ABSTRACT

This study sought to investigate the relationship between exchange rate volatility and export performance in South Africa. The main objective of the study was to examine the impact of exchange rate volatility on export performance in South Africa. This relationship was examined using GARCH methods. Exports were regressed against real effective exchange rate, trade openness and capacity utilisation. The research aimed to establish whether exchange rate volatility impacts negatively on export performance in the manner suggested by the econometric model. The result obtained showed that exchange rate volatility had a significantly negative effect on South African exports in the period 2000-2011.

DECLARATION AND COPYRIGHT

I, the undersigned Wilson Chamunorwa, hereby declare that this research is my own original work and that all reference sources have been accurately reported and acknowledged and that this document has not been previously submitted at any University for a similar or any other academic qualification.

Signature….....

Date:……/……/……

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DEDICATION

This dissertation is dedicated to my mother and late grandmother.

LISTS OF ABBREVIATIONS

AGOA: African Growth and Opportunity Act

ADF: Augmented Dickey Fuller

ASGISA: Accelerated and Shared Growth Initiative in South Africa.

BOP: Balance of Payment

CPI: Consumer Price Index

DTI: Department of Trade and Industry

EMA: Export Marketing Assistance

EMIA: Export Marketing Investment Assistance

FTP: Free Trade Protocol

FDI: Foreign Direct Investment

GATT: General Agreement on Trade and Tariff

GDP: Gross Domestic Products

GEAR: Growth Employment and Redistribution

GEIS: Generalized Exports Incentive Scheme

IDC: International Data Corporation

IMF: International Monetary Fund

IIT: Intra-Industry Trade

MIDP: Motor Industry Development Programme

OPEC: Organisation of the Petroleum Exporting Country

SARB: South African Reserve Bank

SADC: Southern African Development Community

SMME: Small Medium Micro Enterprise

TDCA: Trade Development and Agreement Cooperation

USA: United States of America

WTO: World Trade Organization

WMS: World Market Share

UNCTAD: United Nations Conference on Trade and Development

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CHAPTER ONE

1.1 Background of the study

The exchange rate of a country plays a pivotal role in public debate around trade and trade policy in South Africa, with widespread calls for appreciation, depreciation or simple stabilisation. The Congress of South African Trade Unions (COSATU) for instance in June 2005 marched in pursuit of an in-principle agreement from government and business on the need for exchange rate depreciation. Business also argues that the Rand's post-2001 strength has negatively affected manufacturing production (Business Day, 2003). The relationship is also emphasized in government policy documents. The Growth Employment and Redistribution (GEAR) macroeconomic policy emphasized the need for a 'competitive' exchange rate and, more recently, the Accelerated and Shared Growth Initiative in South Africa (ASGISA) initiative has identified exchange rate volatility as a significant constraint to growth.

The South African export and imports remained relatively stable during the 1970s and early 1980s, but grew strongly from the mid-1980s. Export growth was particularly strong within manufacturing which has become the dominant source of export revenue, accounting for 64 % of total exports (excluding services) in 2000. Indicators of openness (exports and imports as a share of GDP, import penetration and export orientation) have also risen sharply, reflecting the rising importance of international trade for the domestic economy. For example, manufacturing exports as a share of output grew from 10.2 % in 1985 to 27.5 % in 2000. Similar strong growth in imports raised import penetration (imports as a share of consumption) from 18 % in 1990 to 32 % in 2000 (Edwards, L. and Willox, O, 2004).

The manufacturing trade balance has also improved during this period. In contrast, the merchandise trade balance worsened which largely reflects the decline in gold exports. The improvement in the manufacturing trade balance since the mid-1980s coincides with a depreciation of the domestic currency. Although the exchange rate depreciation may have contributed towards this improvement, numerous other policy changes make it difficult to

identify the relative importance of the depreciation. For example, the Generalised Export Incentive Scheme (GEIS) raised export production through subsidies. Trade liberalisation, which accelerated from 1994, has substantially improved the profitability of export production by reducing the cost of domestic and imported intermediate goods used in the production process. Finally, the ending of sanctions and the re-integration of South Africa into the international market have further enhanced export performance (Edwards, L. and Willox, O, 2004).

The 2010 budget speech mentions that exchange rate considerations are also important elements both in adapting to global developments and in creating an environment supportive of growth. To do this, Finance Minister Mr Gordhan, in his 2010 budget speech, held that the government agreed with the Reserve Bank that they would continue to take steps to counter the volatility of the exchange rate and to lean against the wind during periods of rapid capital inflows. The 2011 budget speech also mentions that the growth and transformation of financial markets in recent decades has seen increased volatility of exchange rates and capital flows.

Poor export performance in South Africa is blamed on strong Rand by stakeholders. South Africa has increasingly liberalized its trade frontiers leading to lower barriers to trade, for both goods and services. This has increased trade and intensified international competition.

The increased liberalisation of trade and foreign exchange controls, exports promotion polices like General Export Incentive Scheme (GEIS) and multilateral trade agreements such as African Growth and Opportunity Act have led to greater penetration by South African exporters to the International markets. This resulted in an increase to the ratio of exports to GDP to 35.1% in 2008 from 7.38% in 1993 (DTI, 2012).

The way the South Africa Reserve Bank monitors exchange rate developments has been blamed for the volatility of the Rand. “The Reserve Bank also does not intervene in the market of foreign exchange to defend any specific level of the Rand. This is rather left to supply and demand conditions in the foreign exchange market” (Van de Merwe and Mollentze, 2009). The freely floating exchange rate of the Rand has accordingly resulted in substantial fluctuations in the external value of the Rand. This has also caused the problem of exchange rate risk. Exchange rate risk, or currency risk, is the risk that a business’s operations or an investment’s value will be affected by changes in exchange rates (Vaidya, 2006). For instance, if money is concerted into a

different currency to make certain investment, changes in the value of the currency relative to the US dollar will affect the total loss or gain on the investment as you convert the money back. This risk usually affects businesses but it can also affect individual investors who make international investments. Exchange risk is higher under conditions of exchange rate volatility (Verena, 2006).

South Africa adopted a floating exchange rate regime in the 1980s and 1990s despite its exposure to exchange rate volatility which is a threat to the growth of international trade and macroeconomic stability (Van de Merwe, 1996). It is commonly believed that high exchange rate volatility leads to high uncertainty which eventually increases trading risks. As a matter of fact literature of exchange rate volatility contains a lot of inconsistent results. Brenton (2007) and Clarke (1973) concluded that exchange rate volatility decreases trade as they believed that this happens because of imperfect markets particularly in developing countries. Other models of trade argue that if we increase exchange rate volatility, which is the main source of exchange risks, it has significant and negative implications for the volume of trade and Balance of Payments. On the other hand, some studies provide evidence supporting a positive relationship between exchange rate volatility and trade flows.

However other theoretical models concluded to the contrary that exchange rate volatility in fact increases international trade. Arize (1995) argued that this happens because exporters are sufficiently risk averse a rise in exchange rate variability leads to increase in expected marginal utility of export revenue which acts as an incentive to exporters to increase their exports so that they can maximise revenues. Such ambiguity in theoretical frameworks also causes similar ambiguity and inconsistence in empirical investigations on the effects of exchange rate volatility on export flows.

As an open and middle income country in the Sub-Saharan Africa, South Africa is not an exception to the debate about the impact of exchange rate on export flows since it adopted a flexible exchange rate system in the mid 1990. This policy was to complement its outward looking trade policy which ensures export led growth.

Exchange rate volatility has implications on the performance of the country's economy. Majority of the exporters are risk averse. They tend to withdraw their investments in export sector to avoid

losing if the Rand is not stable. This has far reaching consequences and may result in loss in employment and job creation and government's policies of ensuring export led growth may not be achieved.

South Africa considers exchange rate as a key macroeconomic policy instrument that ensures export promotion and economic growth. The South African Reserve Bank (SARB) exchange rate policy aims at providing an environment that promotes exchange rate stability and assists the government's objectives of accomplishing export led growth (Bah and Musa, 2003).

1.2 Statement of the problem

The impact of foreign exchange rate volatility on foreign trade has received less attention in developing countries than it has in developed countries. Some researchers argue that the variability of the Rand has created uncertainty about profitability (because of exchange rate risk) and negatively affected export production. Others argue that depreciation of the Rand has improved the competitiveness of South Africa's exports in world markets.

South Africa's need for high export growth in an environment of freely floating exchange rates and increased volatility of the Rand calls for an understanding of the effect of this highly fluctuating Rand on South Africa's exports and consequently, its impact on the economy.
The problem of exchange rate volatility has given rise to a broad debate but there is no consensus on whether exchange rate volatility influences trade volumes or on whether any such influence is negative or positive.

The critical question for South African policy makers is whether managing exchange rate volatility can improve export performance? To what extend does real exchange rate volatility affects export performance? In particular does exchange rate volatility influence export volumes or whether such influence is positive or negative? These questions remain unanswered in the South African context and there is need to provide answers to these questions. In other words there is need to empirically establish the impact of exchange rate volatility on export performance.

1.3 Objective of the study

The main objective of the study is to examine the impact of exchange rate volatility on export performance in South Africa. Other objectives are

- To determine short run and long run determinants of exports
- To review trends in exchange rates and exports
- To econometrically estimate the relationship between exchange rates and exports

1.4 Hypothesis of the study

The study hypothesises that there is negative relationship between real exchange rate volatility and export performance.

1.5 Significance of the study

This study seeks to unpack the impact of real exchange rate on export performance. A number of studies have been carried out and empirical evidence presented on the macro economic effects of exchange rate on trade flows. These studies have inconclusive results on the impact of real exchange rate volatility on export performance and it is under this background that this study is undertaken. This research contributes to the government's understanding of export performance by establishing if exchange rate volatility can affect export performance.

A clear understanding of the impacts of exchange rate volatility on exports is crucial and it helps policy makers to formulate the right exchange rate policies that encourages export performance given that exports forms a major part of the country's Gross Domestic Products (GDP). Improvement in export production increases sales and creates employment which is one of the national goals pursued by the South African government at the moment.

This study therefore adds on to the ongoing debate about the impact of exchange rate volatility on export performance in South Africa. The general public will benefits from this research in the sense that they will know in detail the real impact of real exchange rate volatility which may be different from their presently held perception. This study shall be of importance to the government of South Africa in making policy recommendations about its exchange rate policies taking into account the outcomes of this study. This research may also be used as references for

further researches in this topic. This study shall act as a source of information for teaching purposes and for other research citations.

1.6 Organisation of the study

The study is divided into five chapters. Following this chapter is chapter two which shall give an overall overview of the foreign exchange rate volatility in South Africa. Chapter three will discuss literature review. It will be divided into two sections, theoretical literature review and empirical literature review. Chapter four will present methodology and data sources used. Chapter five will present the results obtained and interpretation. The conclusion, recommendations and limitations are presented in chapter six.

CHAPTER TWO

OVERVIEW OF EXCHANGE RATE VOLATILITY AND EXPORTS

2.1 Introduction

This chapter provides an overview of exchange rate volatility. The first subsection of this chapter gives a historical overview of exchange rate volatility. This subsection gives a history of the origins of exchange rate volatility. The second subsection looks at the trends in exports and export structure in South Africa.

2.2 Summary of the historical Overview of Exchange rate.

At the end of World War 2, the world of international economic policy making was dominated by two preoccupations: first, to facilitate the reconstruction of European economies, and second, to prevent a return to the competitive devaluations and protectionism that had characterised the periods of 1930s. Because of that, the British and American governments established the International Monetary Fund (IMF), which was intended to police a system of fixed exchange rate universally known as the Bretton Woods System in 1944 (Lawrence, 1980).

Under the Bretton Woods System, countries undertook two major commitments. The first was to maintain convertibility. The second was to preserve a fixed exchange rate until unambiguous evidence of "fundamental disequilibrium" appeared. This was the point they were expected to devalue or revalue the currency and announce a new (fixed) parity. Convertibility turned out to be more a pious intention than a realistic objective. It was always more honoured in the breach than the observance, with only the United States of America among the major economic powers ever permitting full freedom of capital movements (Zho, 2009).

As far as fixity of exchange rates was concerned, the Bretton Woods system was a success. Changes in the majority parities were few and, when they did prove unavoidable, tended to be relatively small scale, at least by comparison with the wild swings that have taken place in the 1970s and 1980s. Until the process of breakdown began, in the late 1960s, there were only really two marked trends: the decline in the value of the pound, with two devaluations, in the 19848

and 1967, and the rise of the Deutsche Mark, as the German economy recovered and the competitiveness of USA trade decreased (Bordo, 1981).

The Bretton Woods system worked on a principle known as the Gold Exchange Standard, which amounted to a kind of nineteenth century Gold standard by proxy. Under this arrangement the USA operated a fully-fledged Gold Standard. It pledged to keep the dollar price of gold fixed at the price of $35 per ounce and standing ready to exchange gold for United States of America (USA) currency on demand via the Gold Window (Vienna, 2004).

Other countries then fixed their currencies in terms of dollars, devaluing or revaluing as necessary in order to counteract disequilibrium. This was deemed to originate from their own deviant behaviour and in that of USA. In other words, the USA anchored the system as a whole by virtue of the fixed dollar price of gold. Other countries had to accommodate themselves by changing their exchange rates when required.

2.2.1 The Breakdown of Fixed Exchange rate (Bretton Woods)

In the early 1960s, the U.S. dollar's fixed value against gold of fixed exchange rates, was observed as overvalued under the Bretton Woods System. A considerable increase in domestic spending on President L. Johnson's Great Society programs and a rise in military spending caused by the Vietnam War actually worsened the overvaluation of the dollar (IMF, 2013).

The system broke down between 1968 and 1973. In August 1971, U.S.A President Richard Nixon announced the "temporary" suspension of the dollar's convertibility into gold. While the dollar had struggled throughout most of the 1960s within the parity established at Bretton Woods, this crisis marked the breakdown of the system (IMF, 2013).

An attempt to restore the fixed exchange rates failed, and by March 1973 the major currencies began to float against each other. Since the collapse of the Bretton Woods system, IMF members have been free to choose any form of exchange policy they wanted. This allowed the currency to float freely, pegging it to another currency or a basket of currencies, adopting

the currency of another country, participating in a currency bloc, or forming part of a monetary union (IMF, 2013).

2.2.2 The floating Exchange rate era.

The period since the beginning of 1973 has been characterised by a number of attempts to reinstate fixed exchange rate, all of which have failed for some reasons raised above. The floating exchange rate has not delivered anything approaching the degree of stability its proponents had hoped to see. Currency values have been subject to day to day fluctuations and long run swings into apparent over or undervaluation. The period has been dominated by the dollar cycle, the initial decline in mid 1970s followed by resurgence to peak in 1985 and decline since then.

On the other end, if account is taken of the shocks to the world's financial markets over the period, it becomes clear that no straightforward comparisons between fixed exchange rate and floating exchange rate can be made. The 1970s, 1980s, 1990s, 2000s have been far turbulent than the Bretton Woods Period. The main features of this exchange rate period were;

- A large US current deficit reaching about US$100 billion by 1980s whose domestic counterpart were a very low saving ratio in the private sector and federal overspending of the same size orders as the external deficit. By contrast Japan and West Germany enjoyed large surpluses most of that period. The massive increase in the price of oil, engineered by the Organisation of the Petroleum Exporting Countries (OPEC) cartel in 1973-4 and 1979. The first shock was accommodated by the fiscal and monitory policies of the oil importing countries, and therefore led to accelerated inflation (IMF, 2013).
- The second shock by contrast was accommodated by and was associated by the short, sharp recession in the USA and a more prolonged slump in Europe. The consequent decline in oil prices since 1984 has attracted far less attention because partly it has been masked by the fall in value of the dollar in which oil prices were fixed. Meanwhile its impact on financial world markets has been substantial particularly via its effects on the stability of the US banking system. A deepening, and as yet unresolved, international debt crisis. The massive OPEC oil surpluses of the 1970s and early 1980s had found their way into short term deposits in western commercial banks, whence the latter had recycled

them into loans to governments of third world country. This is generally the overview of the origins of floating exchange rate.

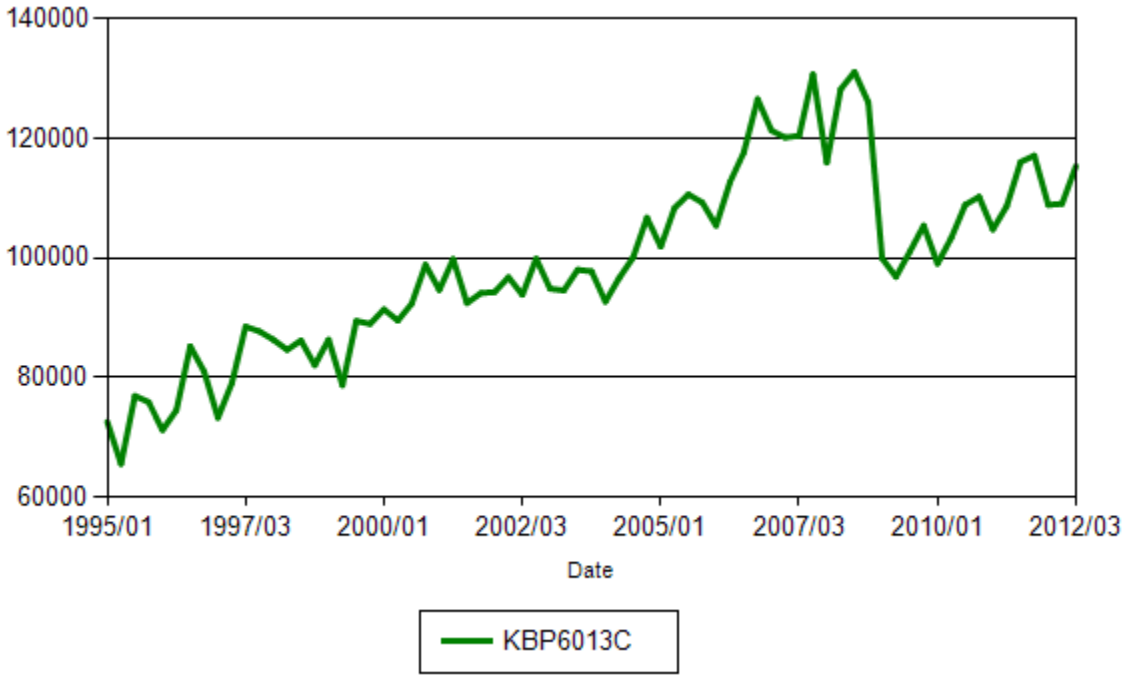
2.3 Summary of the Historical overview of S.A exports

South African economy is one of the most advanced economies in the African continent and it is amongst the largest economies in the continent. It is a middle income country, with a fully developed basic infrastructure which is very important to support exportation of goods and services to other countries. The country's economy has well developed natural resources such as gold and platinum which are exported to other countries. Natural resources form a significant portion of export base. Beside strong linkages to international markets, good transport infrastructures, macroeconomic soundness and good quality institutions appear to be major determinants in the development process of the external sector.

In 1994, the new democratically elected government inherited an economic system characterised by declining economic and employment growth. In response to such pressures the government initiated a number of policies to stimulate growth and employment creation. The macro economic reforms were encapsulated in the Growth, employment and redistribution macroeconomic policy (GEAR) strategy (Edwards and Elvis, 2005).

In addition to encouraging growth and employment, this strategy aimed to transform South Africa into a competitive, outward oriented economy (RSA, 1996). Measures to reduce unit costs and exchange rate policy to keep the real effective exchange rate policy stable at a competitive level formed key components of the strategy. To distinguish it from the previously protectionist government, the new government also embarked upon an ambitious trade liberalisation process that commenced with the government's formal offer in 1995 World Trade Organisation (WTO) (Bell, 1997).

Figure 2. 1 Structure of South African Exports from 1995 to 2012.



Source: SARB (2013)

The levels of manufacturing exports have responded to these initiatives in the 1990s. The success of these polices in generating exports has been mixed. We find that exports of the manufactures has increased but not enough to initiate export led growth as those of the Asian markets and a few other emerging markets. South African exports remain resource based and the country has lagged others in diversifying into new and fast growing export sector. The inability to restructure exports towards these high dynamic technology products is another explanation for these poor export performance of South African manufacturing exports during the 1990s.

The demise of apartheid era in 1994 saw a new economic era in South Africa as the export base improved significantly most notably in the post 1994 era. This enabled the adoption of more liberal economic policies that enhanced export performance. Policies such as GEAR and New Growth Path saw the expansion of employment and export promotion. Trade liberalisation was adopted after apartheid era which resulted in the abolishment of trade tariffs, duties and quotas and non tariffs trade barriers thereby expanding the export base. Trade liberalisation was initiated

in the 1990s. The Uruguay Round of Trade negotiations saw the birth of unilateral trade liberalisation and multi lateral trade liberalisation (Edwards, 2005).

Trade liberalisation was adopted as a result of the decline and failure of import substitution approach of industrialization. In the years 1990 and 1994 trade liberalisation took the form of eliminating the remaining import licensing procedure that were in place to reduce import tariffs. In the following years since South Africa's policy conversion from import substitution to export led growth in 1990, there was a remarkable increase in foreign trade.

South Africa made a shift to a more export oriented trade regime with the introduction of export subsidies under the General Export Incentive Scheme (GEIS). GEIS was designed mainly to help exporters offset the price disadvantage they faced in international markets. It was selective system of liberal tax free grants (Verena, 2006).

The country embarked on a number of bilateral trade agreements including the SADC, Free Trade Protocol that was signed in 1996 and also the implementation of the South Africa-European Union Trade, Development and Agreement Cooperation (TDCA) in the year 2000.

The government also initiated the Export Marketing Assistance Scheme (EMA). EMA was developed to include investment and became known as Export Marketing and Investment Assistance Scheme. The export marketing and Investment Assistance Scheme (EMIA) develops export markets for South African products and services and to recruit new foreign direct investment into the country. Its objectives are to provide marketing assistance to develop new export markets and to grow existing export markets. It assists with the identification of new export market through market research. It also assists companies to increase their competitiveness by supporting patent registrations, quality marks and product marks (Edwards, 2005).

EMIA assist with facilitation to grow Foreign Direct Investment (FDI) through missions and FDI research and it increase the contribution of black owned businesses and SMMEs to South Africa's economy. It also rendered financial assistance to the development of new export markets through financing for trade missions and market research. From 1997 to 2002 an

increase in merchandise growth was R284.1 Billion in 2002 from R122 Billion in 1997. This represented an average annual growth of 1.3 % (Miles, 1979).

Although some initiatives had been made in opening the economy from Export Development Scheme (1970s), General Export Incentive Scheme (1990s) and the relaxation of quantitative restrictions, reform of trade regimes accelerated with South Africa's formal offer to WTO. In this offer South Africa agreed to bind 98% tariffs lines, reduce the number of tariff rates to six, to rationalize to over 12 000 tariff lines and to replace quantitative restrictions on agricultural products with tariffs.

Substantial progress has been made in simplifying the tariff structure of the early 1990s. The total number of HS8-digits tariff lines fell from over 11200 in 1994 to 6707 in 2004. The tariff structure has also been simplified with HS8-digits lines bearing formula, mixed or specific duties declining from 3524 in 1994 (30% of total) to 205 in 2004 (3% of total) although close to half of the reductions took place between 2003-2004 (Edwards, 2005).

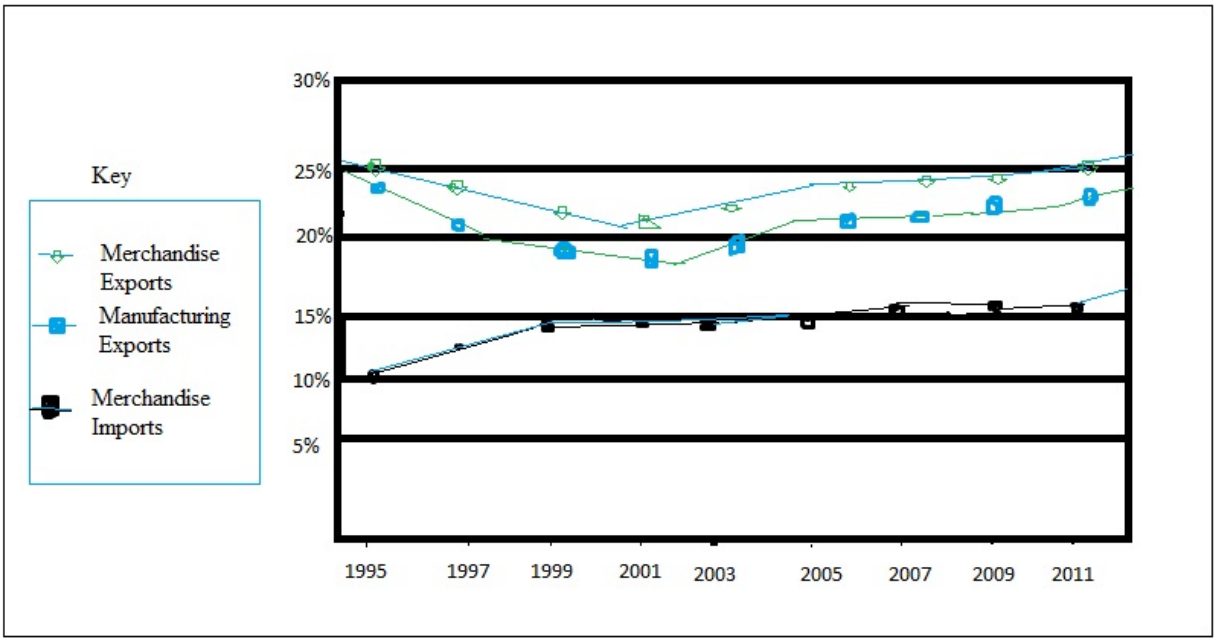
The number of advalorem tariff rates also remain high (37 in 2004 v 31 in 1994) and exceeds the tariff rates proposed in the South Africa's General Agreement on Tariffs and Trade (GATT)/Uruguay Round offer. In non advalorem tariffs are included, the number of different rates in 2004 rises to 99 therefore there is scope to simplify the tariff structure as per offer to the WTO.

The reduction in tariffs contributed to increase in profitability of export production as well as reducing anti export bias. Import taxes on intermediate goods were equivalent to 38% of value added in aggregate manufacturing in 1994 (taking into account export subsidies) but it fell to 19% in 2003. The combined effect of a reduced tax on intermediate goods and reduced effective protection was a reduction in the anti export bias in aggregate manufacturing from 2.2 to 1.5 over this period. However much of the improvement in the Anti Export Bias (AEB) from the tariff liberalisation from 1994 to 1997 was offset by the removal of export subsidies under the General Export Incentive Scheme. Kuhn and Jansen (1997) for example estimated that the removal of export subsidies led to an increase in the anti export bias from 1993 to 1996.

South Africa has made significant progress in reducing tariff protection during the 1990s but there is still room for further simplification of tariff structure. Average nominal protection is still higher than the average for developing countries and high effective protectionist rates remain in manufacturing rates. Nevertheless tariff liberalisation has raised the profitability of export supply which has enhanced export growth in the 1990s.

Increased openness, the reductions in tariffs, the re-integration of South Africa in the international arena and a real depreciation of exchange rate has increased exports and imports as a share of Gross Domestic products.

Figure 2.2 Indices of Openness 1995-2011.



Source. Own graph (SARB ,2013)

Manufacturing exports as a share of GDP continued to rise in the 1990s despite the recovery in output growth. By 2000 manufactured exports as a share of GDP rose to 15%. The rising importance of exports in aggregate manufacturing is also shown in export orientation (exports/gross output) from 12% in 1993 to 23% in 2000. The increased openness to

manufacturing during the 1990s has been broad based, with export orientation rising in 25 SIC 3 digit sectors analysed. During 1990s manufacturing overtook mining as important export sector accounting for 53 % in 2000.

Manufacturing exports have also diversified in 1994 with relatively high export growth in intensive skills sector such as coke and refined petroleum products, other chemicals, motor vehicles, parts and accessories and other transport equipment. Particularly strong export growth was experienced in motor vehicles and other transport equipment sectors in response to the Motor Industry Development Programme (MIDP) introduced in 1995. The share of these sectors in total manufacturing exports rose from 9% in 1999 to 19% in 2002. Poor growth export growth combined with strong import growth, occurred in less intensive skill sectors such as textiles, wearing apparel, leather and footwear has also contributed towards the skill bias of export growth.

2.4 South Africa's Dynamic Export Performance, A Cross Country Comparison

The manner in which export patterns changes over time has profound implications for the relationship between trade on one hand and industrialization, economic growth and real effective exchange rate on the other.

Middle income countries like South Africa have additional reasons to urgently address the issue of upgrading their export structures. The entry of low wage labour abundant economies such as China and India into the world market have challenged South Africa's comparative advantage in low skills manufactures as argued by United Nations Conference on Trade and Development (UNCTAD) (2002).

This section, therefore, presents a cross-country analysis of South Africa's dynamic export performance using two different dynamic indicators. Following UNCTAD (2002), 'dynamic' products are defined in terms of their global demand potential (market-dynamic products) and productivity potential (supply-dynamic products). The former classification identifies products that have a strong growth potential in world markets, while the latter identifies products characterised by strong productivity growth potential.

2.5 Supply-Dynamic Products

Performance in supply-dynamic products is assessed using a technology-based product classification, developed by Lall (2000), and used in UNCTAD (2002) and UNIDO (2004). As shown in Table below, exports are classified into primary products (PP), resource based manufactures (RB), low technology manufactures (LT) medium technology manufactures (MT) and high technology manufactures (HT). Primary products and resource-based manufactures tend to be unskilled-labour- and scale-intensive, and skill requirements tend to rise with the degree of technological complexity (see (Lall, 2000)) for a complete description of each technology category).

"Since increased application of human capital and technology tends to raise labour productivity, such a classification can be expected to provide a reasonably good guide to sectorial differences in the potential for productivity growth" UNCTAD (2002:66). The ability of a country to shift exports into high technology products therefore has important implications for long run output growth, as productivity growth becomes the primary source of output growth (and income per capita) once underutilized labour and natural resources are exhausted.

Table 2.1 Manufactured Products

Primary Products	Fresh fruits, meat, rice, cocoa, tea, coffee, wood coal, crude Petroleum, gas, metals.
Manufactured Products **Resource Based Manufactures** • RB1 : Agro/forest-based products • RB2: Mineral based Products	 Prepared meats/fruits, beverages, wood products, vegetable oils Ores and concentrates, petroleum/rubber products, cement, cut gems, glass
Low Manufactures LT1 Fashion Cluster LT2 Other Low Technology goods	 Textile fabrics, clothing, head gear, foot wear, leather, manufactures, travel goods Pottery, simple metal parts/ structures, furniture, Jewellery, toys, plastic products
Medium Technology manufactures MT1 Automotives MT2 Process Industries MT3 Engineering Industries	 Passenger vehicle and parts, commercial vehicles, motor cycles and parts Synthetic fibres, chemical and paints, fertilizers, Plastics, iron, pipes/tubes Engines, Motors, industrial machinery, pumps, Switch gears, ships, watches.
High Technology Manufactures HT1: Electronics and electrical products	 Office, data processing/telecommunications equipments, televisions, Transistors, turbines,

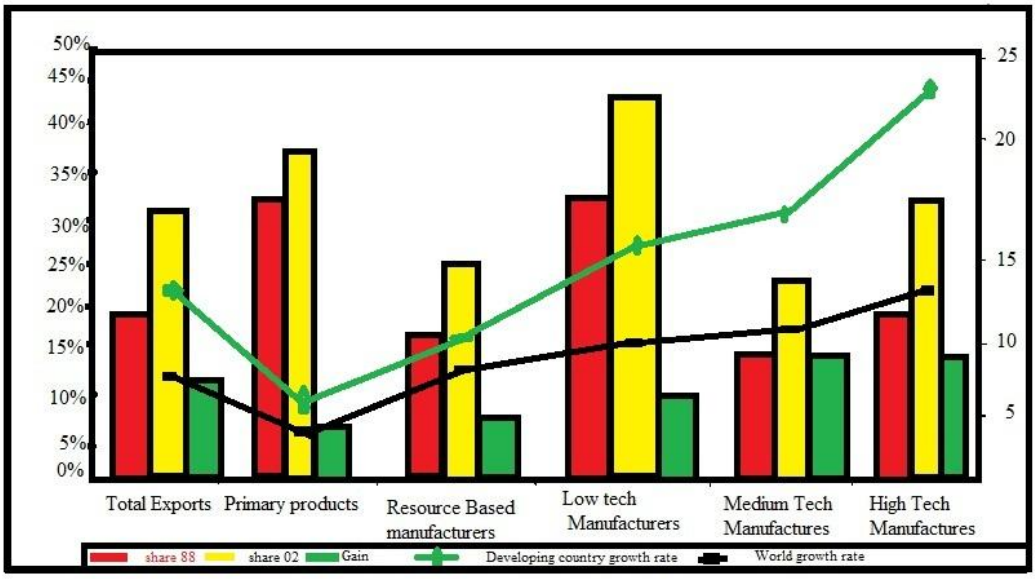
HT2: Other High technology	power generating equipments pharmaceuticals, aerospace, optical/measuring, Instruments, cameras,
Special Transactions	Electricity, cinema film, printed matter, art, coins, pets, non-monetary gold.

Source: Lall (2000)

There are also good market-dynamic reasons for shifting exports into high technology products as these products are the fastest growing in world trade. As shown in Table 2.1, the average annual export growth of high technology products (9.1%) between 1988 and 2002, was almost double that of low technology (5.6%), medium technology (5.7%) and resource-based (4.9%) products. The share of high technology products in world trade rose from 15.8% in 1988 to 23.6% in 2002. All other categories had a smaller share in world trade in 2002 than they did in 1988, although the medium technology group has regained some of its losses since 2000.

An important feature of the changing pattern of world trade in the 1990s is the rapid growth in developing country exports, particularly within high and medium technology products (Table 2.1). Total developing country as a share of world trade rose from 19.1% in 1988 to 30.5% in 2002. Its share in high technology products doubled from 14.8% to 34.3% over the same period. By 2002, the value of developing country exports of medium and high technology products together exceeded the combined value of primary products, resource-based and low technology manufactures. In contrast, in 1988 medium and high technology exports equalled approximately half the value of the remaining categories.

Figure 2.3 Developing countries market share gains in total exports, by broad technology category, 1998 to 2002 (%).



Source: Own graph with data from DTI, 2011.

Note: Share gains expressed in percentages

Growth rates are annual averages.

In comparison to developing countries, however, South Africa's total export growth during the 1990s (2% per annum) has been relatively poor. South African export growth has also lagged the average for the world (6%), developed countries (5%), and a selection of countries with similar shares of resource intensive products in total exports to South Africa, the Resource Group (6.1%) (Figure 2.3). An important source of this relatively poor growth is the negative growth in primary product exports (-1.1%) during this period. As a result of the poor export performance, South Africa's share of world exports declined 0.89% to 0.52% between 1988 and 2002.

Table 2.2 Annual Average Growth rates by Broad Technology Category, 1988-2002

	World	Developed country	Developing country	South Africa	Resource Group
Total Exports	60.2	4.96	9.58	2.02	6.14
Primary products	3.59	2.72	4.95	-1.14	4.18
Total manufactures	6.32	5.13	10.63	9.61	7.72
Resource Based	4.89	4.09	7.89	4.26	5.63
Pure manufactures	6.59	5.33	11.13	8.57	9.52
Low technology	5.63	4.37	7.94	5.57	8.57
Medium technology	5.67	4.77	11.07	9.67	8.51
High technology	9.10	7.14	15.83	11.53	14.95

Source: Lall (2000)

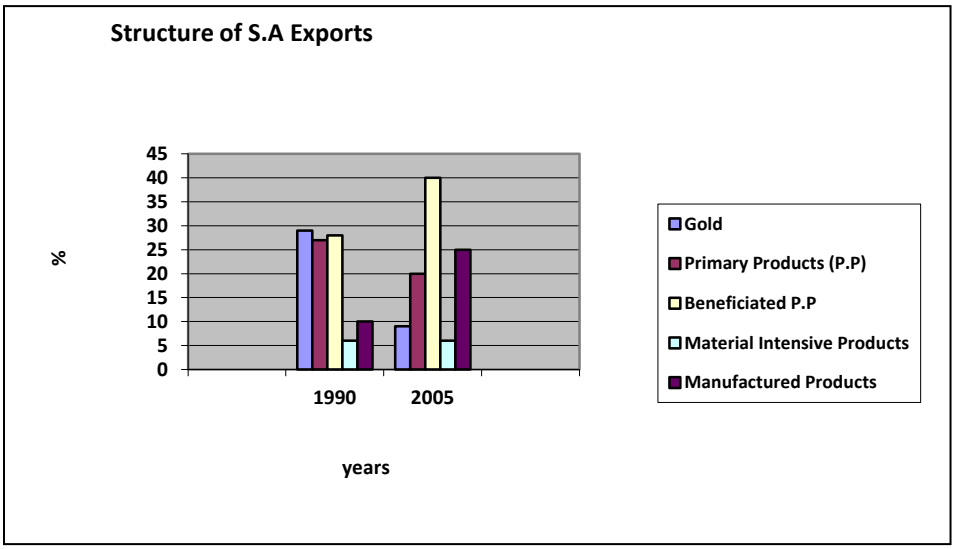
Within aggregate manufacturing, exports have grown marginally more quickly than the global average, but still slower than other developing countries and the Resource Group. The growth performance vis-à-vis developing countries are relatively poor in all technology categories and are particularly weak in high technology products. South African exports also lag that of the Resource Group in all but the medium technology category. The relatively strong growth in Medium technology exports can be attributed to the very strong growth in motor vehicle exports under the MIDP programme.

The relatively poor export growth has resulted in little or no gains to South Africa's share of world manufacturing exports**.** This is shown in Table 2.2 which presents world market shares by region and technology sub-category. South Africa's share of world exports of manufactures rose marginally from 0.3% to 0.32% between 1988 and 2002, while its share of pure manufactures (non-resource based manufactures) rose from 0.2% to 0.26%. As can be seen, South Africa's faster growth vis-à-vis the world in MT exports has been due to very strong performances in MT1 (automotive), whose world market share (WMS) increased seven-fold from 0.05% to 0.36%, and MT3 (engineering), whose WMS roughly tripled In high-technology products, South Africa has seen a small rise in its 1988 share of HT1 (electronics), and no change at all in HT2 (other). The relatively poor performance is in stark contrast to the pattern in East Asia, whose share of manufacturing exports rose from 12% to 18%, and share high technology exports rose from 13% to 27% over this period.

2.6 Export Growth and Structure.

In the early 1980s mining exports accounted for the large proportion of total exports that South Africa was exporting. The bulk of these exports were gold. Gold alone accounted for between 35% and 52% of all the merchandise exports. (Bell, 2004). The mining sector exports accounted for between 60% and 65% including service exports. In the late 1980s the decline in grade of ore saw the share of mining exports fell dramatically. In contrast the share of manufacturing exports in total exports rose. By 1990s the share of manufacturing exports overtook mining as the most important sector and by 2000 it accounted for 53% of total exports.

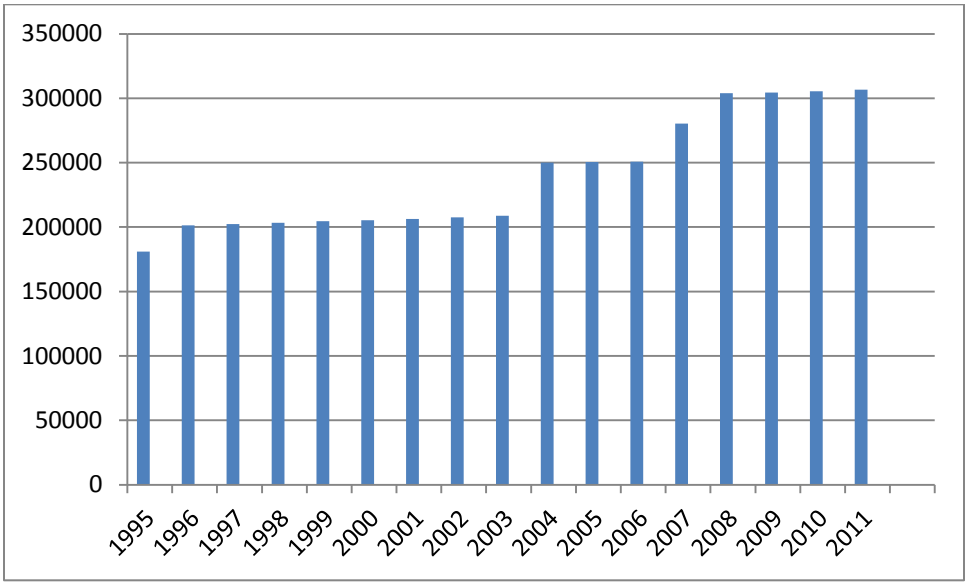
Figure 2.4. The Structure of South African Exports



Source: Own calculations (IDC, 2005)

The structure of South African exports changed significantly during the period 1990 to 2000 as depicted on the figure 2.4 above. Gold contributed 29% in 1990 but declined to 9 % by 2005. The manufacturing sector increased its share in the overall export basket maybe due to the re-admittance into the global economy in the post-apartheid era.

Figure 2.5 Trends in South African Exports in Billions (1995-2011).



Source: Economic Research Unit, 2011.

Figure 2.5 above shows that in real terms exports increased from R180 Billion in 1995 to about R300 Billion in 2011.This was a very impressive growth in exports which can be attributed to a number of factors. South Africa has succeeded in scoring a positive result despite depressed world market conditions due to financial crisis in the world market and it has managed to diversify its export base in terms of products and trading partners. While the sharp depreciation of the Rand has made a significant contribution, it does not fully explain the recent trends.

The South African Revenue statistics showed that since 1998, trade surpluses increased tenfold, from R3,9 Billion to R39 Billion. This was due to the fact that the nominal value of the Rand of the merchandise trade nearly doubled in the same time period from R234.3 Billion in 1998 to R265.4 Billion in 2002. There was a strong increase in the value of both imports and exports. This increase was observed from 1998 to 2002 driving this strong growth.

Even though overall export growth has been comparatively low, some improvements have been made in diversifying manufacturing exports towards medium and high technology products. This diversification was necessitated by the strong growth in motor vehicle related exports (medium technology), with some minor diversification towards high technology products (Figure 2.5). The Resource Group also diversified its manufacturing exports; however this diversification was more evenly spread across high technology, medium technology and low technology products.

The strongest restructuring towards high technology sectors occurred within the East Asian and Pacific region where the share of these sectors in total exports rose from 21% to 41% during the 1990s (Edwards and Alves, 2005).

2.7 Market-Dynamic Products

The other indicator of South Africa's dynamic export performance is its position in demand/market-dynamic products. This performance in market-dynamic products is measured by the change of a country's world market share in products that are becoming progressively crucial to global trade. Nations that are capable of shifting export production towards products with a strong global demand potential will reduce the risk of waning export growth and declining terms of trade. .

2.8 The South African Exchange rate.

A competitive exchange rate is a critical determinant of the export performance in a country. In South Africa, there has been some debate as to whether exports do indeed respond to exchange rate movements. The real effective exchange rate refers to the actual exchange rate after adjusting for differences in prices and costs of production between a country and its main trading partners, and acts as a yardstick for understanding export behaviour. In South Africa's case, the real exchange rate is the external one, usually the purchasing power definition of the real exchange rate. It is calculated as $q = ep/p^*$, where the exchange rate, e is the foreign currency per unit of the Rand, and p/p^* is the ratio of domestic prices, p to foreign prices.

Depending on data available and the theoretical approach taken, the choice of p will vary between consumer price indices (CPIs), wholesale price indices, Gross Domestic Products (GDP) deflators, export and import unit values and unit labour costs. The real exchange rate is useful to analyse bilateral competitiveness. To analyse competitiveness of a country vis-a-vis all trading partners, these bilateral real exchange rates are weighted and combined into a composite index, which is labelled the real effective exchange rate (REER).

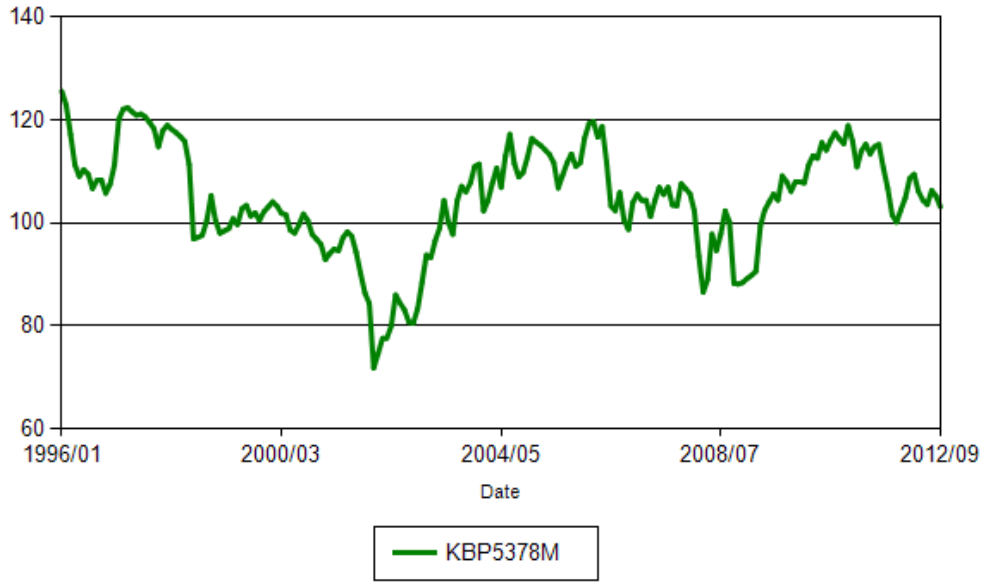
International price and cost competitiveness is an important determinant of trade flows. If South African competitiveness improves, foreign demand for South Africa products should rise as they become less expensive in foreign markets while South African demand for imports would be

expected to drop as the latter become more expensive to South African buyers (Edwards and Golub, 2003).

Prior to the 1980s, the South African currency was pegged. During this period, major shocks in the form of significant gold price changed and political crises resulted in capital outflows and intensified trade sanctions, which complicated the management of the exchange rate. There were also a number of significant regime changes. These shifts were related to changes in policy objectives. The exchange rate was fixed until 1979. In 1979, greater flexibility was introduced into the foreign exchange market with a dual currency exchange rate system. The Reserve Bank announced an official exchange rate on a daily basis in line with market forces.

This practice ceased from 1983 with the commercial rate determined in the market subject to direct intervention by the Reserve Bank. A second exchange rate, the financial Rand, applied to most non-resident portfolio and direct investment in 1983, the financial Rand was abolished. In 1985, following the debt crisis, which was caused by the refusal of American banks to roll-over South Africa's short term foreign debt, the Rand fell further. The Reserve Bank maintained a direct influence on the exchange rate through active intervention in both the spot and forward markets (Aron, 1997).

Figure 2.6. The figure below shows movements in real exchange rates from 1996 to 2012.



Source: SARB, 2013

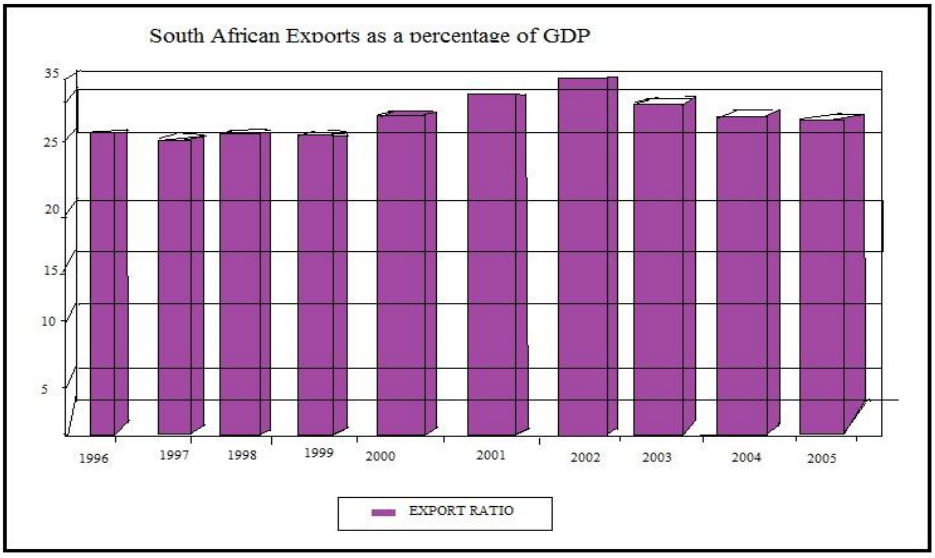
In the figure above the reserve bank has appeared to be more active in stabilising the real effective exchange rate, partly out of concern for the international competitiveness of South Africa's manufacturing exports, and in particular to prevent excessive appreciation of the real exchange rate at times when the nominal exchange rate tended to appreciate. The real effective exchange rate index (on a 2000 base year) appreciated gradually from 96.00 in the year 1998, to 104 by the end of 1992, where after it depreciated to 97.18 by the end of 1994. The real effective exchange rate had seen a depreciation of 3% during the year 2000.

2.8.1 Real Exchange rate and export in South Africa.

As an open and middle income country, South Africa considers exchange rate as a key macroeconomic policy instrument that ensures export promotion and economic growth. SARB's exchange rate policy aims at providing an environment that promotes exchange rate stability and assists the government's objective of accomplishing export-led growth (Bah & Amusa, 2003). In line with this, the adoption of the outward-looking trade policy ensured export growth that lead to long-term economic growth. The increased liberalisation of trade and foreign exchange

controls, exports promotion policies like GEIS and multilateral trade agreements such as African Growth and Opportunity Act (AGOA) have led to greater penetration of South Africa exporters to the international markets such as the U.S.A market. As a result, the ratio of exports to GDP has accelerated substantially from 24.9 percent in 1996 to about 32.71 % in 2002.This is shown in figure 2.7 below:

Figure 2.7. South African exports as a percentage of GDP.



Source: South African Department of Trade (2011).

However, the current flexible exchange rate regime has led to greater volatility of the Rand against the major currencies such as the U.S.A dollar and such variability has implications for South Africa's exports.

2.9 Conclusion

One of the principal concerns since the flexible exchange rate regime was introduced has been whether the increase in exchange rate volatility has impacted on trade and exports performance. However, the current flexible exchange rate regime has led to greater volatility of the Rand against the major currencies such as the U.S.A dollar and such variability has implications for South Africa's exports. Low real exchange rate volatility were associated with increase in the growth of exports but those periods of high real exchange rate volatility such as 1998,2001 and 2002 were associated with a sharp decline in exports. This implies that real exchange rate volatility impacts negatively on South Africa's exports to the U.SA and other major trading partners. Since exports are important to support government's macroeconomic policy of export oriented growth and to the growth of South Africa's GDP, this implies that the effects of the volatility of the Rand should not be taken for granted but should be carefully considered by policy makers.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This Chapter provides a review of Literature on exchange rate volatility. The chapter is divided into theoretical and empirical literature. The empirical literature explores studies that have been previously studied by other researchers regarding exchange rates and export performance. The section on empirical literature is divided into three sub-sections. Following this introductory sub-section is section 3.1 which covers theoretical literature. The theories that are going to be reviewed are: The Marshall-Lerner Condition, the Monetary Approach to exchange rate model, and the absorption. Section 3.4 will present empirical findings on export performance. Finally section 3.5 concludes the chapter.

3.1 Theoretical Literature.

This section describes the theoretical framework that underpins the impact of exchange rate on export performance in South Africa.

3.1.1. Marshall Lerner condition

The Marshal Lerner Condition also called The Marshal-Learner-Robinson (MLR) condition is at the heart of Elasticity approach to balance of payment. It is named after three economists who discovered it independently, Alfred Marshal (1842-1924), Alba Lerner (1903-1982) and Joan Robinson (1903-1983).

When evaluating the effects of currency fluctuations on trade balances this study consider the Marshall Lerner condition. The first assumption that is made is that when currency depreciates exports increases and imports falls resulting in improved net exports. If the rand appreciates normally the assumption is that exports fall and imports increases resulting in balance of trade worsening. Therefore to improve our net exports there is need to depreciate the rand. This analysis however overlooks the impact of price elasticity of demand for exports and imports. The Marshall Lerner condition makes us consider the ignored price elasticities.

The Marshal Lerner condition (ML) stipulates that devaluation or depreciation of a country's currency can lead to improved exports. This takes place when a country's exports and imports price elasticities are greater than one. This means that the change in demand for imports and exports needs to be greater than the change in value of the currency. For instance if the rand deprecates by 5% the sum price elasticity of demand for imports and exports needs to be greater than 5% for the depreciation to improve the trade balance.

If the rand depreciates by 10%. This depreciation of the rand makes exports cheaper by 10% and imports expensive by 10%. In this case if the exports have a price elasticity of demand greater than one then it is said to be elastic. This means exports increases by more than 10%. In this case the marshal Lerner condition holds and the balance of trade improves as a result of depreciation of the rand.

By contrast If Zambia devalues their kwacha by 10% it may find its exports only increasing by 2%, an inelastic response. Its imports may also fall by, say, 4%, another inelastic response. Overall the response to the depreciation is inelastic and Zambia's balance of trade will worsen. They are now spending more on imports and getting less on exports. In the scenario they should not devalue their kwacha since the Marshal Lerner condition does not hold.

If South Africa is importing goods and services that are not elastic such as energy, food and raw materials, consumers are unlikely to import less in the face of a devalued rand. So the governor of the South African Reserve bank has to think twice before adopting that policy.

By contrast if the goods and services that the country is quite elastic products such as textiles, tourism and basic manufactured goods then depreciation will improve the balance of trade.

If the Marshall-Lerner condition is met, and the sum price elasticity of demand for imports and exports is greater than one, then the balance of trade will improve if a country depreciates its rand. When the Marshall-Lerner condition is not met and the sum price elasticity of demand for imports and exports is less than one then the balance of trade will worsen when a country adopts the policy of depreciating its currency.

Hooper, et al (2000, pp. 8-9) have estimated the short run and long run price elasticity's of imports and exports for G7 countries (G7- Group of seven).

Table 3.1 Price elasticity's of imports and exports for G7 countries

COUNTRY	Short Run Export Price Elasticity	Short Run Import Price Elasticity	Long Run Export Price Elasticity	Long Run Import Price Elasticity.
Canada	-.5*	-.1	-.9*	-.9*
France	-.1	-.1	-.2	-.4*
Germany	-.1	-.2*	-.3	-.6*
Italy	-.3*	-.0	-.9*	-4*
Japan	-.5*	-0.1	-1.0*	-.3*
United Kingdom	-.2*	-0	-1.5*	-.6
United States	-.5*	-.6	-1.6*	-3*

Note: * denotes statistical significance at the 5% level.

The message of this table is that trade elasticity's increase over time. Based on long run elasticity's, the MLR condition is met for nearly all the G7 countries. France and Germany are the exceptions. However in the short run the elasticity's are small and do not satisfy the MLR condition. The distinction between the short run and the long run elasticities is crucial and lead to what is termed J curve effect. A real devaluation or (depreciation) will worsen the current account balance in the short run but will improve it in the long run when the MLR condition is satisfied.

3.1.2 Criticism of the Marshall Lerner Condition Model

As a theory, the MLR condition lacks general equilibrium foundations. In particular it considers the two markets (for importable and exportable) to be independent of each other. In a budget constraint, not all markets can be independent. So there must be at least one other market not accounted for by the MLR condition. In addition from the absorption approach, we know that a country that has current account surpluses produces more than it spends. The MLR condition is silent on the mechanism by which this mechanism switching would operate following devaluation. Dornbusch (1975) explicitly introduces a non-traded goods sectors and fiscal policy in an attempt to reconcile the MLR condition with the absorption approach.

Using the ML condition, the government and policy makers are urged to adopt a police of currency devaluation when ML condition holds so as to encourage export growth in the country.

3.2.1 The Monetary Approach to Exchange Rate.

From the time the floating exchange rate system was implemented in 1972, significant volatility has occurred in the exchange rate markets. The approach used to understand exchange rates movement was the Monetary Approach. Diamandis and Kouretas (1996) argued that the monetary approach to understanding exchange rates has become the dominant model of exchange rate determination for the past 35years.

The construction of the Monetary Approach to Exchange rate has been influenced by the quantity theory of money, the Cambridge cash-balance approach, and Keynesian monetary approach.

A The Quantity Theory of Money

Europe experienced the steady increase in money supply during the 15th and 16th century and this put pressure on goods that could command higher prices. It was believed that the flow of goods and services could be maintained by imports and exports. If the supply of money increases, prices increase and vice versa. As a result the price of foreign goods compared to domestic goods would rise. Adam Smith saw a fundamental flaw in accumulating wealth by promoting exports and restricting imports. He believed that excess of money would be drained off through the balance of payments without affecting the prices (Humphrey, 1981)

B The Cambridge Cash-Balance Approach

The Fisher model assumes that the total number of transactions and the turnover of money are constant. Money is a medium of exchange and also a unit and store of value. Money is also endogenous because of the banks and financial institution's ability to create money through credit.

C The Keynesian Theory

According to the Keynesian theory, if an individual holds money to finance current and future transactions, as national income increase, the demand for money increases. The demand for

money varies directly with national income. Keynes highlighted that a cost is associated with holding money. Money can be invested in financial assets which can earn an interest. This was referred to as the speculation demand for money. There is a positive relationship between demand for money and interest rate. The higher the rate of return the more likely one will invest money.

In Summary, monetary theory proposes that exchange rates are a monetary phenomenon affected by the money supply, income level and interest rate.

3.2.2 Empirical test of the Monetary Approach

The Swedish Bullionist controversy of the mid 1700s brought this debate into sharp focus. Sweden moved from a monetary system based on metal and fixed exchange rates to a paper system with flexible exchange rate. The result was a substantial rise in prices. Some believed that an adverse balance led to depreciation of the Swedish currency increasing the price of imported goods and goods in general. Others claimed that rising prices were the result of the Swedish Central Bank issuing too many bank notes (Humphrey, 1978)

A similar Bullionist problem faced England. David Ricardo, John Wheatly and other economists concluded that the exchange rate varied proportionately with the relative supply of money.

3.2.3 Conclusion

The Monetary Approach is used in this study because it emphasizes the effect of money supply on exchange rate determination as well as the subsequent impact on export supply. If there is too much money supply in the nation, the value of that nation's currency is affected. This leads to devaluation and that country's exports become attractive to foreign buyers because they become cheaper. This can lead to the growth of exports in the short run.

3.3.1 Absorption Approach.

This model stipulates that trade balances improves if the nation's GDP improves faster than its domestic spending. The Absorption approach emphasizes changes in real domestic income as a determinant of a country's balance of payment and exchange rate. Since it treats all variables as constant, all variables are real measures.

A country's expenditures falls into four categories namely the consumption (c), investments (i), governments (g) and Imports (m). The total of these four gives us domestic absorption (a).

$$a = c + i + g + m$$

A country's real income (y) is equivalent to total expenditure on its output

$$y = c + i + g + x$$

where x denotes exports.

During the Bretton Woods time, the absorption model was developed, capital flows were not important. Trade flows however determines the current account balance. Hence the current account (ca) = is equivalent to $ca = x - m$

For instance if exports exceed imports X>M then the country is running a current account surplus. The absorption approach hypothesizes that a nation's current account balance is determined by the difference between real income and absorption, which can be written as

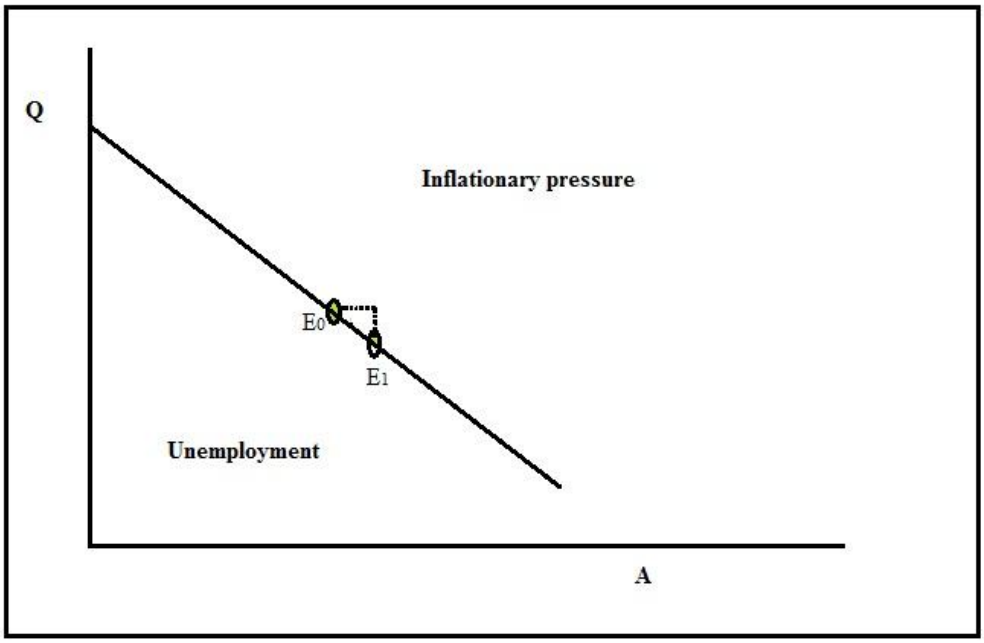
$y - a = c + i + g + m - (c + i + g + m) = x - m$ or $y - e = ca$

Though a simple theory, the absorption approach is helpful in understanding a nation's external performance during contractions and expansions. If we consider the case of an economic expansion. Real income rises, thereby increasing real expenditures or absorption.

Whether the current account balance improves or worsens depends on the relative changes in these two variables. If real income rises faster than absorption, then the current account improves. If real income rises slower than absorption, then the current account worsens. Similar conclusions can be reached for a nation experiencing an economic contraction.

If income exceeds absorption there is a current account surplus, while if absorption exceeds income there is a current account deficit.The absorption approach thus emphasizes that the excess of domestic demand over domestic production will have to be met by imports.

Figure 3.1 Domestic equilibrium

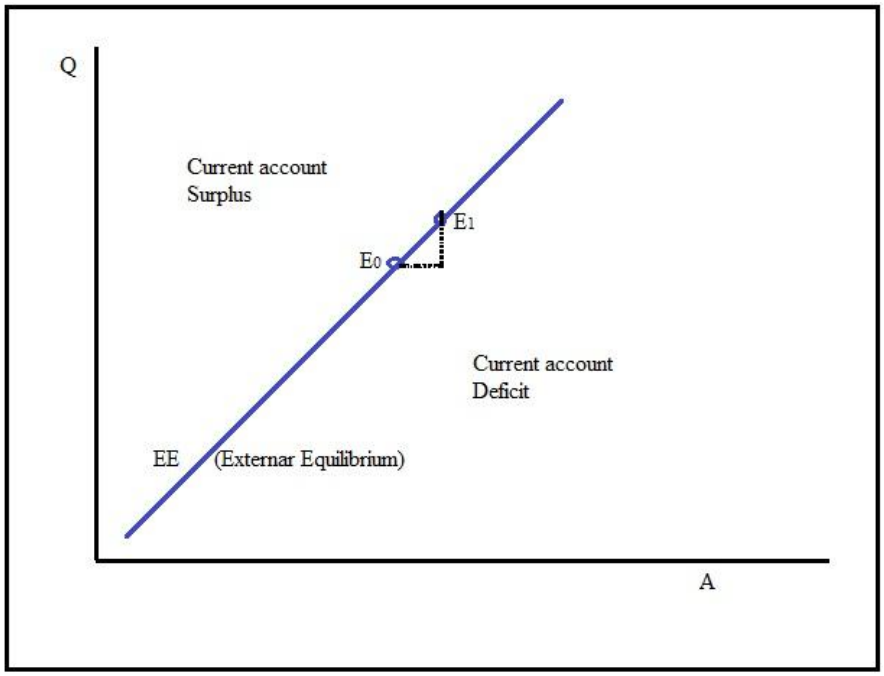


Source: Marrewijk (2005)

In this simple framework output depends on the level of absorption A and on the real exchange rate of the US dollar Q.

Suppose we start from point E_0, a point of initial domestic equilibrium, and the level of absorption increases. At a given real exchange rate Q, this increased demand for domestic goods lowers unemployment and therefore leads to inflationary pressure in the economy. To restore equilibrium, the relative price of American goods Q will have to decline such that the reduced demand in America for South African goods and the increased demand in South Africa for American import goods reduce South African output level and return us back to the natural rate of unemployment. As illustrated in figure 3.1, everywhere above the curve representing domestic equilibrium the economy will experience inflationary pressure, while everywhere below the line the economy will experience unemployment.

Figure 3.2 External equilibrium



Source: Marrewijk (2005)

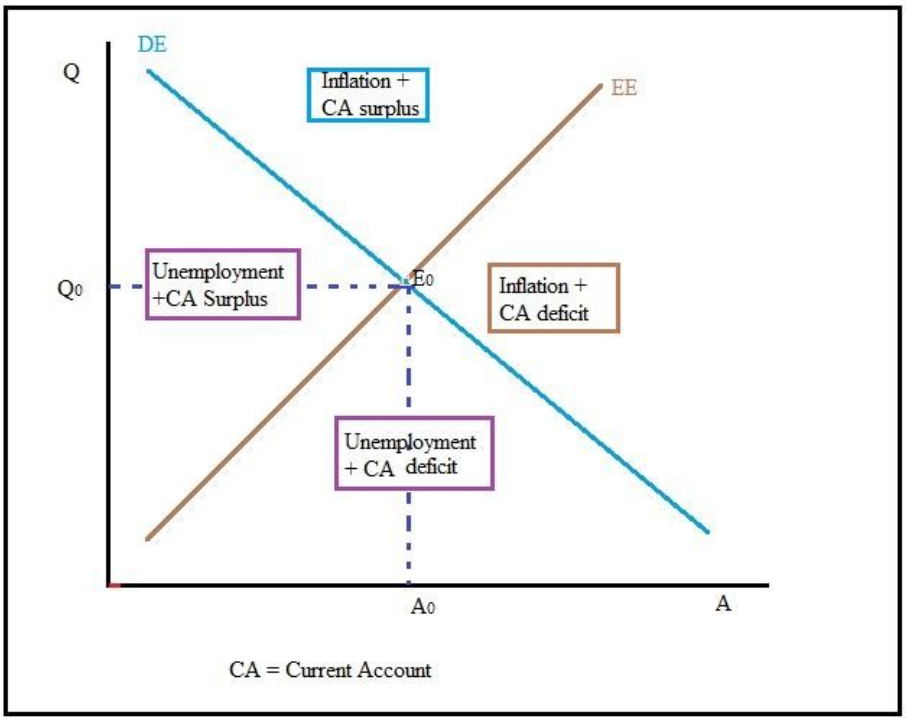
The external Equilibrium is a combination of Absorption A and the real exchange rate Q for which the current account is in equilibrium. The current account balance depends negatively on the level of absorption because an increase in domestic spending leads to an increased demand for import goods. It depends positively on the real exchange rate Q, provided the Marshall-Lerner condition is fulfilled:

$$CA = CA(A^{-}, Q^{t})$$

Figure 3.2 depicts combinations of absorption and real exchange rate with external equilibrium. On the basis of equation above, the curve is upward sloping in (*A, Q)*-space. Starting from point E_0, a point of initial external equilibrium, an increase in the level of absorption for a given real exchange rate will lead to additional import demand and therefore a current account deficit. To restore external equilibrium the relative price of American goods Q will have to increase, such as to increase the demand in America for South African exports and reduce the demand in South

Africa for American imports and eliminate the South African current account deficit. Also illustrated in figure 3.2 everywhere below the curve representing external equilibrium whereby South Africa experiences a current account deficit, while everywhere above this curve it experiences a current account surplus.

Figure 3.3 The Swan diagram



Source: Marrewijk (2005)

Figure 3.10 combines the information on domestic equilibrium and external equilibrium in one graph. It is named after the Australian economist Trevor Swan. There is a unique combination of absorption and the real exchange rate (A_0, Q_0) for which the economy is both in domestic equilibrium and in external equilibrium, (Swan 1955). For any other combination of absorption and the real exchange rate the economy is in one of four disequilibrium regimes, namely (i) unemployment + CA deficit, (ii) unemployment + CA surplus, (iii) inflation + CA deficit, or (iv) inflation + CA surplus.

3.3.2 Exchange Rate Determination

The absorption approach is used in this case to examine how changes in income affect the value of a nation's currency using y - a = x - m.

For example, if real income is rising faster than absorption, then exports must be increasing relative to imports. Hence, the nation's currency will appreciate.

The Absorption Approach emphasizes real income in balance-of-payments and exchange-rate determination. The approach hypothesizes that relative changes in real income or output and absorption determine a nation's balance-of-payments and exchange-rate performance.

It is not clear that expenditure switching and absorption instruments are effective.

3.3.3 Conclusions

The Marshall-Lerner condition. Monetary Approach and the Absorption approach uses different concepts and assumptions to explain the impact of exchange rate on exports and current account balances as discussed in all models.

According to Marshall-Lerner condition, which states that the sum of the price elasticities of export and import demand must exceed unity, a depreciation of the domestic currency will improve the current account balance. Empirical estimates show that the Marshall-Lerner condition is fulfilled for most countries, but only after a sufficiently long period of time has elapsed to ensure that the export and import quantities can adjust to the change in relative prices. According to the J curve effect, the initial response to a depreciation of the domestic currency is to deteriorate the current account balance, leading to an improvement only after an adjustment period of about one year. The absorption approach incorporates income effects into the analysis of the current account balance. This allows for a typology of types of disequilibria and the analysis of some simple adjustment problems.

The main theme derived from each model is that any change in currency values and pricing has an effect on the side of exports. Devaluation tends to promote the supply of exports in the short run whereas a tight money supply tends to reduce the attractiveness of the exports to foreigners. Eichengreen (2008) and Pancaro (2010) cautioned that the depreciation/undervaluation can be

used as a policy tool to upsurge the export growth only in the short term because a country cannot afford to maintain a depreciated exchange rate indefinitely.

3.4 Empirical Literature

This section analyses national and international studies on exchange rate volatility on exports. A large body of evidence comes from developed countries and African literature is scarce. In particular there are few studies that have been carried to study the impact of exchange rate volatility on export performance in South Africa.

Empirical literature can be categorised in a number of ways. That is categorisation by country (developing and developed) and by type of analysis (surveys and econometric studies). The literature review in this section follows the former categorisation.

3.4.1 Empirical evidence from developing countries.

Nwidobie (2005) carried out studies on the topic impact analysis of foreign exchange rate volatility on Nigeria's export performance. The aim of the study was to determine the impact of foreign dynamism on the country's export performance from 1980-2005. Research results from the Chi square analysis of obtained data show that fluctuations in the naira exchange rate affect non-oil exports. To reduce the impact of these fluctuations on non-oil exports, monetary authorities in Nigeria should stabilise the naira exchange rate through monetary and fiscal policies. Exporters should take the advantage of the futures market to eliminate the negative effects of this fluctuation on export income and performance; and fiscal and monetary policies should be initiated by the government to increase local production to meet local consumption, reducing foreign exchange demand for import consumption and reduce pressure on the naira exchange rate. The foreign exchange data for this study from 1980-2005 is segregated into an era when the naira exchange rate was fairly stable and in another era (1986-1987) when the naira depreciated rapidly against the United States. The export data for the study was aggregated as non-oil export by sectors during each of the foreign exchange rate regime.

Research findings were that the foreign exchange rate volatility has an impact on Nigeria's non-oil exports. The author recommended the monetary authorities in Nigeria to initiate policies and programme that will stabilise naira exchange rate and remove negative effect of exchange rate fluctuations on Nigeria's export performance.

Rey (2006) conducted a research titled ‘effective exchange rate volatility and MENA countries exports to the European Union. The study investigated the impact of nominal and real effective exchange rate volatility on exports to six Middle Eastern and North Africa (MENA) countries to 15 member countries of the European Union (EU) for the period 1970 Q1-2002Q4. Moving averages standard deviation and conditional standard deviation at ARCH model are used to generate four different measures of volatility for each country (Algeria, Egypt, Tunisia and Turkey), positive for the last two (Israel and Morocco), between MENA exports and exchange rate volatility. The short run dynamics, using error correction models shows that the Granger-Causality effects of the volatility on real exports are significant, whereas the effects of real exchange rate and the gross domestic product of EU are more contrasted. Indications on appropriate exchange rate regime were derived from these results.

The study used the data extracted from International Monetary Fund’s CD-Rom and OECD’s CD-Rom (Monthly Statistics of International trade). Data for individual country export volume are not directly available for bilateral trade.

The results based on cointegration show that the real exports are cointegrated with the relative price 9real effective exchange rate, REER), European GDP and exchange rate volatility. The direction of the relationship also indicates that the exports volumes are, in the long run, negatively related with volatilities for Algeria, Egypt, Tunisia and Turkey, while the relationship is positive for Morocco and Israel. The likelihood ratio test for exclusion indicates that the volatility variables are significant. The short run dynamics of these relationships is based on the error correction models. The variables REER and GDP are significant with appropriate signs. The exchange rate volatility is significant in most of cases, but the signs of the coefficients are positive or negative, depending on the definition of the volatility (real or nominal exchange rate) and the country. Therefore, their analysis shows that exchange rate volatility affects the real exports of MENA countries, in the long run and in the short run. Moreover, they were able to find a link between the sensitivity of exports to volatility and the composition of exports, i.e., the specialization of MENA countries.

The main economic lesson which can be drawn from this work concerns the choice of exchange rate regime. If the exporting activity is depressed by exchange rate volatility/uncertainty, we can consider that the exchange rate regime is not appropriate. This is true for Tunisia, Turkey, Egypt

and Algeria. In that case, the suitable policy would be one which avoids strong erratic movements in real exchange rates. For example, a peg arrangement based on currency basket involving the euro, as adopted by Israel and Morocco could constitute a reference. In this case a crawling basket peg could be favourable for these countries.

Verena (2008) carried out a similar study on the topic "does exchange rate volatility harm exports'. The study empirically investigated the impact of real effective exchange rate volatility on the Mauritian export performance from 1975 to 2007. Exchange rate volatility was derived from the moving average standard deviation method since no GARCH effect was obtained. The empirical research based on the ARDL analysis showed that real exports are cointergrated with foreign economic activity, real effective exchange rate and volatility of real exchange rate. The research findings revealed that exchange rate volatility has a positive and significant short run effect on exports, whilst in the long run volatility adversely affects the Mauritanian exports. It thus becomes crucial to consider both the existence and the degree of exchange rate volatility for the implementation of appropriate trade policies to improve the country's export performance and trade balance.

This study uses data from the period 1970 to 2008 from the international monetary Fund's international Financial Statistics and the central Statistical Office of Mauritius. The methodology used is the autoregressive distributed lag (ARDL) approach to co-integration proposed by Pesaran et al. (2001) The ARDL bounds co-integration technique has been selected to determine the long run and short run relationships between real exchange rate volatility and export performance.

The findings based on the ARDL bounds testing procedure show that volatility has a positive and significant short run effect on exports, whilst in the long run volatility adversely affects the Mauritian aggregate exports. Foreign income has a positive and significant long run effect on real exports. However in the short run foreign income turns out to be negative and insignificant showing that a permanent rise in income is most likely to increase demand for imported relative to temporary rise in earnings. Further real effective exchange rate has a positive and significant effect on exports in the short run which confirms the depreciating rupee of the Mauritian economy over the recent years. Exchange rate volatility is one among many variables that influence export performance.

3.4.2 Empirical evidence from developed countries.

Hericout and Poncet (2012) carried a study on the impact of exchange rate volatility on a panel of Chinese firms. In this study they investigate both the impact of exchange rate volatility on exporting behaviour and the way financial constraints together with financial development, shape this relationship at firm level. Their empirical estimations for more than 100, 000 Chinese exporters over the period 2000-06. They had access to information on firms' sales as well as on the structure of their exports including the products and destinations they serve. They also infer firm financial level vulnerability from the financial level of their activities. Using this detailed information, they identified the impact of exchange rate volatility (defined as the yearly standard deviation of monthly log differences in the real exchange rate, the latter being computed as the ratio of nominal exchange rate of the Yuan with respect to the partner's currency divided by the partner's price level) on different measures of intensive and extensive margins, depending on the level of financial constraints

Their study found that firms tend to export less and fewer products to destinations with higher exchange-rate volatility. It also appears that the magnitude of this export-deterring effect depends on the extent of firms' financial vulnerability. To illustrate these results, they compared the reduction in the export performance due to real-exchange-rate volatility for strongly and weakly credit-constrained firms. Regarding the strongly constrained firms, their results suggested that a two percentage point (i.e. one standard deviation) increase in yearly real-exchange-rate volatility would reduce the export value by 3% and the number of exported products by 0.85%. The effect is lower, but still present, for weakly constrained firms: for them, the same 2% increase in yearly real-exchange-rate volatility cuts the export value by 0.24% and the number of exported products by 0.07%. Tough non-negligible, the effects appear therefore quantitatively less important for the extensive margin of trade than for the intensive margin

A comprehensive study of exchange rate volatility was conducted by Murray, van Norden, and Vigfusson (1996) in Canada. They concluded that the popular perception of increased exchange rate volatility was not supported by the data. The authors looked at trends in exchange rate volatility over time and compared volatility in currency markets to that in markets for other

assets such as equities. They attributed exchange rate volatility to traders looking to market fundamentals rather than to potentially destabilizing noise traders.

Descriptive indicators of exchange rate volatility were set out in panels. The two panels showed how the daily change in (i) the level and (ii) the log of the bilateral Canada-US nominal exchange rate from January 1975 to March 2005 varied. While the changes seem to remain within roughly the same band over the period through the mid-1990s, there is a discernible increase in these changes after the mid-1990s and, in particular, since 1997. This visual impression is quantified by the 67 per cent increase of the standard deviation of the daily log changes (from 0.002527 to 0.004224) between the 1975–96 and 1997–2005 subsamples. Under the (admittedly heroic) assumption of normality, the *F*-test for the hypothesis of equal variances in the two samples generates a value of 2.83. Under the null hypothesis, this ratio has an *F*-distribution with 1,992 and 5,348 degrees of freedom, and the hypothesis is rejected at a very high confidence level. The 12-month standard deviations of monthly exchange rate changes were used instead of daily data

Hasan (2001) investigated the impact of exchange rate volatility in Turkey on trade flows. The paper empirically investigated the impact of real exchange rate volatility on the export flows of Turkey to the United States and its three major trading partners in the European Union for the period 1990:1-2000:12. This paper re-examines the impact of exchange rate volatility on the demand for real exports in the context of a multivariate error-correction model. The model is estimated for Turkey's real exports to each of its three major trading partners in the European Union and the United States for the period between 1990:01 and 2000:12. The paper estimated two exchange rate volatility measures; the variance of the real exchange rate around its predicted trend and the standard deviation of the percentage change in the real exchange rate. Having confirmed that both of the versions adequately measure the variability of real exchange rates, the version of the standard deviation of the percentage change in the real exchange rate was used as a proxy for exchange rate risk. The empirical results based on co-integration analysis show that real exports are co-integrated with foreign income, real exchange rate and exchange rate volatility. The results concerning the effects of exchange rate volatility on real exports suggest

that the long-run relationship between Turkey's real exports and its exchange rate volatility is negative and statistically significant for Germany, France and the United States.

In addition, the exchange rate volatility has negative short-run effects on real exports to Germany. For the rest of the countries, the short-run impact of the exchange rate volatility is statistically insignificant. Utilization of forward exchange markets to fully hedge exchange rate risk may have made exchange rate volatility less of a factor in explaining real exports to these countries in the short-run. These results, on the whole, provide uniform evidence on the effect of the exchange rate volatility on real exports. This finding supports those who point out that exchange rate volatility have a negative impact on trade. In addition, the Chow test results show the absence of parameter instability in the estimated models Finally, to the extent that one can generalize from Turkey's experience, policy makers in developing countries should consider both the existence and the degree of exchange rate volatility and notice the likely impact of the exchange rate volatility for each trading partner in implementation of trade policies.

3.4.3 Empirical evidence from South Africa.

Todani (2005) carried a similar topic here in South Africa. The topic of the study was "Exchange rate volatility and exports in South Africa." The study examined the characteristics of short term fluctuations/volatility of the South African exchange rate and investigates whether this volatility has affected the South Africa's flows. The ARDL bounds testing procedures developed by Pesaran et al. (2001) were employed on quarterly data for the period 1984 to 2004. The results suggest that, depending on the measure of volatility used, either there exists no statistically significant relationship between South African exports flows and exchange rate volatility or when a significant relationship exists, it is positive. No evidence of long run volatility or when a significant relationship exists, it's positive. No evidence of a long run gold and services exports demand relations were found. These results are however not robust as they show great amount of sensitivity to different definitions of variables used.

The ARDL bounds testing approach developed by Pesaran et al (2001), tests the existence of a level relationships between a dependent variable and a set of regressors when the order of integration of the regressors is known with certainty. The results show the sensitivity of the

variable definitions used. The results found were that depending on the measure of volatility used, exchange rate volatility either does not have a significant impact on South Africa's exports flows or it has a positive impact does have a positive impact on aggregate and goods exports.

The results, which are still considered preliminary, are plausible and are in line with other findings in the literature. They are, however, indicative of additional work to be done, given their lack of robustness with respect to the variables definition used. As a point of departure for further research measurements of the regressors, especially the income and exchange rate volatility need to be considered.

Edwards (2007) also carried a study on the topic 'Trade flows and the exchange rate in South Africa. The study reviewed theoretical and empirical relationship between the exchange rate and trade flows in South Africa. Trade volumes were found to be sensitive to real exchange rate movements but nominal depreciation have a limited long run impact on trade volumes and the trade balance, as real effects are offset by domestic inflation. Policy should not focus on the exchange rate but on the fundamental determinants of the profitability and competitiveness of domestic exporters and import competing industries. The study reviews existing empirical literature on exchange rate-trade performance relationship in South Africa. The conclusion drawn from the study was that trade flows and the trade balance is sensitive to real exchange rate in South Africa. A real depreciation is effective in raising export volumes, reducing import volumes and improving trade balance. A real depreciation is also effective in diversifying exports away from primary commodities towards manufacturing and particularly non-commodity manufacturing.

Bah and Amusi (2003) conducted a study on the impact of exchange rate on export performance in South Africa for the period 1992 to 2000. They used ARCH and GARCH models to test their study. They concluded that exchange rate volatility has a significant negative impact on the performance of exports.

Lira (2007) empirically examines the impact of real exchange rate volatility on trade in the context of South African exports to the United States for the South Africa's floating period 1995-2007. In measuring real exchange rate volatility the author utilised GARCH model. After establishing the existence of cointegration among variables involved in a two country model, the

author estimated long run coefficients by means of ARDL bounds testing procedure proposed by Pesaran et al (2001). The result indicates that real exchange rate volatility exerts a significant and negative impact of South Africa's exports to the United States.

3.4.4 Empirical literature from emerging market economies

Gonzaga and Terra (1997), using Ordinary Least Squares, examined the relation between quantum of exports and exchange rate volatility in the Brazilian case. The authors estimated eight export supply equations combining two different definitions of the dependent variable (volume of exports and the share of exports in GDP) and four different measures of exports. Their regressions included as their explanatory variables, besides the real exchange rate and its volatility, the level of GDP as a proxy for the domestic activity and a linear trend. They found the volatility coefficient to be negative in most specifications (six out of eight).

3.4.5 Assessment of Literature

Both theoretical and empirical literature came out with differing conclusions regarding the role played by exchange rate volatility on export performance. Empirical literature from South Africa and the rest of the world such as those done by Bah and Amusi (2003), Lira (2007), came up with the outcomes that were consistent with the study. They suggested that exchange rate volatility has a significant and negative impact on export performance in South Africa. However other researchers such as Todani (2005) came up with contrasting results. The author suggested that there exists no statistically significant relationship between South African exports and exchange rate volatility. This study is going to follow the first view which proposes that exchange rate volatility has a significant impact on export performance. This study differed from others reviewed above by using monthly data instead of quarterly or annual data to provide more useful results.

3.5 Conclusion

The main objective of this chapter was to give an overview of empirical and theoretical literature on the impact of exchange rate volatility on export performance. The majority of empirical studies reviewed in this chapter have found that volatility of exchange rates have a pronounced negative effect on export performance. However very few studies have found out that volatility of exchange rate has little impact on export performance.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter specifies the methodology applied to examine the impact of real exchange rate volatility on export performance in South Africa. The structure of this chapter shall be as follows: The first section develops an analytical model while the second section defines the variables used in the model and the third section discusses the data sources. A review of estimation techniques for the study of the impact of exchange rate volatility on export performance is presented in the fourth section. The fifth section concludes the chapter.

4.2 Model Specification and Definition of Variables.

To determine the impact of exchange rate volatility on export performance in South Africa, this study shall modify the Guérin and Lahrèche-Révil (2001) methodology. Guérin and Lahrèche-Révil (2001) examined the relationship between currency volatility and growth, in Europe, using the following model:

$$(IV_{it}) = B_1 GDPG_{i,t-1} + B_2\left(GDPV_{i,t-1}\right) + B_3 ECUVOL_{it} + B_4\, OPEN_{it} + e_i + u_t + \varepsilon_{it} \quad \text{..... (4.1)}$$

Where:

(IV_{it}) = is investment

$(GDPG_{i,t-1})$ = is the Gross Domestic Product growth.

$(GDPV_{i,t-1})$ = is the investment share of GDP

$(ECUVOL_{it})$ = is exchange rate volatility and it was the standard deviation of the monthly percentage changes of nominal exchange rates of European countries against a basket of the 15 currencies of the European Union. It is expressed in %.

$(OPEN_{it})$ = is trade openness and it was measured as the share of exports and imports with the 15 European partners, compared to GDP, and expressed in percentages. Hence, was an intra-European openness.

This study shall modify the Guérin and Lahrèche-Révil (2001) model by putting trade openness measured by exports plus imports divided by GDP, Real Effective Exchange rate and capacity utilisation. Moreover this study shall put the volatility of the Rand as the independent variable.

Using GARCH, the model will be represented as a system of equations for export supply (X^s) and export demand (X^d) which simultaneously determine export price and export quantity.

4.2.1 Export Demand Function

The export demand function will be modelled as a function of real effective exchange rate, real foreign income, and domestic prices of exports. This can be expressed as follows;

$$X^d = \alpha_0 + \beta_1 REER_t + \beta_2 Y_t + \beta_3 GDP_t = u_t \text{.....}(4.2)$$

We postulate the following export adjustment mechanism for export demand.

$$X_t - X_{t-1} = \delta(X^{dt} - X_{t-1}) \text{.....}(4.3)$$

Where δ is equal to a coefficient of adjustment $0 \le \delta \le 1$. By substituting (4.2) into (4.3) the following model is derived

$$X^{dt} = \alpha_0 + \beta_1 REER_t + \beta_2 Y^t + \beta_3 GDP_t + (1-\delta)X_{t-1} + \mu_t \text{.....}(4.4)$$

All the variables are converted to logarithms. This is done in order to remove trends and obtain elasticity coefficient of these variables. The model in (4.4) above thus assumes the form

$$LX^{dt} = \alpha_0 + \beta_1 LREER_t + \beta_2 LY^t + \beta_3 LGDP_t + (1-\delta)X_{t-1} + \mu_t \text{.....}(4.5)$$

LREER is the logarithm of the real effective exchange rate of the Rand, measured in foreign currency terms. The REER of a country *i* is normally calculated as a geometric weighted average

of weighted bilateral exchange rates. The weighted bilateral exchange rate is calculated as follows:

$$REER_i = \prod_{i \neq j} \left(\frac{P_i e_{i1}}{P_j e_{j1}} \right) x_{ij}$$

Where *ej* indicates the exchange value of country $j's$ currency against the US dollar, *xij* is the country *j's* weight in country *i's* index and *pj* is price index of country *j*. Under this study a rise in REER represents a real depreciation of the Rand.

LGDP is the logarithm of Gross value added at basic prices of manufacturing Gross Domestic Products.

LY is the logarithm for foreign income and is defined as income arising from outside South Africa.

μ is the error term.

4.2.2 Export Supply Function

On the supply side, the desired levels of exports are assumed to be influenced by real exchange rate (REER), Trade openness (TO), and capacity utilisation (CU). This can be expressed as follows:

$EX^s = \alpha_0 + \beta_1 REER + \beta_2 TO + \beta_3 CU_t + \mu_t$.....(4.6).

LEX^s= is the logarithm of exports

LTO = is the logarithm of trade openness.

LCU = is the logarithm of capacity utilisation (infrastructure and the level of technology).

This specification assumes that the desired level of exports supplied is equal to the level of exports supplied. To get a disequilibrium export supply function, a partial adjustment mechanism is needed. It is postulated in the following adjustment mechanism for exports:

$\Delta X_t = \lambda(X_t - X_{t-1})$.....(4.7)

Where $\lambda =$ is equal to coefficient of adjustment $(0 \leq \lambda \leq 1)$. By substituting equation (4.6) into equation (4.7) the following general export function is derived.

$$EX^s = \alpha_0 + \beta_1 REER + \beta_2 TO + \beta_3 CU_t + (1-\lambda) X_{t-1} + \lambda u_t \text{ .....(4.8)}$$

All the variables are converted to logarithms. The model becomes

$$EX^s = \alpha_0 + \beta_1 LREER + \beta_2 LTO + \beta_3 LCU_t + (1-\lambda) LX_{t-1} + \lambda u_t \text{ .....(4.9)}$$

By substituting (4.5) into (4.9) then the following general export function for South African exports is derived as follows:

$$LEX_t = \alpha_0 + \beta_1 LREER + \beta_2 LTO_t + \beta_3 LCU_t + \beta_4 LGDP + \beta_5 LY + \mu_t \text{ .....(4.10)}$$

This will give us potentially important relationships among expected determinants and trade growth on which the estimation will apply.

4.3 Definition of Variables

LEX is the natural logarithm of exports. Exports are goods and services produced domestically and sold to buyers in another country.

LREER is the logarithm of the Real Effective Exchange rate of the Rand, measured in foreign currency terms. The REER of a country *i* is normally calculated as a geometric of weighted bilateral exchange rates. The weighted bilateral exchange rate is calculated as follows:

$$REER_i = \prod_{i \neq j} \left(\frac{P_i e_{i1}}{P_j e_{j1}} \right) x_{ij}$$

Where *ej* indicates the exchange value of country $j's$ currency against the US dollar, *xij* is the country *j's* weight in country *i's* index and *pj* is price index of country *j*. Under this study a rise in REER represents a real depreciation of the Rand.

There is a larger variety in what countries can expect from using the exchange rate as a policy to boost their trade balance and growth. The sign of the real effective exchange rate is expected to be positive for countries that expect an improvement in trade balance through depreciation of the

real effective exchange rate. The sign can be negative for countries that do not expect a larger gain in trade from depreciating their currency to boost exports. South Africa is likely to benefit from real exchange rate depreciation because South African exports are elastic.

LTO is the logarithm of trade openness. Trade openness is associated with positive trade outcomes. More open economies must experience more trade growth. Trade openness can improve exports as there will be limited hindrances to trade between countries. Trade openness is associated with positive trade outcomes and hence a positive relationship is expected. More open economies are expected to result in increased growth in trade. Trade openness can improve exports as there will be limited hindrances to trade between countries.

LCU is the logarithm for capacity utilization. Capacity utilization (infrastructure and technology) is the extent to which the productive capacity of plant, firm, country is being utilized in generating goods and services for exports. More capacity utilization by firms would result in more goods and services being produced at a lower cost because fixed costs and total costs decreases as more units are produced. Higher capacity utilization generally results in more output and more exports. A positive sign is expected on capacity utilization. More capacity utilization by firms would result in more goods and services being produced at a lower cost because fixed costs and total costs decreases as more units are produced.

LGDP is the logarithm of the country's growth domestic product. The GDP measures a country's economic growth. It indicates the total output produced per year. Since net export is a component of GDP, this variable has been dropped from the South African export equation because it results in collinearity.

LY is the logarithm for foreign income and is defined as income arising from outside South Africa. Since Net foreign income is a component of GDP, the variable has also been dropped out of the equation because it results in collinearity.

4.4 Data Sources

The study shall use data on exports of goods and services, real effective exchange rate, trade openness and capacity utilisation, obtained from Statistics South Africa and Reserve Bank of South Africa. Nominal figures shall be used for the study. The study employs monthly South African data for the period 2000/01 – 2012/11 so that there will be adequate observations so as to get reliable conclusion. The data shall be tested for stationary to determine the order of integration of the data series in order to eliminate spurious regression results. This shall be done using the Augmented Dickey Fuller method and the Phillip Peron test.

4.5 Research Techniques

The study uses Dickey Fuller test, Augmented Dickey Fuller test and Phillip Peron unit root tests for stationarity. Variables are tested for stationarity because most economic series are not stationary in their levels which lead to estimations being meaningless. In this section the techniques used to test for stationarity are reviewed.

4.5.1 Stationarity Test

If a series is non-stationary it must be differentiated ‘d’ times before it becomes stationary, then it is said to be integrated of order ‘d”, written I (d). Applying the difference operator more than “d” times to an I (d) process will result in a stationary series but with moving average error structure. An I(0) is a stationary series, while an I(1) series contains one unit root. An I(2) series contains two unit roots and so would require differencing twice to induce stationarity.

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

$$E(Y_t) = \mu \qquad (4.11)$$

a constant variance;

$$Var(Y_t) = E(Y_t - \mu)^2 = \partial^2 \qquad (4.12)$$

and a constant auto-covariance;

$$Y_k = E[(Y_t - \mu)(Y_{t-k} - \mu) \qquad (4.13)$$

The level of stationarity ranges from strict, weak stationarity or white noise (Brooks, 2002). A series is strictly stationary when the distribution remains the same as time progresses implying that the probability of Y falls within the particular interval is the same now as at any time in past or future. Weak stationarity refers to a series with a constant mean, constant variance and constant auto-variance while a white noise has a constant mean, constant variance and a zero auto-co variance except at lag zero (Brook, 2002). The use of non-stationary data in econometric modelling gives invalid standard assumptions for asymptotic analysis. Non-stationary data can also lead to dangers of running spurious regressions. A spurious regression is one with two variables trending together over time and could have a higher R^2 and t-statistic values even if the two values are totally unrelated.

The effect of a shock in time t on a stationary data gradually dies away with time whereas in a non-stationary series, the effect of a shock persists throughout the period. There are several methods and techniques of testing for stationarity but the most common are the Dickey Fuller (DF) test, Augmented Dickey Fuller (ADF) test (Dickey & Fuller, 1981, 1984) and Phillips-Peron (PP) test (Phillips & Peron, 1988). These methods are discussed in the following sub sections.

4.5.2 Dickey Fuller (DF) test

Dickey and Fuller (1979, 1981) devised a procedure to formally test for non stationarity (Asteriou and Hall, 2007:295). The key insight of their test is that testing for non-stationarity is equivalent to testing for the existence of a unit root (Asteriou and Hall, 2007:308). The DF method, tests the null hypothesis that a series contains unit root against an alternative hypothesis that a series is stationary. Dickey Fuller test estimates the following equation;

$$\Delta Y_t = (\rho - 1)Y_{t-1} + \mu_t = \delta Y_{t-1} + \mu_t \text{.....} (4.14)$$

Three models can be estimated for each variable for using DF test that is, an equation with no constant and no trend; with constant and no trend and with constant and trend. The test is done on under the hypothesis that, there is a unit root. When the statistical value is smaller than the critical value in the DF test the null hypothesis of a unit root is rejected in favour of the alternative hypothesis and conclude that the series is stationary. However, the DF test has been criticised of being weaker than the ADF and PP unit root tests. The weakness of the Dickey

Fuller test is that it does not take into account the possibility of autocorrelation in the error term. As the error term is unlikely to be white noise, Dickey and Fuller extended their test procedure suggesting an augmented version of the test which includes extra lagged terms of the dependent variable in order to eliminate autocorrelation (Asteriou and Hall, 2007:295).The DF method has been criticised for the near observation equivalence. This arises when the analytical tests have low statistical power because they often cannot distinguish between true unit-root processes ($(\delta = 0)$ and near unit root processes (δ is close to zero). In addition the DF test is valid only if it is assumed that there is no autocorrelation in μ_t but that would be the case if there is autocorrelation in the dependent variable of the regression ΔY_t .The test would therefore be outsized, meaning that the true size of the test would be higher than the normal size used. The Dickey fuller method therefore suffers from low power and size distortions. The error term should, thus, satisfy the assumption of normality, constant error variance and independent error terms failure would render the DF tests biased (Takaendesa, 2006). These problems can be eliminated by using a stricter version of DF test method known as the ADF test together with the PP test.

In view of the weakness of DF test the ADF test and PP tests are explored in the following sub-section

4.5.3 Augmented Dickey Fuller (ADF) test

The ADF test is more preferred to the DF test since the latter has critical values that are bigger in absolute terms and may sometimes lead to a rejection of a correct null hypothesis (Brooks, 2004:379). The ADF test is carried out by augmenting the lagged values of the depended variable and estimates the following equation;

$$\Delta Y_t = \beta_1 + \beta_2 t + \lambda Y_{t-1} + \sum_{i=I}^{n} \eta \Delta Y_{t-i} + \mu_t \text{.....} (4.15)$$

This equation has an intercept and a time trend. The number of augmenting lags n is determined by minimising the Schwartz information criterion (SIC) or minimising the Akaike information criterion (AIC) or lags is dropped until the last lag is statistically significant. Econometric Views (Eviews) software allows all the options to choose from. The test is done on λ and the critical

values from DF tables are used. The null hypothesis of a unit root is rejected in favour of the stationary alternative where the test statistic is smaller than the critical value and is significant.

4.5.4 Phillips–Peron (PP) Test

Phillips and Peron have developed a more comprehensive theory of unit root non-stationarity (Brooks, 2008:330) The tests are similar to ADF tests, but they incorporate an automatic correction to the DF procedure to allow for auto-correlated residuals (Brooks, 2008:330).The main difference between the PP test and the ADF test is in how they deal with serial correlation and heteroskedasticity in the errors. The PP test has an advantage over the ADF test as it gives robust estimates when the series has serial correlation, time dependent heteroskedasticity and a structural break. In particular, the PP test ignores any serial correlation in the test regression where the ADF tests use a parametric auto regression to approximate the ARMA structure of the errors in the test regression. The test regression for the PP tests is;

$$\Delta Y_t = \alpha_{1+}\gamma Y_{t-1} + \alpha_2(t - T/2) + \sum_{i=I}^{m} \phi_i \Delta Y_{t-I} + \mu_{2_t} \text{.....}(4.16)$$

Where ΔY_t is the first difference operator, T is the sample size and μ_{2t} is the co-variance stationary Random error term. The lag length m is decided according to Newly-West's (Newly and West, 1987) suggestions. The null hypothesis of non-stationary is tested using the t-statistic with critical values calculated by Mackinnon (1996). The null hypothesis that the series is I(1) is rejected when the test statistic is more negative than the critical value and is significant in favour of the alternative hypothesis that the series is stationary. In this study, the ADF test and PP test for stationarity are applied for unit root tests and are chosen instead of the DF because of the diverse reasons that are explained above.

4.6 Heteroskedasticity Test

In econometrics unequal variance is referred to as heteroskedasticity. In contrast, a sequence of Random variables with a constant variance are said to be homoskedastic. According to Brooks (2002:148), there are a number of formal statistical tests for heteroskedasticity. One such popular test is the White's test for heteroskedasticity. The test is useful because it has a number of assumptions such as; it assumes that the regression model estimated is of the standard linear type

after running the regression, residuals are obtained and then test regression is run by regressing each product of the residuals on the cross products of the regressors and testing the joint significance of the regression. The null hypothesis for the White test is homoskedasticity and therefore failure to reject the null hypothesis means that there is homoscedasticity. If the null hypothesis is rejected then there is heteroscedasticity.

4.7 Diagnostic checks

Diagnostic checks are vital in the examination of the relationship between exchange rate and export performance because they validate the parameter evaluation outcomes achieved by the estimated model. Diagnostic tests ought to be performed to show that the model chosen is a good model in the sense that all the estimated coefficients have the right signs according to Gujarati (2004:516). They are statistically significant on the basis of the t and F tests, and the R-squared values should be reasonably high. These checks test the stochastic properties of the model such as residual autocorrelation, heteroscedasticity and normality, among others. The multivariate extensions of the residual test is applied in this study and is briefly discussed below.

4.7.1 Normality test

One of the most commonly applied tests for normality is the Jarque-Bera (JB) test (Jarque, & Bera, 1981). The residual normality test employed in this study is the multivariate extension of the Jarque Bera normality test. It compares the third and fourth moments of the residuals to those from the normal distribution. The preferred residual factorization (orthogonalisation) method for the test is by Urzua (1997). This method makes a small sample correction to the transformed residuals before computing the Jarque-Bera statistic. The Jarque-bera test is based on the fact that skewness and kurtosis of normal distribution equal zero. Therefore the absolute value of these parameters could be a measure of deviation of the distribution from normal. The Jarque-Bera test is a goodness of fit measure to departure from normality, based on the sample kurtosis and skewness. The JB test is conducted under null hypothesis and it states that residuals are normally distributed. Machiwal and Jha (2012:48) stated that the test is defined as

$$\text{JB} = \frac{n}{6}\left(S^{2+\left(\frac{k-3}{4}^{2}\right)}\right) \qquad (4.17)$$

Where n = number of observations, S = sample skewness and k = sample kurtosis. The JB test is based on the result that a normally distributed random variable has a skewness that is equal to zero and kurtosis that is equal to 3. A significant Jarque-Bera statistic, therefore, points to non-normality in the residuals. However, the absence of normality in the residuals may not render cointegration tests invalid. A more important issue in carrying out the cointegration analysis is whether the residuals are uncorrelated and homoskedastic (Islam and Ahmed, 1999:105).

4.7.2 Correlogram-Q-statistics

This tests whether a volatility model has sufficiently captured all of the persistence in the variance of returns. If the model is adequate then the standardized squared residuals should be serially uncorrelated (Knight and Satchell, 2007:56). The q-statistic of squared residuals looks as follows:

$$Q^{*} = T\,(T+2)\,\sum_{k=1}^{m}\frac{\tau_k^2\,(\alpha_t^2\,)}{T-K} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.18$$

Where T is the sample size, m represents the maximum length and τ_k are the correlation coefficients. The null hypothesis is$H_0 = \beta_1 = \cdots \ldots\ldots\ldots\ldots \beta_m = 0$, where β_i is the coeeficient of α_{t-1}^2 of linear regression:

$$\alpha_t^2 = \beta_0 + \beta_1\,\alpha_{t-1}^2 \ldots\ldots \beta_{t-m}^2 + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.19$$

for $t = m + 1 \ldots\ldots, T$.

If there is no serial correlation in the residuals, the autocorrelations and partial autocorrelations at all lags should be nearly zero, and all Q-statistics should be insignificant with large p-values (Knight and Satchell, 2007:56).

4.7.3 Serial Correlation Test

Serial correlation occurs when there is dependence between error terms. Error terms of the equation estimate must be distributed independently of each other and hence the covariance between any pair of error or residual terms must be zero (Lhabitant, 2004). Serial correlation occurs when the covariance is not zero. The use of time series data often leads to the problem of autocorrelation. Serial correlation is a problem because standard errors (even heteroskedastic robusts) are not consistent, affecting statistical inferences (hypothesis testing). Durbin-Watson is

the most commonly used test in time series. However, it is significant to know that it is not relevant in many instances, for instance if the error distribution is not normal, or if there is a dependent variable in a lagged form as an independent variable, this is not an appropriate test for autocorrelation. A test that is more appropiate that does not have these limitations is the Lagrange Multiplier test (LM test).

4.7.4 Autocorrelation – LM tests

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

The test can be done by using the following identity;

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

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

4.8 Estimation Technique

Econometric models that wish to estimate relevant parameters for volatility of financial time series data are increasingly relying on the ARCH and GARCH models. Studies that deals with financial time series have often been estimated through these two approaches and due to this, the GARCH model by Bollerslev (1986) has been chosen to determine the impact of currency volatility on export performance.

4.8.1 GARCH Model

One of the assumptions of the least squares model is that the expected value of all error terms, when squared, will be the same at any point. This assumption is called homoskedasticity. When the expected value of all error terms squared, is not the same there exists a problem of heteroscedasticity. Engel (2001) noted that “data in which the variances of the error terms are not

equal and in which the error terms may be expected to be larger for some points or ranges of the data than for others, are said to suffer from heteroskedasticity as a variance to be modelled. As a result, not only are the deficiencies of least squares corrected, but a prediction is computed for the variance of each error term.

This study employs the Garch Model to estimate the impact of exchange rate volatility on the export market. The origins of the GARCH model can be found in the ARCH model which was developed by Engel in 1982. To describe data series with time varying volatility, an ARCH model allows the variance of error terms to change over time. Engel (1982) defined the terms of the ARMA mean equation as an autoregressive conditional heteroskedastic (ARCH) process .

The ARCH model has known two shortcomings. The first one is that the ARCH model is regarded as a short memory process because only recent p residuals has an effect on the current variance. The ARCH specification looked more like a moving average specification but with an auto regression. The GARCH lets the conditional variance be a function of the squares of previous observations and past variances. It improves an autoregressive structure on the conditional variance allowing shocks to persist over time. Bouchet, Clark and Lambert (2003:120) held that the GARCH (1,1) model is based on the fact that over time the variance tends to get pulled back to the long run average level. In this manner, the error term has a conditional variance that is a function of the magnitudes of past errors. The 1,1 in GARCH mean that the conditional variance depends on the 1 most recent squared residuals and the 1 most recent conditional variance. The Garch (1.1) is defined by the following equation:

$$h_{t+1} = \varpi + \alpha\varepsilon_t^2 + \beta h_t \text{.....}$$

Where h is the variance, ε is the residual squared, t denotes time ϖ, α, β are empirical parameters determined by maximum likelihood estimation. The equation tells us that tomorrow's variation is a function of today's squared residual, today's variance and the weighted average long-term variance.

Piot-Lepeti and M'Barek (2011:88) held that the GARCH model allows a longer memory process in which all the past residuals can affect the current variance either directly or indirectly through the lagged variance terms. The GARCH estimates are used to identify periods of high

volatility and high clustering. The GARCH have become widespread tools for dealing with time series heteroskedastic models. The goal of such model is to provide a volatility measure deviation that can be used in financial decisions concerning risk analysis, portfolio selection and derivative pricing.

Many financial time series such as exchange rates, exhibits changes in volatility in time and these changes tend to be serially correlated. Moreover, evidence shows the distribution of time series data such as real effective exchange rates is characterised by leptokurtosis, fat tails, skewness and volatility clustering (Lee, 2003). GARCH models accounts for fat tails, Leptokurtosis and volatility that are commonly associated with financial time series.

Dowd (2005:132) argues that the GARCH model is tailor made for volatility clustering and this clustering produces returns with fatter than normal tails even if the innovations, the Random shocks are themselves normally distributed.

Generally the presence of leptokurtic tendencies on the time series returns suggests the presence of volatility clustering; hence the modelling of such phenomena is recommended through the use of GARCH models. In the GARCH, effects such as volatility clustering and leptokurtosis are captured by letting the conditional variance be a function of the squares of previous observations and past variances.

4.9 Concluding Remarks

In this chapter, the variables that influence the export performance in South Africa were specified as well as the model which determines the impact of exchange rate volatility on exports performance has been laid down. The variables that influence export performance used in this study are Real Effective Exchange Rate (REER), Trade Openness (TO) and Capacity Utilisation (CU). This study analyses the impact of exchange rate volatility on export performance. The GARCH model is employed to model this relationship. The model employs the Augmented Dickey Fuller test and Phillips-Peron tests for unit root check. A number of diagnostic checks have been presented including among others, residual normality test, heteroscedasticity and autocorrelation LM. These checks are used to check whether the residuals pass all these diagnostic tests

CHAPTER FIVE

PRESENTATION OF EMPIRICAL FINDINGS

5.1 Introduction

The main aim of this chapter is to provide answers to questions raised in the first chapter. This chapter will present empirical findings of this study. Results from this chapter explain the impact of exchange rate on export performance in South Africa. There are eight sub-sections in this Section. The first section will look at descriptive statistics of quarterly changes in real effective exchange rate and export performances; the second section is about testing for collinearity. The third section is about testing for ARCH effects. The fourth section presents the results of stationarity/unit root tests. The fifth section presents the impulse response analysis, the sixth section presence variance decomposition analysis, the seventh section presents stability tests and the last section concludes the chapter.

5.2 Descriptive statistics of quarterly changes in real effective changes and export performances

Many financial series, such as foreign exchange rates exhibit leptokurtosis and time varying volatility. These two features have been exposed to intensive studies since Mandelbrot (1963) and Fama (1965) first reported them. In this regard it is necessary to perform some descriptive statistics to examine if a real effective exchange rate which is our main explanatory variable in the study exhibit time varying volatility and leptokurtosis characteristics. The statistics of the real effective exchange rate series is displayed in the table below.

Table 5.1 Descriptive statistics

Variable	LREER	LEX	LCU	LTO
Mean	4.65	10.51	3.30	0.31
Standard Deviation	0.10	0.34	0.03	1.03
Skewness	0.94	5.77	0.18	5.97
Kurtosis	3.54	37.89	1.59	40.52
JB p-value	23.17 0.0000	8104.41 0.0000	12.61 0.0018	9306.97 0.0000

Table 5.1 shows the descriptive statistics of the REER variable. Under the null hypothesis of normal distribution, the p-value of J-B statistics is 0. The J-B value of 23.175 deviated from normal distribution. Similarly, skewness and kurtosis represent the nature of departure from normality. Emenike (2010) mentioned that in a normally distributed series, skewness is 0 and kurtosis is 3. The coefficient of skewness is used to measure asymmetry. The REER for skewness is 0.855 and it reflects positive skewness. A positive skewness indicates that a tail on the right side is longer than the left side and the majority of the values lie to the left of the mean. Moreover, if skewness is positive, the average magnitude of positive deviations is larger than the average magnitude of negative deviations. The coefficient of the REER variable indicates that there is asymmetry in the REER. The understanding is that the variable that follows a normal distribution should be symmetric.

The coefficient of kurtosis measures the peakedness of distribution. The value for kurtosis is 3.5 and this suggests that there is peakedness in the variable REER. Kurtosis coefficients have values greater than 3, also Jarque-Bera statistic is significant at 5% level and this suggests much higher distribution than normal distribution. From this it can be observed that REER variable exhibits some deviations from normality and this can be taken to demonstrate lerptokurtosis. A

distribution with a coefficient lager than 3 is said to be leptokurtic and one with a coefficient less than 3 is platykurtic.

From the quarterly standard deviations, it can be seen that REER is volatile hence there is need for it to be captured under the GARCH model. In this case REER does not conform to normal distribution but displays negative skewness and leptokurtic distributions. In Nigeria, Emenike (2010) discovered that the series in stock return did not conform to normal distribution but showed negative skewness and leptokurtic distribution.

5.3 Testing for Collinearity

Collinearity was performed to see if there is no linear relation between explanatory variables. Logic behind assumption of no multicollinearity is as follows: if two variables are collinear it becomes difficult to separate the effect of each individual independent variable on the dependent variable. In order to check if multicollinearity exists among independent variables, a correlation analysis was performed. The closer the r coefficient approaches +-1, regardless of the direction, the stronger is the existing association indicating that a more linear relationship between the two variables. However a suggested rule of thumb is that if the pair wise correlation between two regressors is very high, in excess of 0.8 multicollinearity it may pose a serious problem. The correlation analysis results are reported below.

Table 5.2 Matrix of correlation of independent variables.

Variable	LEX	LREER	LTO	LCU
LEX	1.000000	0.261826	0.305787	0.270083
LREER	0.261826	1.000000	0.099201	0.391755
LTO	0.305787	0.099201	1.000000	0.135676
LCU	0.270083	0.391755	0.135676	1.000000

Table 5.2 shows that the highest correlation coefficient value is 0.3912 which is relatively low. It is well below 0.8. Since the highest correlation numbers are lower than 0.8 the results clearly show that none of the independent variables are highly correlated and no multicollinearity amongst independent variables exist.

5.4 ARCH Test

ARCH test was used to test for ARCH effects on the residuals. The results are presented by table 5.3 below

Table 5.3 ARCH Test

Heteroskedasticity Test: ARCH

F-statistic	108.2324	Prob. F(1,141)	0.0000
Obs*R-squared	62.09959	Prob. Chi-Square(1)	0.0000

Table 5.3 shows that the statistic labelled “Obs*R-squared” is the ARCH test of autocorrelation in the squared residuals. The p-value (0.0000) indicates the null hypothesis can be rejected which states that there is no heteroscedasticity in the residuals. In other words, the zero probability value strongly shows the presence of heteroscedasticity in the residuals. The presence of hetetoscedasticity makes the use of GARCH more evident in this study. The correlogram of squared residuals was also conducted to complement the ARCH test in detecting heteroscedasticity in the table below.

Table 5.4 Correlogram of squared residuals

Sample: 2000M01 2011M12
Included observations: 144

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|***** |	.|***** |	1	0.655	0.655	63.120	0.000
.|** |	*|. |	2	0.318	-0.195	78.121	0.000
.|. |	**|. |	3	-0.013	-0.245	78.145	0.000
.|. |	.|** |	4	-0.000	0.330	78.145	0.900
.|. |	*|. |	5	0.002	-0.128	78.146	0.000
.|. |	*|. |	6	0.005	-0.127	78.149	0.000
.|. |	.|** |	7	0.009	0.224	78.162	0.000
.|. |	*|. |	8	0.008	-0.107	78.171	0.000
.|. |	*|. |	9	-0.008	-0.113	78.181	0.000
.|. |	.|* |	10	-0.036	0.132	78.382	0.000
.|. |	*|. |	11	-0.056	-0.090	78.873	0.000
*|. |	*|. |	12	-0.068	-0.097	79.612	0.000
*|. |	.|* |	13	-0.069	0.101	80.371	0.000
.|. |	.|. |	14	-0.065	-0.065	81.050	0.000
.|. |	*|. |	15	-0.058	-0.076	81.591	0.000
.|. |	.|. |	16	-0.059	0.062	82.158	0.000
*|. |	*|. |	17	-0.069	-0.073	82.955	0.000
*|. |	*|. |	18	-0.092	-0.097	84.360	0.000
*|. |	.|. |	19	-0.102	0.055	86.119	0.000
*|. |	.|. |	20	-0.101	-0.053	87.836	0.000

Table 5.4 provides evidence of arch effects as shown by the autocorrelations of the squared residuals. There is no autocorrelation up to the 4th lag, thereafter autocorrelation is present. The test p-values are all significant, and resultantly the no ARCH hypothesis is rejected. Moyes (2011) argues that "autocorrelation of squared residuals or absolute returns suggest the presence of strong dependencies in higher moments, something that in turn is indicative of conditional heteroscedasticity"

5.5 Testing for Stationarity

If the mean and variance are constant over time, then the series is stationary. Stationarity is essential for standard econometric theory. Without it we cannot obtain consistent estimators. One way of telling if a process is stationary is to plot the series against time. Graphical representations taking the form of time series plots gives us particularly useful ways of envisioning information and conducting comparative analyses over time. If the graph crosses the mean of the sample many times, chances are that the variable is stationary; otherwise that is an indication of persistent trends away from the mean of the series. If the mean and variance change, then the series is non-stationary. To detect if a series is stationary graphical plots were done on observed values of the data.

Figure 5.1 (a) Graphical representations of variables in Levels (1995Q1-2011Q4).

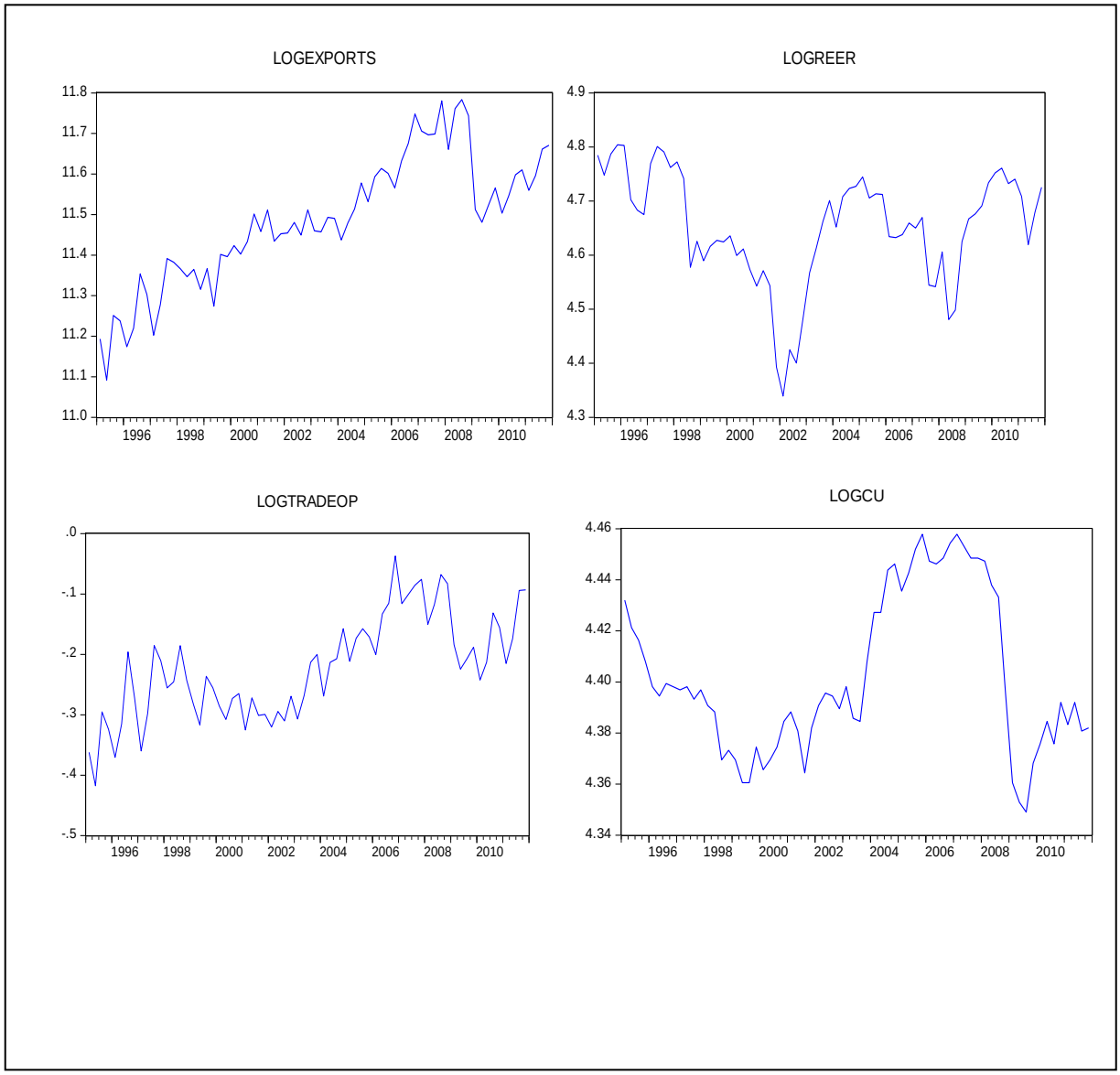
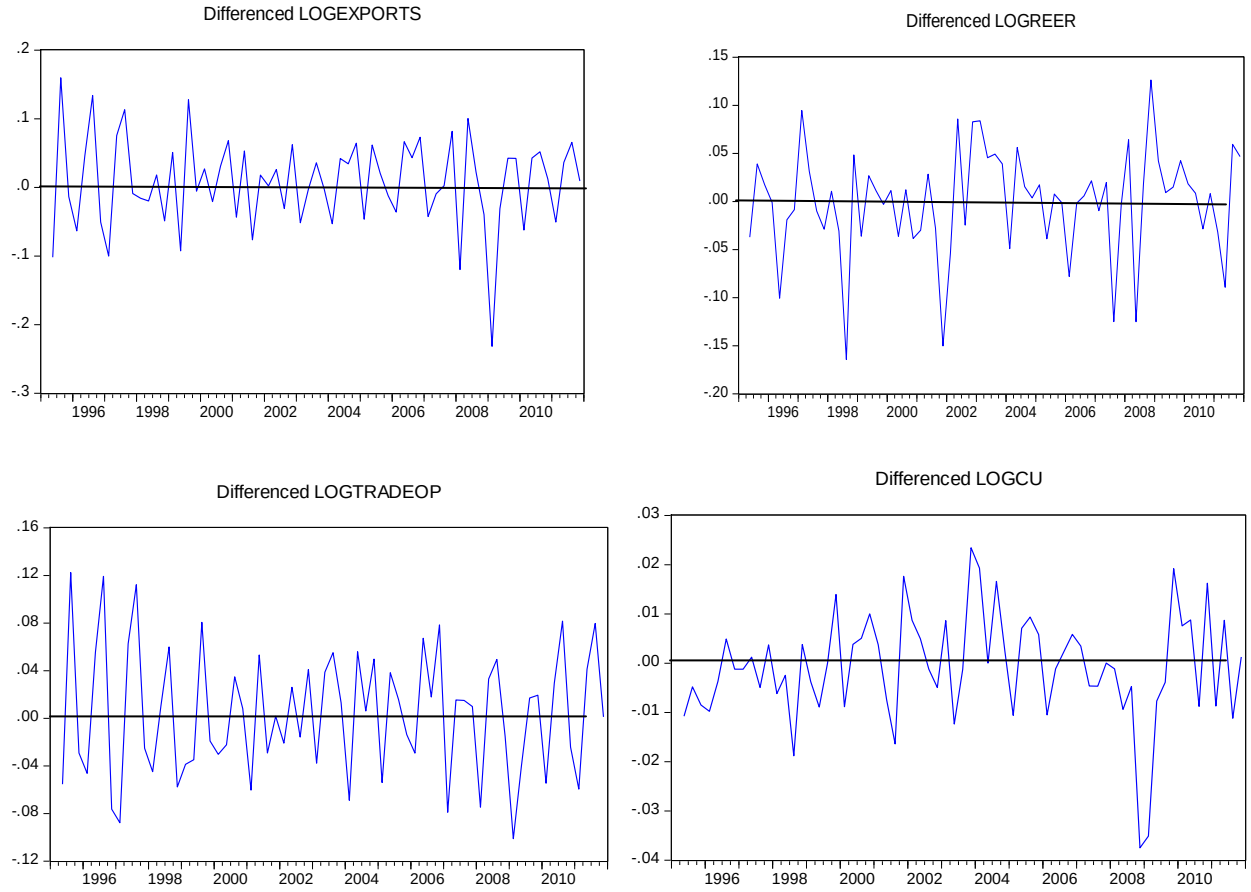


Figure 5.1(a) show that Exports (LOGEXPORTS) and trade openness (LOGTRADEOP) show a trendy behaviour. These variables have a growth trend. Log real effective exchange rate

(LOGREER) and log capacity utilisation (LOGCU) have a downward trend in 2002 and 2001 respectively. Figure 5.1 (b) shows that all the differenced variables fluctuate around the zero mean hence the variables are likely to be integrated of order 1 (1). This implies that the data is stationary if integrated of order 1. The first order integrated series ensure that economic data is stationary for the purpose of avoiding spurious regressions.

5.1(b) Plots of first differenced variables for 1995Q1-2011Q4



To identify if time series data are stationary, one checks if the plots on a graph are fluctuating around the zero mean. Data that fluctuate around the zero mean indicate stationarity. However, one cannot precisely base conclusions on the graphical analysis because it is an informal test for stationarity. Therefore, other formal tests are conducted to reinforce findings from the graphical findings. In this regard, Augmented Dickey-Fuller and Philip Peron Test are adopted and the results are presented below.

Table 5.5 Augmented Dickey Fuller unit test

Level				First Difference			
Variables		**Constant**	**Constant And Trend**	**None**	**Constant**	**Constant & Trend**	**None**
LEX		-1.60	-2.28	1.28	-7.35***	-7.4***	-7.05***
LGDP		-0.73	-2.59	1.93*	-4.88***	-4.85***	-4.23***
LCU		-1.95	-1.96	-0.28	-4.33***	-4.30***	-4.36***
LREER		-2.33	-2.23	-2.2***	-4.11***	-4.18***	-4.15***
LTO		-1.44	-2.20	-1.41	-9.12***	-9.14***	-8.97***
Critical Values	1%	-3.53	-4.10	-2.60	-3.54	-4.11	-2.60
	5%	-2.91	-3.48	-1.95	-2.91	-3.49	-1.95
	10%	-2.59	-3.17	-1.61	-2.60	-3.17	-1.61
***, ** and * denotes rejection of the null hypothesis at 1%, 5% and 10% respectively.							

Table 5.6 Phillips-Peron (PP) Unit Root Test

Level				First Difference			
Variables		**Constant**	**Constant& Trend**	**None**	**Constant**	**Constant & Trend**	**None**
LEX		-1.78	-3.42	-2.58	-13.97***	-21.55***	-10.70***
LGDP		-0.68	-2.10	2.84	-4.38***	-4.33***	-4.30***
LCU		-1.84	-1.88	-0.49	-6.36***	-6.31***	-6.39***
LREER		-2.48	-2.38	-0.18	-7.73***	-7.73***	-7.80***
LTO		-1.84	-1.88	-0.49	-6.36***	-6.31***	-6.40***
Critical Values	1%	-3.53	-4.10	-4.10	-3.53	-4.10	-2.60
	5%	-2.90	-3.48	-3.48	-2.91	-3.48	-1.95
	10%	-2.59	-3.17	-3.67	-2.60	-3.17	-1.61

***, ** and * denotes rejection of the null hypothesis at 1%, 5% and 10% respectively.

Table 5.4 and 5.5 shows the Augmented Dickey-Fuller and Phillips Peron Test results. Both tests have a null hypothesis of unit root. The null hypothesis is rejected if the test statistic has a greater absolute value compared to the critical values at all levels of significance. The rule of thumb is to reject the null hypothesis if the p value is less than 0.05. If the null hypothesis is rejected, it means that we fail to reject the alternative hypothesis of stationarity, thus indicating that there is no unit root, that is, the series is stationary.

The Augmented Dickey-Fuller is much stricter. It tests variables in (a) intercepts, (b) trends and intercepts and (c) no trend and no intercept. For variables in levels the test in intercepts revealed that none of the variables is stationary.

All differenced variables on intercept are stationary. All differenced variables on intercept are stationary at 1% significance level. On trend and intercept all variables are non-stationary in levels. Both methods used to test for stationarity have significantly revealed that the data series are non-stationary in levels and stationary when first differenced. Therefore, the series are integrated of the same order I(1).

5.6 Presentation of Results

The table below presents the results from the estimated GARCH (1.1) model.

Table 5.7 Presentation of results

Dependent Variable	LEX
Included observations	144

Variable	Coefficient	Standard error	z-statistic	P-value
C	2.198244	0.573746	3.831389	0.0000
LCU	1.750573	0.182538	9.590184	0.0000
LTO	0.037012	0.006310	5.865599	0.0000
DLREER	0.550590	0.063148	8.719043	0.0001

Variance Equation

Variable	Coefficient	Standard error	z-statistic	P-value
C	0.064155	0.066387	0.966373	0.3339
RESID(-1)^2	2.419967	0.315017	7.682020	0.0000
GARCH(-1)	-0.004952	0.032312	-0.153244	0.8782
LREER	-0.006409	0.007305	-0.877374	0.3803
LCU	-0.010078	0.023422	-0.430268	0.6670
LTO	0.003315	0.001208	2.744001	0.0061

R-squared	0.145729
Adjusted R-squared	0.127423
Durbin-Watson stat	0.676449

5.6.1 Discussion of Results.

Real Effective Exchange Rate

LREER has a positive coefficient. This is consistent with economic theory. Exchange rates movements affects export competitiveness according to the Flow oriented model. When the Rand depreciates, the exporters will benefits. A depreciation of the Rand will cause South African exports to increase as they become competitive in terms of cheap prices by international buyers. This will result in them gaining competitiveness on the international market. The results from this study showed that the exchange rate can affect the size of export volume by 55%. This result was expected given that South African exports are elastic and have a higher responsiveness to prices.

A similar research in South Africa by Edwards and Garlic (2004), the authors acknowledged that depreciating the exchange rate can lead to increase in export performance and profitability to exporters but warned that such a policy would feed back into domestic inflation, put upward pressure on interest rates as well as raising the cost of imported capital, intermediate and final goods.

Lira (2008) carried on a similar study in South Africa and obtained similar results but recommended that a stable exchange rate policy is what the policy makers should focus on since unstable exchange rates have detrimental effects on exports. However, Todani (2005) came up with contrasting results. The author suggested that there exists no statistically significant relationship between South African export flows and exchange rate volatility.

Capacity Utilization

As expected, the sign of capacity utilization is positive. One percent increase in capacity utilization (LCU) increases export volumes by 1.75%. This result shows that there is a positive relationship between manufacturing capacity utilization and export volumes. The value of capacity utilization is statistically significant and it shows the greatest impact on export perfomance. This means that an increase in capacity utilization will result in increase in export volumes. A country's capacity utilization is its total possible production capacity that is actually being used. Jessica (2004) noted that capacity utilization promotes exports by inducing firms to

export more and therefore uses resources more efficiently by making use of otherwise idle resources.

Trade Openness

Trade openness has a positive sign. One percent increase in trade openness will result in 3,7 % increase in exports. The coefficient maybe statistically insignificant but it is economically significant. Trade openness can improve exports as there will be limited hindrances to trade between countries. More open economies must experience more trade growth. The link between openness and trade growth is conditioned by the extent to which a country has diversified its export base. In recent years, sub-Saharan African countries have grown remarkably. According to data from the Penn World Table 7.0 (Heston et al.2011), average annual GDP per capita growth from 2005-2009 has been over 2.5%. By causal empiricism, it is motivating to note that the average sub-Saharan African country is today 30% more open to international trade than in the 1960 (as measured by the ration of exports plus imports over GDP) and this increase in trade openness is a consequence of the increase in economic growth.

5.6.2 The variance equation

The variance equation represents the GARCH model and it is through the use of this equation that volatility of the Rand (LREER) and Exports were captured. The expected priori of LREER is positive according to results above. This indicates that one percent increase of LREER will result in increase in exports by 0.55. This shows that depreciation has a very strong and positive impact on promoting export. A strong Rand hurts manufacturing sector a lot because exported goods and services become more expensive while imported goods and services become cheaper. In these two cases the price for local goods becomes less competitive. Manufacturing is well known to contribute more than 15% to the country's overall GDP and remarkable for job opportunities, this sector's performance is very important to the South African economy.

However low export performance cannot be attributed to the exchange rate alone but to a number of factors. Low economic growth from South Africa's trading partners also plays a major role. Unless there is a sustainable recovery and improved consumers demand in our trading partners, such as in Europe, the performance of our local manufacturing sector will remain vulnerable.

Even though it appeared to be a general consensus that the strong Rand has been a setback on export oriented sector of the economy, it would not be health for the economy for the manufacturing sector to rely on weak Rand for its competitiveness.

Having said this, there are some advantages to the economy from a strong currency. The strong Rand has been important with regards to inflation, as the cost of importing goods remains very low. Low inflation means that interest rates can continue to be low for longer, which benefits consumers and particularly the poor, as it preserves saving and spending power. Low interest rates and low inflation are beneficial to consumers who remain extremely indebted with high household debt

However, according to Golub (2004), the currency volatility plays an important role in determining international trade and exports. Preliminary inspection of South African Exports and imports from 2000 to 2005 suggest a positive association between exchange rate depreciation and export performance. Exports recovered during this period largely due to significant improvements in manufactured exports. Improvements in manufactured exports and the manufacturing trade balances correspond with Rand depreciation during the same period. In particular the realized improvement in exports following a sharp depreciation in 2001 was subsequently reversed as the currency appreciated.

The countries that expect a larger gain in trade from depreciating their currency to boost exports and growth can adopt a policy of depreciating their real effective exchange rate. South Africa is likely to benefit from real exchange rate depreciation than a country like Japan since Japan has a higher Intra-Industry Trade (IIT) index.

5.7 Conclusion and discussion of results

The main aim of this chapter was to present results of this study. In order to achieve this objective, the chapter began by looking at the descriptive statistics of the two major variables, REER and Exports. The variables also showed excess kurtosis and non-normally distribution. This, however, raised questions about the stationary of the variables of the study. Stationarity tests were conducted and all the variables were not stationary at levels. However, they were stationary after first differencing.

Furthermore collinearity test was performed to see if there was any correlation between the explanatory variables. The collinearity test denoted that the variables LGDP and LTO were correlated and this resulted in one of the variables with highest p value (LGDP) being dropped from the equation.

The GARCH model was chosen for estimation purposes. The normal GARCH was chosen in place of the non-normal GARCH because it modelled well the problems of fat tails and asymmetry in the variables. The normal GARCH appeared to be better than the non-normal GARCH. This was proved by the normality tests. The normality test showed that the normal GARCH model reduced the problems of non-normality in the variables seven times than the non-normal GARCH model. Furthermore normal GARCH model eliminated the problem of serial correlation. Diagnostic tests conducted in this study showed that the model was good. The GARCH model also eliminated the problems of the ARCH. Trade openness was shown to have a positive marginal impact of 0.37 percent which is insignificant but the exchange rate has a strong positive impact of 0.555 percent on export performance. Capacity utilisation has a positive impact on export performance of 0.175 percent. Results obtained from this study were all supported by existing empirical studies and by prevailing economic theory.

CHAPTER SIX

CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

The first chapter outlined that the aim of the study was to determine the impact of exchange rate volatility on export performance. Chapter two of this study provides an overview of exchange rate volatility in South Africa. This particular chapter highlighted the history of the origins of exchange rate volatility as well as the trends in exports and export structure in South Africa. This led to the application of applicable theoretical and empirical literature in the third chapter.

This study is supported by several economic theories such as The Marshall-Lerner condition, the Monetary Approach to exchange rate model, and the absorption approach. The Marshall-Lerner condition assumed that when currency depreciates exports increases and imports falls resulting in improved net exports. Therefore to improve the net exports there is need to depreciate the Rand. The Monetary approach assumed exchange rate as a monetary phenomenon whereby money supply plays a pivotal role in determining exchange rate and export performance. The Absorption approach assumed that that trade balances improves if the nation's GDP improves faster than its domestic spending. It hypothesises that relative changes in real income or output and absorption determine a nation's balance-of-payments and exchange-rate performance.

Previous researchers carried out studies on the impact of exchange rate volatility on export performance. However different conclusions were made depending on the country researched, methodology and the type of data used. Research conducted in South Africa include the works of Todani (2005), Edwards (2007), Bah and Amusi (2003)and Lira (2007). Research conducted in developing countries includes the work of Nwidobie (2005), Rey (2006), Verena (2008). Research conducted in developed countries include the works of Hericout and Poncet (2012), Murray, van Norden, and Vigfusson (1996), and Hasan (2001).

An overview of export performance in South Africa revealed that the increased liberalisation of trade and foreign exchange controls, exports promotion policies like General Export Incentive Scheme (GEIS) and multilateral trade agreements such as African Growth and Opportunity Act (AGOA) have led to greater penetration of South Africa's exporters to the international markets. As a result, the ratio of exports to GDP has accelerated substantially from 7.38% in 1993 to about 35.1% in 2008.

The levels of manufacturing exports have responded to these initiatives in the 1990s. The success of these polices in generating exports has been mixed. We find that exports of the manufactures has increased but not enough to initiate export led growth as those of the Asian markets and a few other emerging markets. South African exports remain resource based and the country has lagged others in diversifying into new and fast growing export sector. The inability to restructure exports towards these high dynamic technology products is another explanation for these poor export performance of South African manufacturing exports during the 1990s.

6.2 Key Findings

The analysis of data was performed using the outlined methodology. The data was tested for stationarity using Augmented Dickey Fuller test and Phillips Peron test. This was followed by heteroscedasticity test. Diagnostics and normality test were also conducted. The study employed monthly South African data for the period 2000 – 2010. The frequency of the data selected ensured that there are enough observations. The variables used in this study were Real Effective Exchange rate, capacity utilisation and trade openness. Descriptive statistics were employed to investigate the statistical properties of the main variable; real effective exchange rate .Results showed that this main variable was positively skewed and has fat tail.

The study employed the GARCH model to estimate the impact of exchange rate volatility on export performance. The explanation for the results is as follows: Real effective exchange rate has a positive marginal impact of 0.55% on exports. This is consistent with economic theory as exchange rates movements affects export competitiveness according to the Flow oriented model. A depreciation of the Rand will cause South African exports to increase as they will be competitive in terms of cheap prices by international buyers. A strong Rand hurts manufacturing sector a lot because exported goods and services become more expensive while imported goods

and services become cheaper. In these two cases the price for local goods becomes less competitive. Manufacturing is well known to contribute more than 15% to the country's overall GDP and remarkable for job opportunities, therefore this sector's performance is very important to the South African economy.

However low export performance cannot be attributed to the exchange rate alone but to a number of factors. Low economic growth from South Africa's trading partners also plays a major role. Unless there is a sustainable recovery and improved consumers demand in our trading partners, such as in Europe, the performance of our local manufacturing sector will remain vulnerable

There was a weak relationship between export performance and trade openness. However even though the variable was statistically not significant but it is economically significant. Trade openness means there are limited hindrances to trade with other countries.

The sign of capacity utilization is positive. One percent increase in capacity utilization (LCU) increases export volumes by 1.75%. The value of capacity utilization is statistically significant and it shows the greatest impact on export performance. A country's capacity utilization is its total possible production capacity that is actually being used. Capacity utilization promotes exports by inducing firm's top produce and export more and therefore uses resources more efficiently by making use of otherwise idle resources.

6.3 Policy recommendations

Results in this study show a number of policy implication. A major caution is that exchange rate be carefully managed to ensure a stable non-volatile behaviour that cannot hamper export growth in future.

Fluctuations in exchange rate have a significant negative impact on the performance of exports. Since most South African exporters are risk averse, the government should consider developing hedging facilities and institutions that can protect its exporters against exchange risk. Furthermore, the current objective of South Africa in ensuring sustainable economic growth through increased exports should be substantiated by a stable and competitive exchange rate, viable fiscal and monetary policies as well as structural reforms that contribute to decline in per

unit cost of production and the improvement in international competitiveness of South African exporters.

The South African government should also endeavour to reduce trade restrictions mechanisms such as tariffs, quotas, embargoes and other restrictions measures so that other countries cannot do trade retaliation. This will promote free trade as we have discovered that trade openness has a positive effect on export goods.

According to results obtained from this study, depreciation has a general positive effect on exports. Therefore a larger gain in trade is expected from depreciating the currency the government should consider adopting a policy of depreciating its exchange rate.

6.4 Limitations of the study and areas of further research

Inaccessibility to data on the actual variables suggested by the theoretical model regarding the impact of exchange rate volatility on export performance is one of the limitations faced by the study. Consequently, it means that some of the variables were either excluded in the empirical model, or proxies have been found for those variables. The risk involved in using proxies is that they may not correctly represent the impact of the actual variables, resulting in inconsistent results. However, this problem seems not to significantly affect the findings presented in this study because it supports both the theoretical and empirical knowledge regarding the impact of exchange rate volatility on export performance. Variables such as LGDP (logarithm of Gross Domestic Products) and LY (logarithm of foreign income) were dropped from the equation due to the problem of collinearity.

This study and others I have observed concentrated on using monthly data to examine the impact of exchange rate on export performance. Meanwhile, it is important to use daily data or weekly data which provide more useful results that monthly data. I therefore, suggest that the significance of this study's results can be improved by using daily or weekly data. Using more frequent observations is better known to capture dynamics of exchange rate relationships.

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Appendix

Appendix 1 Data used in the regressions

Years	IMPORTS	EXPORTS	GDP	TO	REER	CU
2000M01	23788	30476.67	72196	0.7516299	104.11	26.23333
2000M02	23788	30476.67	72196	0.7516299	103.28	26.23333
2000M03	23788	30476.67	72196	0.7516299	101.88	26.23333
2000M04	24089.33	29847.67	73377	0.7350668	101.63	26.33333
2000M05	24089.33	29847.67	73377	0.7350668	98.62	26.46667
2000M06	24089.33	29847.67	73377	0.7350668	98.03	26.46667
2000M07	26229	30785.67	74911.33	0.7610954	99.66	26.46667
2000M08	26229	30785.67	74911.33	0.7610954	101.74	26.73333
2000M09	26229	30785.67	74911.33	0.7610954	100.51	26.73333
2000M10	25665	32959	76403.33	0.7672964	97.79	26.73333
2000M11	25665	32959	76403.33	0.7672964	96.84	26.83333
2000M12	25665	32959	76403.33	0.7672964	95.85	26.83333
2001M01	5934.33	31557.67	76817	0.488069	92.87	26.83333
2001M02	5934.33	31557.67	76817	0.488069	94.07	26.63333
2001M03	5934.33	31557.67	76817	0.488069	94.94	26.2
2001M04	25249.66	33276.67	76818	0.761883	94.61	26.2
2001M05	25249.66	33276.67	76818	0.761883	97.14	26.2
2001M06	25249.66	33276.67	76818	0.761883	98.28	26.6667
2001M07	25411.66	30824.33	75997	0.7399764	97.46	26.6667
2001M08	25411.66	30824.33	75997	0.7399764	94.35	26.6667
2001M09	25411.66	30824.33	75997	0.7399764	90.24	26.9
2001M10	25424.66	31379.33	76632.33	0.7412536	86.41	26.9
2001M11	25424.66	31379.33	76632.33	0.7412536	84.41	26.9
2001M12	25424.66	31379.33	76632.33	0.7412536	71.85	27.0333

2002M01	24633	31442.67	77252.33	0.7258767	74.68	27.0333
2002M02	24633	31442.67	77252.33	0.7258767	77.62	27.0333
2002M03	24633	31442.67	77252.33	0.7258767	77.66	27
2002M04	26290.33	32268.33	78602.33	0.744999	80.05	27
2002M05	26290.33	32268.33	78602.33	0.744999	86.05	27
2002M06	26290.33	32268.33	78602.33	0.744999	84.44	26.8667
2002M07	27001	31286.67	73485	0.7931914	83.15	26.8667

2002M08	27001	31286.67	73485	0.7931914	80.78	26.8667
2002M09	27001	31286.67	73485	0.7931914	80.54	27.1
2002M10	27438.66	33297	79504.33	0.763929	83.35	27.1
2002M11	27438.66	33297	79504.33	0.763929	88.48	27.1
2002M12	27438.66	33297	79504.33	0.763929	93.76	26.7667
2003M01	26320.66	31624.33	78763.67	0.7356817	93.29	26.7667
2003M02	26320.66	31624.33	78763.67	0.7356817	96.56	26.7667
2003M03	26320.66	31624.33	78763.67	0.7356817	99.01	26.7333
2003M04	27940.33	31533.33	77769367	0.0007647	104.39	26.7333
2003M05	27940.33	31533.33	77769367	0.0007647	100.09	26.7333
2003M06	27940.33	31533.33	77769367	0.0007647	97.78	27.3667
2003M07	29534.33	32684.67	77003.67	0.8080004	104.33	27.3667
2003M08	29534.33	32684.67	77003.67	0.8080004	107.13	27.3667
2003M09	29534.33	32684.67	77003.67	0.8080004	106.03	27.9
2003M10	30083	32592.67	76571.67	0.818523	107.75	27.9
2003M11	30083	32592.67	76571.67	0.818523	110.99	27.9
2003M12	30083	32592.67	76571.67	0.818523	111.42	27.9
2004M01	29335.33	30906	78842.36	0.7640731	102.33	27.9
2004M02	29335.33	30906	78842.36	0.7640731	104.31	27.9
2004M03	29335.33	30906	78842.36	0.7640731	107.71	28.3667
2004M04	33021.33	32229.67	80757.67	0.8079852	110.65	28.3667
2004M05	33021.33	32229.67	80757.67	0.8079852	106.89	28.3667
2004M06	33021.33	32229.67	80757.67	0.8079852	113.01	28.4333
2004M07	33856	33360.3	82686.67	0.8129037	117.2	28.4333
2004M08	33856	33360.3	82686.67	0.8129037	111.54	28.4333
2004M09	33856	33360.3	82686.67	0.8129037	108.93	28.1333
2004M10	35329.67	35578	83000	0.8543093	109.79	28.1333
2004M11	35329.67	35578	83000	0.8543093	112.74	28.1333
2004M12	35329.67	35578	83000	0.8543093	116.42	28.3333

2005M01	33206	33963.33	82985.67	0.8094088	115.64	28.6
2005M02	33206	33963.33	82985.67	0.8094088	115.06	28.6
2005M03	33206	33963.33	82985.67	0.8094088	114.2	28.6
2005M04	36369	36125	86201.67	0.8409814	113.31	28.7667
2005M05	36369	36125	86201.67	0.8409814	111.66	28.7667
2005M06	36369	36125	86201.67	0.8409814	106.78	28.7667
2005M07	38460.33	36875.33	88177	0.8543686	109.28	28.4667
2005M08	38460.33	36875.33	88177	0.8543686	111.61	28.4667
2005M09	38460.33	36875.33	88177	0.8543686	113.41	28.4667
2005M10	37817.66	36426	88103.67	0.8426852	110.99	28.4333
2005M11	37817.66	36426	88103.67	0.8426852	111.64	28.4333
2005M12	37817.66	36426	88103.67	0.8426852	116.44	28.4333
2006M01	37959	351138.66	89322	4.3561235	119.28	28.5
2006M02	37959	351138.66	89322	4.3561235	119.67	28.5
2006M03	37959	351138.66	89322	4.3561235	116.62	28.5
2006M04	42118	37557	91029	0.8752705	118.75	28.6667
2006M05	42118	37557	91029	0.8752705	111.86	28.6667
2006M06	42118	37557	91029	0.8752705	103.27	28.6667
2006M07	43480	39213	92809.67	0.8909955	102.37	28.7667
2006M08	43480	39213	92809.67	0.8909955	105.91	28.7667
2006M09	43480	39213	92809.67	0.8909955	100.51	28.7667
2006M10	48930.33	42181.67	94548.33	0.9636553	98.72	28.6333
2006M11	48930.33	42181.67	94548.33	0.9636553	103.99	28.6333
2006M12	48930.33	42181.67	94548.33	0.9636553	105.55	28.6333
2007M01	44992.67	40428.33	95930	0.8904514	104.41	28.5
2007M02	44992.67	40428.33	95930	0.8904514	104.43	28.5
2007M03	44992.67	40428.33	95930	0.8904514	101.23	28.5
2007M04	47064.67	40047	96338.33	0.9042265	104.33	28.5
2007M05	47064.67	40047	96338.33	0.9042265	106.92	28.5
2007M06	47064.67	40047	96338.33	0.9042265	105.53	28.5
2007M07	48258.33	40145.33	96310	0.9179074	106.94	28.4667
2007M08	48258.33	40145.33	96310	0.9179074	103.47	28.4667
2007M09	48258.33	40145.33	96310	0.9179074	103.33	28.4667
2007M10	47670.67	43565	98416.33	0.9270379	107.62	28.2

2007M11	47670.67	43565	98416.33	0.9270379	106.65	28.2
2007M12	47670.67	43565	98416.33	0.9270379	105.7	28.2
2008M01	45980	38646	98361.33	0.8603584	102.29	28.0667
2008M02	45980	38646	98361.33	0.8603584	93.55	28.0667
2008M03	45980	38646	98361.33	0.8603584	86.57	28.0667
2008M04	48292.67	42730.33	102352.67	0.8893075	89.05	27.0333
2008M05	48292.67	42730.33	102352.67	0.8893075	97.84	27.0333
2008M06	48292.67	42730.33	102352.67	0.8893075	94.63	27.0333
2008M07	50323.33	43694.67	100616.33	0.9344209	97.85	26.1
2008M08	50323.33	43694.67	100616.33	0.9344209	102.37	26.1
2008M09	50323.33	43694.67	100616.33	0.9344209	100.1	26.1
2008M10	46234	41994.33	95855	0.9204353	88.28	25.9
2008M11	46234	41994.33	95855	0.9204353	88.15	25.9
2008M12	46234	41994.33	95855	0.9204353	88.44	25.9
2009M01	41133.67	33314	89498.67	0.8318299	89.22	25.8
2009M02	41133.67	33314	89498.67	0.8318299	89.83	25.8
2009M03	41133.67	33314	89498.67	0.8318299	90.63	25.8
2009M04	37299	32289	87096.33	0.7989774	99.38	26.3
2009M05	37299	32289	87096.33	0.7989774	102.52	26.3
2009M06	37299	32289	87096.33	0.7989774	104.09	26.3
2009M07	38629.33	33690.33	88985.33	0.8127144	105.6	26.5
2009M08	38629.33	33690.33	88985.33	0.8127144	104.42	26.5
2009M09	38629.33	33690.33	88985.33	0.8127144	109.14	26.5
2009M10	40580.33	35141.33	91383.67	0.8286126	107.98	27.7333
2009M11	40580.33	35141.33	91383.67	0.8286126	106.13	27.7333
2009M12	40580.33	35141.33	91383.67	0.8286126	108.02	27.7333
2010M01	39836.33	33022	92853.67	0.7846575	107.95	26.5
2010M02	39836.33	33022	92853.67	0.7846575	107.76	26.5
2010M03	39836.33	33022	92853.67	0.7846575	111.26	26.5
2010M04	41976.67	34466.33	94591.33	0.8081396	113.07	26.9333
2010M05	41976.67	34466.33	94591.33	0.8081396	112.53	26.9333
2010M06	41976.67	34466.33	94591.33	0.8081396	115.6	26.9333
2010M07	46168.66	36298	94047.67	0.8768602	114.11	26.7
2010M08	46168.66	36298	94047.67	0.8768602	115.93	26.7

2010M09	46168.66	36298	94047.67	0.8768602	117.5	26.7
2010M10	44725	36743.33	95186	0.8558856	116.3	26.7333
2010M11	44725	36743.33	95186	0.8558856	115.36	26.7333
2010M12	44725	36743.33	95186	0.8558856	118.88	26.7333

2011M1	44230	34930	98155.67	0.806474	115.83	26.7
2011M2	44230	34930	98155.67	0.806474	110.86	26.7
2011M3	44230	34930	98155.67	0.806474	113.96	26.7
2011M4	45358.33	36224.33	97083	0.8403393	115.28	26.9333
2011M5	45358.33	36224.33	97083	0.8403393	113.38	26.9333
2011M6	45358.33	36224.33	97083	0.8403393	114.81	26.9333
2011M7	49590.33	38679.33	96998	0.9100153	115.25	26.6333
2011M8	49590.33	38679.33	96998	0.9100153	110.7	26.6333
2011M9	49590.33	38679.33	96998	0.9100153	106.77	26.6333
2011M10	50313.33	39038	98074	0.9110603	101.6	26.6667
2011M11	50313.33	39038	98074	0.9110603	100.14	26.6667
2011M12	50313.33	39038	98074	0.9110603	102.57	26.6667