OLS Tables above). Second, it conducts a unit root test on residuals for the null hypothesis of no cointegration relationship and against the alternative of a cointegration relationship between them.

The following figures 5.3.1 and 5.3.2 shows the line graph of residuals which are produced after determining an OLS with non-stationary series, therefore makes the residuals in order of integration *I(0)*.

Figure 5.3.1 Residuals produced from ecuation (4.1a)

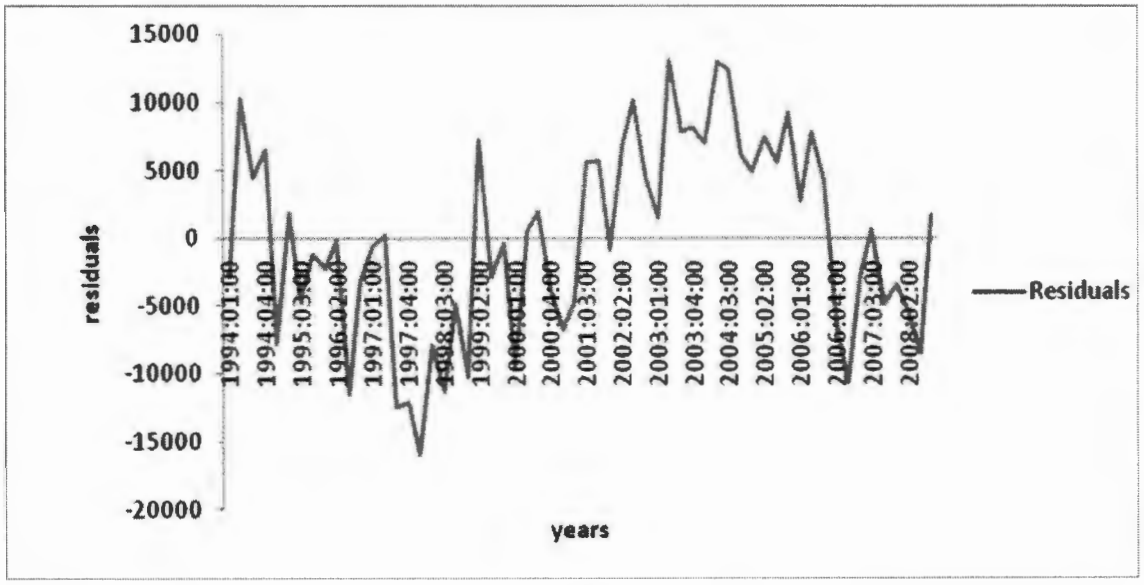
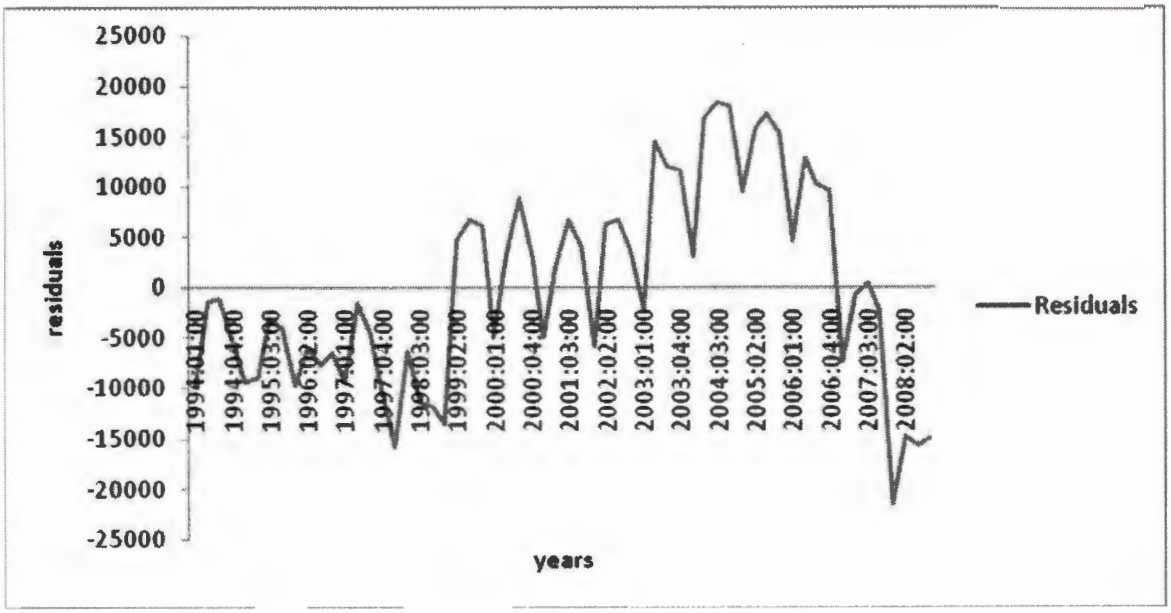


Figure 5.3.2 Residuals produced from equation (4.1b)



Since we are able to produce residuals from OLS, the next step is to perform the unit root test on residuals. The hypothesis is to test the null hypothesis of no cointegration relationship (they are not stationary) against the alternative of a cointegration relationship between them. See Tables 5.3.1 and 5.3.2 below.

Table 5.3.1: *Unit root test on residuals (RESID01)*

Series	**Model**	**ADF** Lags	**ADF** τ_τ τ_μ τ
RES_COINT	Intercept	3	-7.61***
RES_COINT	Trend + intercept	3	-7.65***

Table 5.3.2: *Unit root test on residuals (RESID02)*

Series	**Model**	**ADF** Lags	**ADF** τ_τ τ_μ τ
RES_COINT	Intercept	3	-8.20***
RES_COINT	Trend + intercept	3	-8.32***

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

MacKinnon (1991) has coupled the critical values for particular tests involving the residuals from an OLS equation to a set of parameters of an equation of the response surface estimates. The residuals from cointegrating regression (4.1a) and (4.1b) are then evaluated using the ADF test and the MacKinnon (1991) response table to determine whether they are I(0). Macknnon response surface variables to determine the critical values which must be compared with the ADF statistics above. Critical values are at constant, no trend and constant + trend. The following is the formulae to compute the critical values.

$$C(p)= \Phi_{\infty} + \Phi_1 T^{-1} + \Phi_2 T^{-2} \quad \text{.....5.1}$$

Where:

C(p) is the p percent critical value

T is the number of observation

Constant, no trend:

$$C(p)= \Phi_{\infty} + \Phi_1 T^{-1} + \Phi_2 T^{-2}$$

1%C(p)= -4.64 – 17.188(1/56) – 59.20(1/3136) = - 4.94

5%C(p)= -4.10 – 10.74(1/56) – 21.57(1/3136) = - 4.28

10%C(p)= -3.81 – 8.31(1/56) – 5.19(1/3136) = -3.95

Constant + trend

$$C(p)= \Phi_{\infty} + \Phi_1 T^{-1} + \Phi_2 T^{-2}$$

1%C(p)= -4.96 – 22.50(1/56) – 50.22(1/3136) = - 5.35

5%C(p)= -4.42 – 14.50(1/56) – 19.54(1/3136) = - 4.67

10%C(p)= -4.14 – 11.16(1/56) – 9.88(1/3136) = - 4.33

Hypothesis testing

H_0: *no cointegration (residuals are non-stationary)*

H_1: *cointegration (residuals are stationary)*

Rejection rule: *reject* H_0 *if* **ADF** < *critical value*

Unit root test on residuals (RESID01) and *residuals (RESID02)* ADF for constant is significant at 1 percent level of significance and constant + trend is significance at 1 percent significance level. *Therefore we reject* H_0, meaning that residuals are stationery and there is cointegration.

In summing up the results from Engle and Granger cointegration test are presented in Table 5.3.1 and 5.3.2 and they show that there is cointegration between trade openness measures and GDP growth. According to MacKinnon's critical value, the computed ADF statistics strongly rejected the null hypothesis of a unit root for the regressed residuals. That is trade openness measures such as export of goods and service, imports of goods and service, import ratio, exports ratio and GDP growth are cointegrated.

5.3.2 Johansen cointegration results

It is very important to mention that although the Engle-Granger procedure has distinct advantages and in spite of positive results stated earlier, the model has some defects. Several Monte Carlo studies that considered the robustness of the test showed that in general the most standards test are not powerful. It is important to try several tests of cointegration instead of using one single procedure. Thus, the following Johansen cointegration is applied here.

Table 5.3.2.1 *Johansen cointegration test GDP, KINV, M and X*

Hypothesized no. of CE(s)	Eigenvalue	Likelihood Ratio	1 Percent Critical Value	5 Percent Critical Value
None	0.384	72.880 **	54.46	47.21
At most 1	0.364	46.170 **	35.65	29.68
At most 2	0.279	21.259 **	20.04	15.41
At most 3	0.057	3.230	6.65	3.76

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 3 cointegrating equestion(s) at 5% significance level

Table 5.3.2.2 *Johansen cointegration test GDP, KINV, MRA and XRA*

Hypothesized no. of CE(s)	Eigenvalue	Likelihood Ratio	1 Percent Critical Value	5 Percent Critical Value
None	0.440	66.014 **	54.46	47.21
At most 1	0.313	34.106 *	35.65	29.68
At most 2	0.174	13.389	20.04	15.41
At most 3	0.050	2.875	6.65	3.76

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 2 cointegrating equestion(s) at 5% significance level

The study also confirms the relationship between trade openness and GDP growth by employing Johansen cointegration. Its results are presented in Table 5.3.2.1 and 5.3.2.1. In the first table, according to the critical values reported by Johansen cointegration, a likelihood ratio and eigenvalue test statistics provides significant evidence for the existence of cointegrating relationship between trade openness measures such as exports, imports, capital formation and GDP growth. The cointegration exists with 3 cointegrating vectors found for equation (4.1a). Also, positive results are found when trade openness is measured in terms of ratio of exports and ratio of imports, with 2 cointegrating vectors.

5.4 Error-Correction Model (ECM)

The initial concept of this type of model can be traced back to the work done by Sargan in the mid 1960s, who considered a class of models subsequently to be labelled error correction mechanisms (ECM). The ECM conveniently combines variables in levels, first differences and error correction term to explain the dynamic behaviour of variables of interest. At this stage, we estimate all the long and short-run parameters in the ECM in one single step. It is important to note that in estimating ECM, ordinary least square (OLS) is applied. The reason is that in the first case all variables to be included are *I(0)* and therefore all assumption of OLS hold, and in the other instance although GDP_{t-1},

$KINV_{t-1}$, MRA_{t-1}, XRA_{t-1}, X_{t-1} and M_{t-1} are *I(1)*, OLS can still be employed since cointegration exists between variables.

In estimating the the error correction model, the expression can be drawn from equations (4.1a) and (4.1b). All the variables expressed in first difference and lagged variables are used to reflect the short and long-run parameters. The results for ECM are as follows:

Table 5.4.1 Error-correction Model based on equation (4.1a)

Variable	Coefficient	Std. Error	t-statistics
C	-0.030765	0.141636	-0.217211
DLOG_KINV	0.312779	0.100092	3.124914***
DLOG_M	0.225926	0.049119	4.599535***
DLOG_X	0.147309	0.053825	2.736794***
DLOG_GDP(-1)	-0.369590	0.100020	-3.695153***
M(-1)	-0.025202	0.123742	-0.203664
X(-1)	0.060724	0.140098	0.433440
GDP(-1)	-0.017908	0.377630	-0.047423
RESID01(-1)	-0.207164	0.421544	-0.491442
Sample period = 1994Q2-2008Q4			
R-squared = 0.682			
Adjusted R-squared = 0.630			
S.E of regression = 0.017			
Durbin-Watson stat = 1.856			
Akaike info criterion = -5.110			
Schwarz criterion = -4.790			

* Statistically significant at 10% level

** Statistically significant at 5% level

*** Statistically significant at 1% level

Table 5.4.1, after regressing equation (4.1a) shows the output of error correction mechanism. The coefficients of the variables are in general significant and have the correct sign. They confirm that the short –term effects of capital formation, imports and exports are extremely important in explaining GDP growth. These variables are 1 percent statistically significant in the short run in explaining GDP growth. The coefficient of capital formation growth shows (0.312) has the greatest magnitude, followed by imports growth (0.225) and finally the rate of exports (0.147). Moreover, in the short run, GDP lagged in one period is negatively correlated with GDP by a coefficient of (-0.369). This implies that the current GDP is not influenced by previous GDP. In the long run the study used the lagged variables and there is no evidence indicating any significance of these variables in explaining GDP growth. The residuals from level regression estimated by OLS are included in lagged form and labelled as Resid01(-1). This represents the short-term adjustment mechanism from the equilibrium point, which is always significant, regardless of the specification employed. The significance of the lagged residuals provides strong evidence of the adequacy of an error correction framework. The coefficient shows (-0.207) is negative, as is needed for the dynamics to adjust towards the long-run equilibrium path. Looking at the estimated equation from a purely statistical point of view, it appears as though we have a good relationship with approximately 68 percent of the variation in the dependent variable being explained by the regressors.

Table 5.4.2 Error-correction Model based on equation (4.1b)

Variable	Coefficient	Std. Error	t-statistics
C	-0.007426	0.036155	-0.205396
DLOG_KINV	0.281580	0.121931	2.309348 **
DLOG_MRA	0.271617	0.138582	1.959966
DLOG_XRA	0.009744	0.077714	0.125378
DLOG_GDP(-1)	-0.427720	0.121725	-3.513824**
MRA(-1)	-0.043717	0.069357	-0.630318
XRA(-1)	0.027233	0.045363	0.600331
GDP(-1)	0.022295	0.070732	0.315207
RESID02(-1)	-0.266303	0.149663	-1.779356

Sample period = 1994Q2-2008Q4
R-squared = 0.4075
Adjusted R-squared = 0.3108
S.E of regression = 0.02391
Durbin-Watson stat = 1.940
Akaike info criterion = -4.486
Schwarz criterion = -4.166

* Statistically significant at 10% level
** Statistically significant at 5% level
*** Statistically significant at 1% level

Table 5.4.2 presents results for equation (4.1b) which show that most explanatory variables are positive but differ in their significance level. The coefficient for capital formation is 0.281, the imports ratio is 0.271 and the exports ratio is 0.009 in the short run. Among the entire explanatory variables in the short run, lagged GDP and capital formation has the greatest magnitude followed by the ratio of imports. Exports ratio is according to prior expectations with a small positive impact on GDP growth. In the long run none of the lagged variables import ratio and GDP is statistically significant in explaining GDP growth at 5 percent significance level. The estimated coefficient on the

cointegration regression residual RESID02(-1) is negative at -0.266 as is expected. It appears as though we have a weak relationship with approximately 40 percent of the variation in the dependent variable being explained by the regressors. Overall, the models suggest that exports have positive effect in equation 4.1a and also in equation 4.1b and that exports ratio has a small positive effect in the long run.

5.5 Granger causality results

Since there is cointegration between trade openness and GDP growth, the next step is to test for the direction of causality using a simple Granger causality test by estimating the bivariate autoregressive processes for GDP and trade openness. The objective of this exercise is to empirically test the trade openness led growth (TLG) hypothesis for South Africa. The presence of a cointegrating vector allows for the use of a vector error correction model to test causality. The results of the Granger causality test are presented in the following Tables.

Table 5.5.1: Granger causality (GDP: M)

Null hypothesis	Obs	F statistics	Probability
DLOG_M does not Granger Cause DLOG_GDP	56	0.51455	0.67418
DLOG_GDP does not Granger Cause DLOG_M	56	3.98371	0.01285**

Table 5.5.2: Granger causality (GDP:MRA)

Null hypothesis	Obs	F statistics	Probability
DLOG_MRA does not Granger Cause DLOG_GDP	56	0.41239	0.74483
DLOG_GDP does not Granger Cause DLOG_MRA	56	0.80765	0.49573

Table 5.5.3: Granger causality (GDP:X)

Null hypothesis	Obs	F statistics	Probability
DLOG_X does not Granger Cause DLOG_GDP	56	0.94170	0.42774
DLOG_GDP does not Granger Cause DLOG_X	56	1.18655	0.32456

Table 5.5.4: Granger causality (GDP:XRA)

Null hypothesis	Obs	F statistics	Probability
DLOG_XRA does not Granger Cause DLOG_GDP	56	0.04321	0.98791
DLOG_GDP does not Granger Cause DLOG_XRA	56	0.23821	0.86928

In all the cases in Tables 5.5.1 to 5.5.4, the most reported probabilities are greater than 0.05 significant levels. There is no evidence found to suggest that real exports and ratio of export Granger cause GDP growth. In testing Granger causality test only 3 lags are employed. The hypothesis that GDP does not granger causes imports to be rejected at 5 percent significance level. The evidence in this section does not provide much support for the causality relationship between trade openness measures and GDP growth. There is weak evidence suggesting that the direction of causality runs from GDP to exports, which further strengthens the case against the ELG hypothesis for the South Africa.

5.6 Impulse responses function (IRFs)

In order to demonstrate the dynamic affects of the impact of unitary shocks on the macroeconomic variables under consideration, we consider the formulation of a VAR model. The first differences of the variables are employed, since the variables are both stationary and cointegrated. The VAR system is used to extend the analysis and generate impulse response functions. The causal analysis is extended by examining impulse response functions. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. The IRFs could provide more insight into how shocks to trade openness measures affect GDP growth. *See figures below* 5.6.1 to 5.6.3 for estimating equation 4.1a and also figures 5.6.4 to 5.6.6 for equation 4.1b.

Impulse Response Functions for equation (4.1a)

Figure 5.6.1: Response of Dlog_GDP to One S.D Innovations

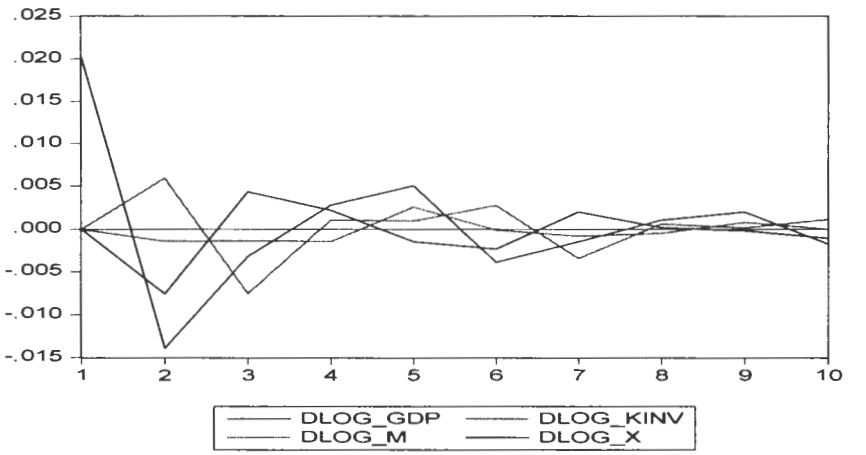


Figure 5.6.2: Response of Dlog_ M to One S.D Innovations

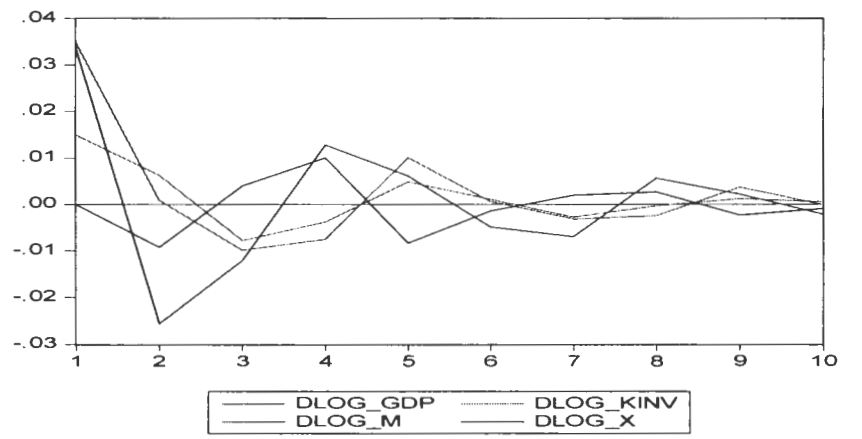
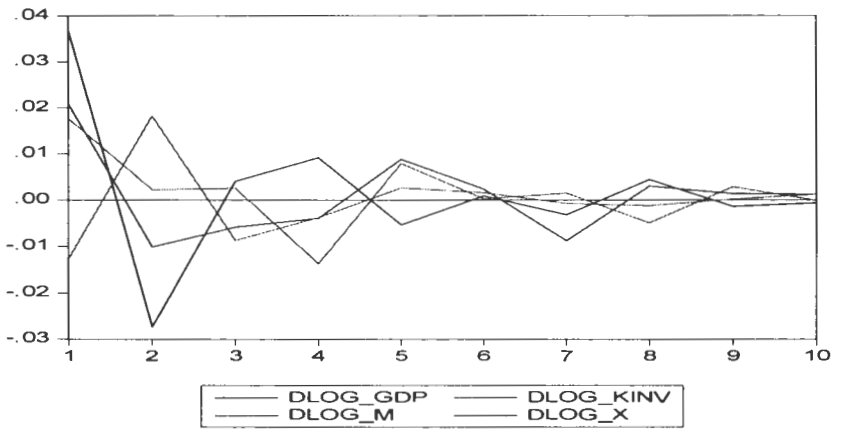


Figure 5.6.3: Response of Dlog_X to One S.D Innovations



Impulse Response Functions for equation (4.1b)

Figure 5.6.4: Response of Dlog_GDP to One S.D Innovations

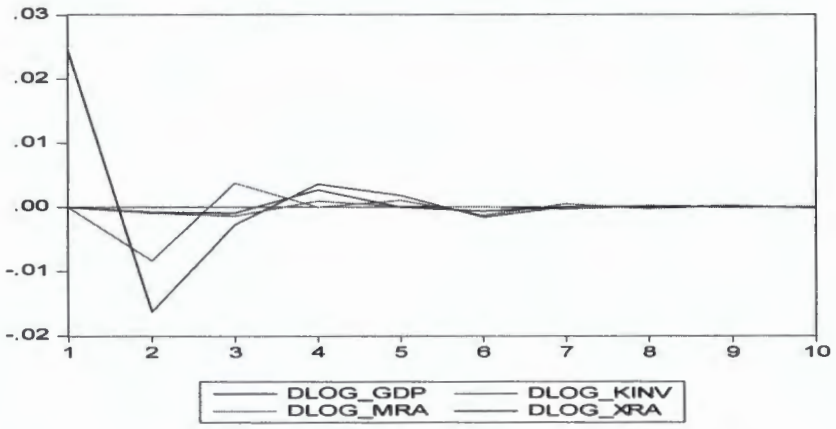


Figure 5.6.5: Response of Dlog_MRA to One S.D Innovations

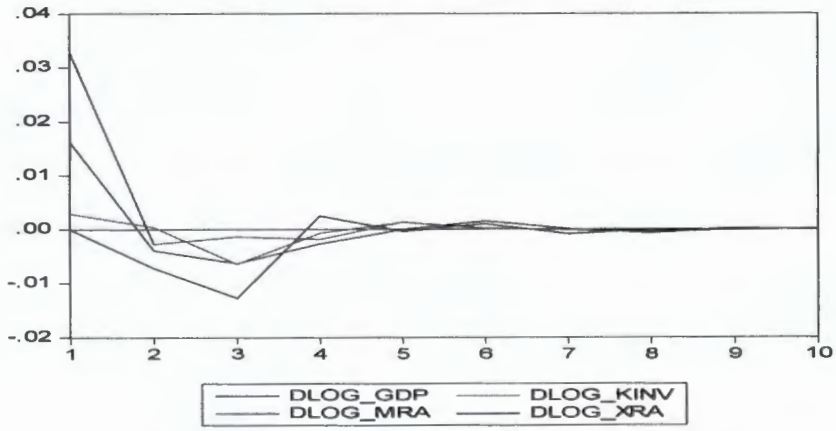
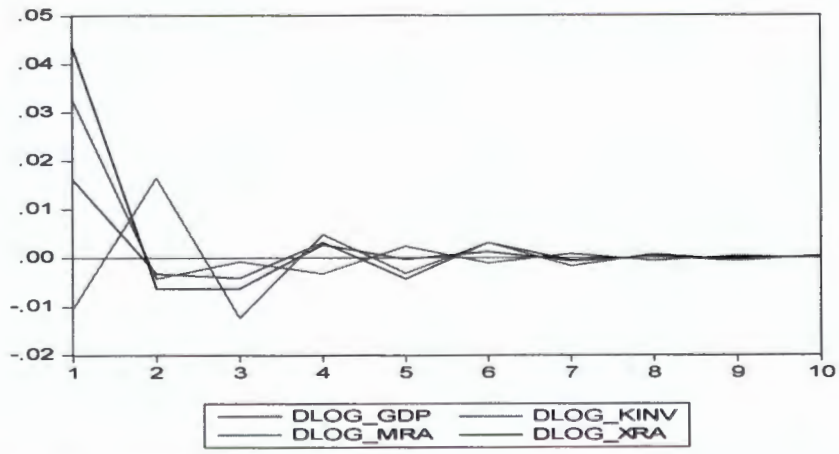


Figure 5.6.6: Response of Dlog_XRA to One S.D Innovations



Figures 5.6.1 to 5.6.3 show the impulse response of each variable to innovations from each of the other variables for equation (4.1a). For completeness, impulse responses are provided for each of the variables in model 1a in the system. However, emphasis is placed only on the relationships between the variables of interest in this study. Figure 5.6.1 indicates that when introducing a shock to the GDP growth, we observe a "small" negative response from capital formation until the periods between four and five and it became unclear throughout the periods. The GDP growth's response to a shock in imports initially indicates a positive response which dies out after two periods and became negative and is unclear quickly throughout the period. The imports response is reported in figure 5.6.2. A negative response from GDP is observed and it dies out after three periods and is not clear through out the period in response to imports. Also there is no significant evidence in the response of imports to shocks introduced by exports throughout the period. Figure 5.6.3 contains the response of exports; it indicates that from period two to four there was a negative shock from GDP growth and dies out through the horizon.

Figures 5.6.4 to 5.6.6 present the results from impulse response analysis for equation (4.1b). Firstly, in figure 5.6.4 there is no evidence in support of ratio of imports and ratio of exports as the response of GDP growth to innovations in exports and import ratio is not significantly different from zero at all periods. In the following figure 5.6.5 the shock is introduced to imports ratio. A positive response from GDP is observed which dies out very quickly after two periods. In the last figure 5.6.6 the shock is introduced to ratio of exports. A positive and 'small' response from GDP is observed which dies out after two periods.

Overall, the Granger causality test result confirms that there is no significant impact of export or export ratio to GDP growth. It is also shown that GDP growth causes imports but not in reversal order. The extension of the analyses to include impulse response analysis indicates that trade openness measures play no significant role in stimulating GDP growth.

5.7 Diagnostic Tests

There are five critical assumptions relating to the classical linear regression model (CLRM). These assumptions are required to show that the estimation technique, Ordinary Least Squares (OLS), has a number of desirable properties, and also that the hypothesis tests regarding the coefficient estimates could validly be conducted. Some of the following assumptions not to be violated: the errors must have zero mean, the errors must be statistically independent of one another, and errors are normally distributed.

The stability test is also applied assuming that the appropriate functional form is linear. This means that the regression model is assumed to be linear in parameters. Whether the model should be linear in form can be formally tested using Ramsey's reset test, which is a general test for misspecification of functional form.

Table 5.7.1 Diagnostic test on equation (4.1a)

Test	H_0	Test Statistic	p-Value	Conclusion
Jarque-Bera	*Residuals are normally distributed*	JB = 1.43	*0.486*	*Accept H_0, and conclude that the residuals are normally distributed*
Breusch-Godfrey	*No serial correlation in the residuals up to the 2nd order*	$nR^2 = 0.420$	*0.516*	*Accept H_0, and conclude that there is no serial correlation in the residuals up to the 2nd order*
ARCH LM	*No autoregressive conditional heteroskedasticity up to the 1st order*	$nR^2 = 1.70$	*0.191*	*Accept H_0, and conclude that there is no autoregressive conditional heteroskedasticity up to the 1st order*
White	*No heteroskedasticity*	$nR^2 = 46.63$	*0.364*	*Accept Reject H_0, and conclude that there is no heteroskedasticity*
Stability test				
Ramsey RESET	*Model is stable with no specification error*	LR = 13.42	*0.98*	*Accept H_0, and conclude that the model is stable with no specification error*

Rejection rule H_0: if P< 0.05

Source: Own compilation

Table 5.7.2 Diagnostic test on equation (4.1b)

Test	H_0	Test Statistic	p-Value	Conclusion
Jarque-Bera	*Residuals are normally distributed*	JB = *1.45*	*0.483*	*Can not reject H_0, and conclude that the residuals are normally distributed*
Breusch-Godfrey	*No serial correlation in the residuals up to the 2nd order*	nR^2 = *0.05*	*0.814*	*Can not reject H_0, and conclude that there is no serial correlation in the residuals up to the 2nd order*
ARCH LM	*No autoregressive conditional heteroskedasticity up to the 1st order*	nR^2 = *3.298*	*0.069*	*Can not reject H_0, and conclude that there is no autoregressive conditional heteroskedasticity up to the 1st order*
White	*No heteroskedasticity*	nR^2 = *48.67*	*0.290*	*Reject H_0, and conclude that there is heteroskedasticity*
Stability test				
Ramsey RESET	*Model is stable with no specification error*	LR = 8.69	*0.368*	*Can not reject H_0, and conclude that the model is stable with no specification error*

Rejection rule H_0: if P< 0.05

Source: Own compilation

The hypothesis tests and interval estimates for the coefficients are based on the assumption that the errors, and hence the dependent variables, are normally distributed. The normality of the errors for the model selected is tested using Jarque-Bera test. The rejection of normality may indicate that there are some outlying observations or that the error process is not homoskedastic. The results, based on Table 5.7.1 and Table 5.7.2, indicate that the evidence given by Jargue-Bera test concludes that the residuals are normally distributed. This satisfies the assumptions of the classical normal linear regression model. The white test also suggests that there is no heteroskedasticity in residuals from ECM for both models.

The study also applies stability cusum tests when analysing the stability of the long-run coefficient together with the short run dynamics. The cusum tests point that the null hypothesis (i.e. that the regression equation is correctly specified) cannot be rejected if the plot of these statistics remains within the critical bound of the 5 percent significance level. As indicated in figure 5.7.1 and 5.7.2, the plots both CUSUM are within the boundaries. That is to imply that the stability of the parameters has remained within its critical bounds of parameter stability and hence these statistics confirm the stability of the long run coefficients of the GDP functions in both models.

Figure 5.7.1: Cusum test for equation 4.1a

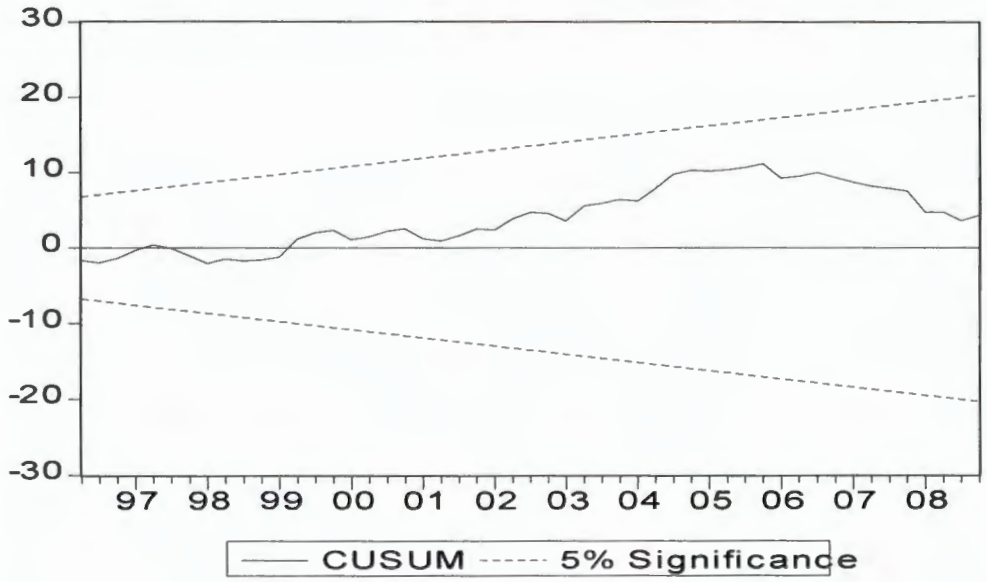
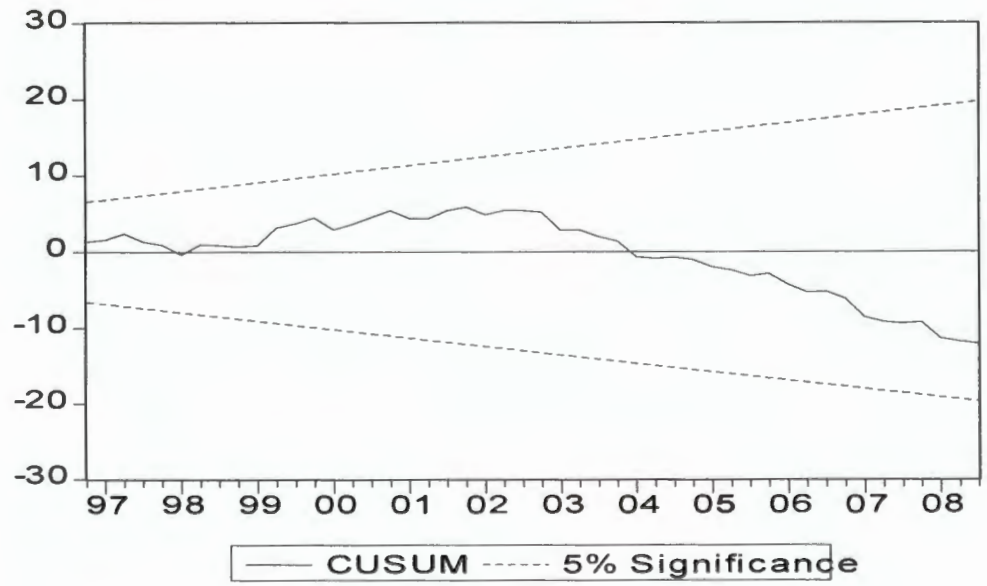


Figure 5.7.2: Cusum test for equation 4.1b



5.8 Findings of the study

The current study attempts to make some contribution to international trade as a field by analysing and explaining the causal relationship between trade openness and GDP growth in South Africa since the ushering in of democracy in 1994. Moreover, the results obtained from the econometric analysis of the data are analysed with regard to the main objective of this study. As explained in previous chapters, and based on different theories on trade openness, the main factors adopted by this study in explaining GDP growth include gross capital formation, total exports, total imports and the ratio of exports and ratio of exports. The estimation is based on the assumptions of regression analysis and the GDP growth equation have been estimated with gross capital formation, exports and imports as an independent variables for equation (4.1a). For equation (4.1b), GDP growth is estimated with variables imports ratio, gross capital formation and ratio of exports. Both cointegration tests have shown that there exists a long-run relationship between openness and GDP growth at 1 per cent significance level.

The estimated equation (4.1a) (*see results in table 5.4.1)* shows the short-run effect of the cointegrating results relating to all the above mentioned variables. The estimate of the elasticity of GDP growth with respect to the total exports is 0.14 and also imports shown an elasticity of 0.22. The individual coefficients obtained are quite precise and have the expected signs. Hence, that an increase in total exports by 1 percentage point will result in an increase in GDP growth by 14 percent. In considering imports results from the theoretical point, it is expected to give a negative sign but surprisingly the finding is positive. However, this result can be explained by the fact that imports, in the form of capital goods and intermediate goods, may boost the GDP if they are used to further production. The study also adopts Granger causality tests and impulse response functions to examine whether growth in trade openness stimulate GDP growth or vice versa. The results suggest that in all trade openness measures that were used, there is weak evidence suggesting causality from GDP to exports or vice versa.

5.9 Summary

The results of the econometric analysis have been presented in this chapter. The study uses two forms of trade openness measures which are estimated in two models. Prior to the estimation, the study uses ADF and P-P unit root test to stationarise the data. The empirical results based on the ADF model in levels provide no evidence against the null hypotheses of unit roots in the series under investigation. In other words, all variables examined are found to be non-stationery at levels. The study further difference the series where they are found to be integrated of order *I(1)*. This chapter also presents results to determine the long-run relationship between trade openness and GDP growth in the South African economy with the application of Engel-Granger and Johansen cointegration techniques. The result shows that there is a cointegration between trade openness measures and GDP growth. The application of ECM in equation (4.1a) indicates that in the long run, exports seem to have a positive impact on GDP growth whereas imports have a negative effect. Therefore it can be concluded that estimating the equation (4.1a) gives better outcomes than other equation 4.1b.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMEDATIONS

6.1 Introduction

The assumption of comparative advantage gave rise to the trade openness-led GDP growth (TLG) hypothesis. Although it is frequently assumed that trade growth contributes positively to economic growth, recent empirical studies generate mixed results. Given such uncertainty of results, this research contributes to the literature by studying the relationship between trade openness and GDP growth in South Africa. This chapter is structured as follows: section 6.2 presents the summary, section 6.3 deals with the conclusions of the study. Section 6.4 looks at policy implications and recommendations and section 6.5 discusses suggestions for further research.

6.2 Summary

The main objective of this study was to examine the causal relationship between trade openness and GDP growth since the country's democracy in 1994Q1 to 2008Q4. Chapter 1 of this study introduced the following research questions: (1) is there a positive relationship between exports and GDP growth in South Africa? (2) Is there a positive relationship between imports and GDP growth? (3) Does causality exist between exports and GDP growth? (4) Does causality exist between imports and GDP growth? (5) Do exports and imports have any significant effect on GDP growth? (6) Is there lack of increased exports due to less openness in South African economy?

Chapter 2 of this study explored the South African economic performance during the democratic era. The situation has improved drastically since the coming of democracy, where it is shown that even though GDP growth is at lower levels it has shown some improvements better than during the apartheid period. The performance of exports and imports were also reviewed where the study has looked at South Africa's trading partners. It is evident from the study that South Africa still has a problem of diversifying

its exports. The investigation has also indicated that most imports in South Africa are capital based.

Chapter 3 provided a review of the trade theories and empirical literature that gave a background to this work. The first section of this chapter dealt with trade theories that have shown that even though GDP growth is influenced by many factors, international trade and the market reforms are important determinants of GDP growth. Empirical evidence on this issue in South Africa is mixed, that is, some authors reported results supporting trade-led GDP growth, others reported growth-led trade, and still others reported no significant relationship between trade and GDP growth.

Chapter 4 presented the research methodology dealing with the trade openness and GDP growth hypothesis. The econometric procedures used in conducting this study were also developed in this chapter. These procedures included formulating economic models, testing for unit roots and estimating long run equations. In order to determine cointegration, the study adopted Engle-Granger two steps and Johansen cointegration techniques. The study further adopted the following techniques for analysis: the ECM, Granger causality test, Impulse responses functions (IRFs) and diagnostic tests.

Chapter 5 presented the data used in analysing trade openness-Led GDP growth in South Africa. Results, analysis and interpretations of the data were also presented in this chapter.

6.3 Conclusion

The results shows that in estimating equation (4.1a), the long-run equilibrium relationship shows that variables such as exports, imports and gross fixed capital formation are positively correlated with GDP growth. These results are expected from economic theory, that an increase in exports leads to an increase in GDP. Investment can determine long-term growth, so the higher the level of investments, the higher the prospect of GDP growth. In contrast, estimating equation (4.1b) where trade openness is measured in terms of ratio of imports, the results have shown a negative impact on GDP growth. This outcome is inconsistent with prior expectations.

Cointegration is also studied using Engle-Granger's two-step procedure. Using the two equations (4.1a) and (4.1b), empirical evidence shows that at the 1 percent level of significance, the variables are cointegrated of order 1 for quarterly data under scrutiny. The Johansen Cointegration test is also used on the assumption of a constant and no trend in the cointegrating vector. Johansen's cointegration tests show that cointegration (long-run relationships) exists between the GDP, exports, imports and capital formation. Three cointegrating vectors are found for equation (4.1a). Johansen's cointegration tests for equation (4.1b) has also shown that long-run relationships exists between the GDP, ratio of exports, ratio of imports and capital formation and two cointegrating vectors are found.

The relationship between trade openness and GDP growth in South Africa is also investigated by estimating an error correction model (ECM). It is indicated that in both equations, capital formation in the long run has 1 and 5 percent significance level in explaining GDP growth. In considering trade openness measures such as imports and exports in equation (4.1a) the variables that have significance in affecting GDP growth in the short run, but its coefficient is not that statistically significant.

The causal relationship between trade openness and GDP growth is examined using Granger-causality tests. When testing Granger causality, restrictions are imposed. That is, the Granger-causality tests are estimated for the short run causality. No evidence is found to support the hypothesis that trade openness measures Granger causes GDP growth in the short-run for South Africa. The only hypothesis found is GDP growth-led import growth which is supported by the empirical findings in South Africa at 5 percent significant level.

The study has also utilised the concept of impulse response functions in order to investigate how the system responds to a macroeconomic shock. This approach allows us to simulate the effect of a given (predetermined) shock on the economic system. The response shocks show no evidence of causality between trade openness and GDP growth. The only exception that can be made is the shock made by GDP growth on imports but the shock does not last for a long period. Finally, the results of the diagnostic tests employed in equation (4.1a) are satisfactory, with no heteroskedasticity, and residuals are normally distributed with no problem of serial correlation in residuals. In equation (4.1b) there is no problem of heteroskedasticity and serial correlation in the residuals. It is therefore, concluded that there is weak evidence suggesting causality from GDP growth to trade openness or vice versa. This implies that the South African government should continue improving the policy regarding trade openness and GDP growth.

6.4 Policy Implications and Recommendations.

It is apparent that even the best economic policies cannot achieve the expected outcomes immediately. It is however, important to look at long-term results. The following policy directions are proposed.

- Trade openness promotion strategies are beneficial to GDP growth. In fact, openness stimulates economic growth on both the demand and supply side.

South Africa should use policies that make exports more competitive in order to get access to international markets. For this rationale, increasing the share of and diversifying of total exports and imports should be considered as top priorities.

- The findings of the study show a smaller than expected effects of trade openness on the GDP growth process in South Africa. This is mostly because the South African exports are more raw resource based. Therefore, to promote openness, the South African government should encourage exporters to improve their competitive advantage and change their trade pattern from raw material based to more technological and human capital intensive goods.

- Empirical findings of this investigation indicate that capital formation is necessary to GDP growth rate. This means that the competency of investment projects needs to be enhanced. Moreover, infrastructure must be upgraded and modernised. It is therefore, very important that the South African policy makers take the necessary steps to exploit capital formation to their advantage.

- The statistical insufficient impact of imports on GDP growth rate in South Africa were perhaps due to ineffective governmental controls intervention policies of import restrictions. It is recommended that the South African government establish a relatively low and uniform tariff system. In addition, the elimination of trade barriers to the importation of capital and intermediate goods which are to be used for exporting goods is highly recommended.

- Most openness measures used in this study show a positive small relationship between trade openness and GDP growth. An open trade policy will be a beneficial strategy for South Africa in the long-run. Therefore, it is suggested that the South African government continue the policy of trade openness, enhancing its international competitiveness by reducing restrictions on exports and imports.

6.5 Suggestions for future research.

The present dissertation has studied the relationship between trade openness (exports/imports) and GDP growth. It is suggested that future investigations should exclude imports and exports from GDP, and this could help identify any prospective relationship between trade openness and GDP growth and would be useful for future policy decisions. Another important issue for further investigation is the role of exports or imports in individual sectors of the economy. This would allow the formulation of policies specific to individual sectors in the South African economy.

Alternatively, future research on trade openness and GDP nexus might involve the development of a wide array of data such as annual and disaggregated data. For instance, the total GDP could be disaggregated into tradable and non-tradable and potential links between the two sectors could be investigated in order to formulate specific targeted growth policies.

Finally, the study could be further extended to include other relevant variables that determine GDP growth. In other words, future research in this area could also consider other variables such as the effect of the exchange rate, tariffs and government spending. This could enable the quantification of the small effect of openness on GDP growth and the implementation of policies related to such issues as exchange rate management and monetary and fiscal stability.

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APPENDIX A: A summary on trade openness and GDP in developed economies

Study	Period of Study	Methodology		Conclusion
		Variables	Econometric technique	
Economidou & Murshid (2007)	1978-1997 OECD	Total factor productivity (TFP), trade	OLS	positive
Konya (2006)	1960-1997 OECD	Real exports, GDP	Granger causality	Mix results
Laszlo (2004)	OECD	Exports, GDP	Granger causality, wald test, VAR	Unanimous conclusion
Zestos & Tao (2002)		GDP, Imports, Exports	Granger causality	Causality exist
Awokuse (2007)		Imports, exports, GDP	Granger causality	ELG,ILG
Morley & Morgan (2008)	Europen Union	Exports, productivity	ADRL	positive
Dritsakis (2004)	1991:1-2001:4 European union	Exports, investment, economic development	Causality tests	positive
Xiao & Reed (2007)	1966-2000	Exports, production growth	VARMA, ARMA, IRFs, Causality Test	Bi-directional
Cortés-Jiménez, Pulina, Riera-i-Prunera. and Artis. (2009)	1964-2000 Spain	Tourism, exports, economic growth	Granger causality	ELG,TLG confirmed

Khalafalla & Webb (2001)	1965Q1-1980Q4 1981Q1-1996Q4	Economic growth, total exports, total imports	Causality based on VECM	ELG for two periods
Beko (2003)	1992-1999 Slovenia	Exports, output growth	Causality analysis	Bi-directional relation
Mah (2005)	1971-2001 China	Real exports, output growth	Causality analysis	Bi-directional causality
Álvarez-Ude, Gálvez and Gómez (2007)	1960-2004 Cuba	Export, GDP	Causality test, MWALD, VAR	ELG valid
Medina-Smith (2001)	1950-1997 Costa-Rica	Export, GDP	Causality analysis	ELG valid
Dritsaki, Dritsaki and Adamopoulos (2004)	1960-2002 Greece	Trade, FDI, Economic growth	VAR, Causality analysis	Bilateral causal between export and GDP
Mah (2007)	1980-2001 China	Exports, GDP	ECM, Causality analysis	Bi-directional causation
Awokuse (2006)	1960Q1-1991Q4 Japan	Real exports, GDP	Causality analysis, FEVD	Bi-directional causality
Balaguer and Cantavella-Jorda (2004)	1961-2000 Spain	Economic growth, exports	OLS	positive

Source: own compilation

APPENDIX B: A summary on trade openness and GDP in developing economies

Study	Period of Study	Methodology		Conclusion
		Variables	Econometric technique	
Sarkar (2007)	1961-2002 East Asian countries	trade-GDP ratio, growth	ARDL	Majority of countries experience no positive long-term relationship
Bahmani-Oskooee, Economidoe and Goswami (2005)	1969-1999 developing countries	export and output	OLS	Positive long run relationship
Francis, Iyare and Lorde (2007)	1961 to 2000 Eight selected Caribbean countries	agricultural export diversification, economic growth		Most countries Positive relation exist
Gutie´rrez de Pineres and Cantavella-Jorda (2007)	sixteen Latin American countries	export and growth	Causality analysis	ELG hypothesis receives weak support
Love and Chandra (2004)	1950–98, 1970–2000, 1965–97 South Asian countries	real exports, real GDP	multivariate framework	bidirectional causality
Audrey and Evan (2007)	1976 to 2005 three ASEAN countries	export, inflation, investment and economic growth		export and GDP positive and significant

Sinoha-Lopete (2006)	1980-2002 nine Southern African countries	Export-Led Growth	causality tests	Most countries exports do not cause GDP
Jordaan and Eita (2007)	1970 to 2005 Namibian	Exports, GDP, GDP per capita	Causality analysis	exports Granger cause GDP and GDP per capita
Siddiqui and Iqbal (2005)	1972 to 2002 Pakistan	GDP, export and import, investment, population growth	OLS	negative relationship between trade and GDP growth
Abou-Stait (2005)	Egypt	exports, imports and GDP	Causality analysis	exports Granger cause GDP
Sharma and Panagiotidis (2004)	1971-2001 India	exports and output	Causality analysis	no evidence that real exports Granger cause GDP

Source: own compilation

APPENDIX C:

Basic Statistical definitions

Prob-

- Is the probability that the Student's t random variable lies further in the tail of the distribution than the calculated t-statistic for the coefficient does. This value can also be used to test the hypothesis given above. This is an easier approach, and always produces exactly the same decision as the previous decision rule:

R-Squared (R^2)

- Is the "goodness of fit" measure. It measures the proportion of variation in the dependent variable that is "explained" by the sample regression function; it measures the degree to which the data lie "close" to the line.

Adjusted R^2

- It contains a degrees of freedom correction that accounts for the estimation of additional parameters. Intuitively, if adding independent variables adds more statistical information than is consumed by the additional coefficients, then the adjusted R^2 increases.

Sum squared resid (SSR)

- Is an estimator of the error variance σ and the square root of this estimator is known as the standard error of the regression (S.E. regression).

Durbin-Watson stat

- Is designed to detect first-order serial correlation of residuals.

APPENDIX D:

Long run cointegration equation 4.1a

Dependent Variable: GDP
Method: Least Squares
Date: 04/18/10 Time: 01:02
Sample: 1994:1 2008:4
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
KINV	0.834976	0.387399	2.155339	0.0354
M	0.443804	0.239010	1.856839	0.0686
X	1.605283	0.223485	7.182950	0.0000
C	75515.36	7198.300	10.49072	0.0000

R-squared	0.965705	Mean dependent var	245887.2
Adjusted R-squared	0.963868	S.D. dependent var	38883.07
S.E. of regression	7391.090	Akaike info criterion	20.71828
Sum squared resid	3.06E+09	Schwarz criterion	20.85790
Log likelihood	-617.5484	F-statistic	525.6290
Durbin-Watson stat	0.886845	Prob(F-statistic)	0.000000

APPENDIX E:

Long run cointegration equation 4.1b

Dependent Variable: GDP
Method: Least Squares
Date: 04/18/10 Time: 01:10
Sample: 1994:1 2008:4
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
KINV	2.677274	0.297699	8.993228	0.0000
MRA	-324.3242	1195.981	-0.271178	0.7873
XRA	1561.742	514.5383	3.035230	0.0036
C	97751.58	18595.88	5.256626	0.0000

R-squared	0.933990	Mean dependent var	245887.2
Adjusted R-squared	0.930454	S.D. dependent var	38883.07
S.E. of regression	10254.09	Akaike info criterion	21.37308
Sum squared resid	5.89E+09	Schwarz criterion	21.51270
Log likelihood	-637.1924	F-statistic	264.1191
Durbin-Watson stat	0.526227	Prob(F-statistic)	0.000000

APPENDIX F:

Error Correct Mechanism for equation 4.1a

Dependent Variable: DLOG_GDP
Method: Least Squares
Date: 09/02/10 Time: 13:01
Sample (adjusted): 1994Q3 2008Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG_KINV	0.312779	0.100092	3.124914	0.0030
DLOG_M	0.225926	0.049119	4.599535	0.0000
DLOG_X	0.147309	0.053825	2.736794	0.0086
DLOG_GDP(-1)	-0.369590	0.100020	-3.695153	0.0006
GDP(-1)	-0.017908	0.377630	0.047423	0.9624
M(-1)	-0.025202	0.123742	-0.203664	0.8395
X(-1)	0.060724	0.140098	0.433440	0.6666
RESID01(-1)	-0.207164	0.421544	-0.491442	0.6253
C	-0.030765	0.141636	-0.217211	0.8289

R-squared	0.682497	Mean dependent var	0.008703
Adjusted R-squared	0.630660	S.D. dependent var	0.028811
S.E. of regression	0.017509	Akaike info criterion	-5.110445
Sum squared resid	0.015022	Schwarz criterion	-4.790721
Log likelihood	157.2029	Hannan-Quinn criter.	-4.985906
F-statistic	13.16616	Durbin-Watson stat	1.856040
Prob(F-statistic)	0.000000		

APPENDIX G:

Error Correct Mechanism for equation 4.1b

Dependent Variable: DLOG_GDP
Method: Least Squares
Date: 09/02/10 Time: 14:47
Sample (adjusted): 1994Q3 2008Q4
Included observations: 58 after adjustments

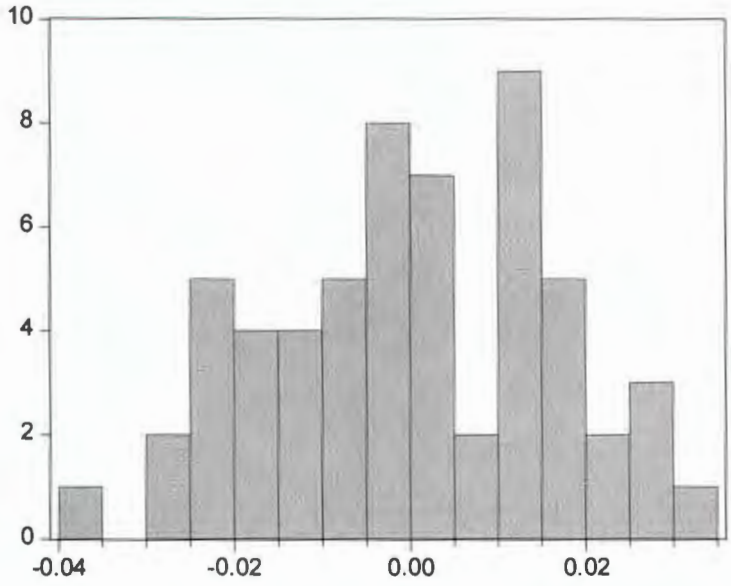
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG_KINV	0.281580	0.121931	2.309348	0.0252
DLOG_MRA	0.271617	0.138582	1.959966	0.0557
DLOG_XRA	0.009744	0.077714	0.125378	0.9007
DLOG_GDP(-1)	-0.427720	0.121725	-3.513824	0.0010
GDP(-1)	0.022295	0.070732	0.315207	0.7539
MRA(-1)	-0.043717	0.069357	-0.630318	0.5314
XRA(-1)	0.027233	0.045363	0.600331	0.5511
RESID02(-1)	-0.266303	0.149663	-1.779356	0.0814
C	-0.007426	0.036155	-0.205396	0.8381

R-squared	0.407531	Mean dependent var	0.008703
Adjusted R-squared	0.310802	S.D. dependent var	0.028811
S.E. of regression	0.023918	Akaike info criterion	-4.486634
Sum squared resid	0.028032	Schwarz criterion	-4.166910
Log likelihood	139.1124	Hannan-Quinn criter.	-4.362095
F-statistic	4.213098	Durbin-Watson stat	1.940099
Prob(F-statistic)	0.000672		

APPENDIX H:

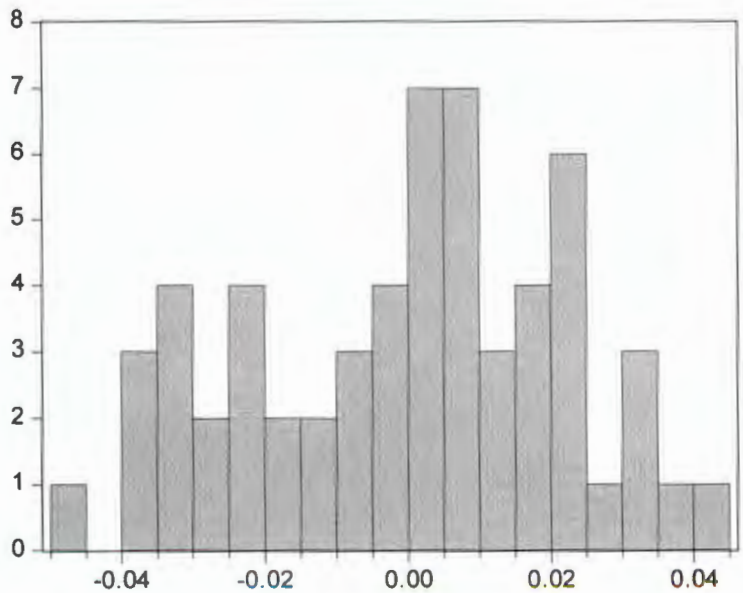
Jarque-Bera test

Equation 4.1a



Series: Residuals	
Sample 1994Q3 2008Q4	
Observations 58	
Mean	4.01e-18
Median	1.31e-05
Maximum	0.033687
Minimum	-0.036987
Std. Dev.	0.016234
Skewness	-0.081476
Kurtosis	2.245572
Jarque-Bera	1.439644
Probability	0.486839

Equation 4.1b



Series: Residuals	
Sample 1994Q3 2008Q4	
Observations 58	
Mean	-6.11e-18
Median	0.002567
Maximum	0.041532
Minimum	-0.047453
Std. Dev.	0.022176
Skewness	-0.242007
Kurtosis	2.184998
Jarque-Bera	2.171369
Probability	0.337671

APPENDIX I:

Breusch-Godfrey Serial Correlation LM Test

Equation 4.1a

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.350256	Prob. F(1,48)	0.5567
Obs*R-squared	0.420160	Prob. Chi-Square(1)	0.5169

Equation 4.1b

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.117007	Prob. F(1,48)	0.7338
Obs*R-squared	0.141040	Prob. Chi-Square(1)	0.7072

APPENDIX J:

Heteroskedasticity Test: ARCH

Equation 4.1a

Heteroskedasticity Test: ARCH

F-statistic	1.699744	Prob. F(1,55)	0.1978
Obs*R-squared	1.708745	Prob. Chi-Square(1)	0.1911

Equation 4.1b

Heteroskedasticity Test: ARCH

F-statistic	3.359625	Prob. F(1,55)	0.0722
Obs*R-squared	3.281355	Prob. Chi-Square(1)	0.0701

APPENDIX K:

Heteroskedasticity Test: White

Equation 4.1a

Heteroskedasticity Test: White

F-statistic	1.212604	Prob. F(44,13)	0.3675
Obs*R-squared	46.63681	Prob. Chi-Square(44)	0.3645
Scaled explained SS	20.73022	Prob. Chi-Square(44)	0.9989

Equation 4.1b

Heteroskedasticity Test: White

F-statistic	1.602205	Prob. F(44,13)	0.1793
Obs*R-squared	48.96974	Prob. Chi-Square(44)	0.2804
Scaled explained SS	20.70864	Prob. Chi-Square(44)	0.9989

APPENDIX L:

Ramsey RESET Test:

Equation 4.1a

Ramsey RESET Test:

F-statistic	1.334457	Prob. F(8,41)	0.2543
Log likelihood ratio	13.42205	Prob. Chi-Square(8)	0.0981

Equation 4.1b

Ramsey RESET Test:

F-statistic	0.234525	Prob. F(9,40)	0.9872
Log likelihood ratio	2.982535	Prob. Chi-Square(9)	0.9650