THE IMPACT OF THE REAL EFFECTIVE EXCHANGE RATE ON SOUTH AFRICA'S TRADE BALANCE

by

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DECLARATION

I declare that the dissertation hereby submitted to the University of Limpopo for the degree of Master of Commerce in Economics has not previously been submitted by me for a degree at this or any other university; that it is my own work in design and in execution, and that all material contained herein has been duly acknowledged.

Matlasedi, NT (Mr) September 2016

Surname, Initials (title) **Date**

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ABSTRACT

The purpose of this paper is to ascertain the impact of the real effective exchange rate on South Africa's trade balance and whether the J-curve phenomenon and the Marshal-Lerner condition are satisfied in the economy. Using data spanning the period 1980Q1 – 2014Q4, the Autoregressive Distributed Lag (ARDL) bounds test as well as the Johansen cointegration test were employed to test for the long run cointegrating relationship between the variables. The ARDL approach was employed to estimate both the long run and short run models as well as to ascertain whether the Marshal – Learner condition as well as the J-curve phenomenon are satisfied in the RSA economy. The results from the cointegration tests show that there is a stable long run equilibrium relationship between the trade balance, real effective exchange rate, domestic GDP, money supply, terms of trade and foreign reserves. The results from the Autoregressive Distributed Lag long run model show that a depreciation of the ZAR improves the trade balance, thus confirming the Marshal-Lerner condition. The results further reveal that domestic GDP and money supply both have a significant negative impact on the trade balance in the long run with the terms of trade reported positive as well. Foreign reserves were not found to significantly affect the trade balance in the long run. In the short run, the ARDL error correction model shows that a ZAR depreciation leads to a deterioration of the trade balance, thus confirming the J-curve effect for the RSA economy. The terms of trade effect was reported positive in the short run, thus confirming the Harberger-Laursen-Metzler effect (HLME) in the process. Money supply, domestic GDP and foreign reserves are also found to have a significant negative impact on the trade balance in the short run. Finally, the error correction model reveals that about 26% of the disequilibrium in the trade balance model is corrected in each quarter.

Keywords: *Trade Balance, Real Effective Exchange Rate (REER), J-Curve effect, Marshall – Learner condition, Autoregressive Distributed Lag (ARDL), Error Correction Model, Johansen Cointegration.*

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CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

The integrated world economy has brought with it both trade benefits such as economic growth and development and trade associated problems such as trade deficits, misalignment of exchange rates and disequilibria in the balance of payments. The trade associated problems in particular have affected several emerging economies including South Africa. According to Mohr, Fourie and Associates (2009), when trade deficits arise, they can be balanced out by inflows of foreign capital into the economy, but since the world financial crisis of 2007-2010 as noted in Oyinlola, Adeniyi and Omisakin (2010), it has been difficult for emerging economies in particular to attract the necessary inflows of foreign capital to offset the trade deficits if and when they arise. This means that these emerging markets have to use both commercial and exchange rate devaluation policies to manage the trade deficits and ensure some degree of good balance in the economy.

The nexus between the trade balance, trade flows and the exchange rate has been examined both theoretically and empirically. Three theories in particular have attempted to explain the relationship between the exchange rate and the trade balance. The first theory is the elasticities approach, the second, the absorption approach and the third, the monetary approach.

The elasticities approach states that, following a currency depreciation, the demand for imports falls and so does the volume of imports, which leads to the trade balance improving on the import front due to the price effect of imports. The absorption approach on the other hand, argues that the net impact of the depreciation on the balance of payment would depend on changes in income and absorption which will have repercussions on the balance of payments (BOP) rather than depend only on the price elasticities of demand for imports. Any increase in income due to an improvement in the balance of payment (which is brought about by a devaluation or depreciation) is bound to lead to an increase in imports and hence, a decline in the balance of trade. Lastly, the monetary approach states that, if money demand in the economy is greater than money supply, then the excess demand for money would be met a flow of money from abroad. In this case, the trade balance will improve. Conversely, if money supply is greater than money demand in the economy, then the excess supply of money would be reduced by an outflow of money to other countries and in turn, this will I worsen the trade balance in the process.

There are four ways to track an exchange rate and according to Lindert and Pugel (2000), this can be done through nominal bilateral, nominal effective, real bilateral and real effective exchange rates. As no country engages in trade only on a two way (bilateral) level, the analysis of a bilateral exchange rate becomes inappropriate. The nominal effective exchange rate also becomes inappropriate as it does not account for inflation. Thus this study will focus on the real effective exchange rate (REER).

1.2. RESEARCH PROBLEM

This section discusses the background to the research problem and the problem statement.

1.2.1. Background to the research problem

The International Monetary Fund (2013) reported that the South African current account deficit had averaged 3.5% of gross domestic product (GDP) between 2009 and 2011, and deteriorated further to 6.3% of GDP in the year 2012, reflecting a wider trade deficit and deteriorated competitiveness. This means that South Africa's trade with the rest of the world has not been favourable, hence the negative trade balance (which is the difference between Exports and Imports, where a negative balance is a trade deficit and a positive balance a trade surplus).

South Africa is currently confronted with a huge deficit in the current account of the BOP as reported in the SARB Quarterly Bulletin (March 2015). The balance in the fourth quarter of 2014 recorded a deficit of R207 billion representing just over 5.4% of the country's GDP. Although this deficit was mainly due to the outflow of funds in the form of net service, income and current transfer payments, part of it was as a result of a seemingly perpetual trade deficit which was reported at R35 billion for the 4th quarter and a cumulative R69 billion for the year 2014.

On the other hand, by close of business in South Africa on January 09th 2014, the rand was trading at R10.81 to the US dollar, thus succumbing to its weakest level since 2008 (Pressly, 2014). The rand also hit a near seven-year low against the pound sterling, trading at R17.70 on the same day (Pells, 2014). By the 23rd of January, the Rand had depreciated further to R18.13 against the Pound sterling and R10.93 against the US Dollar (Peters, 2014). According to Mittner (2014), there are also fears that the Rand may stay weak for at least the next five years (2014-2018).

1.2.2. Statement of the problem

From the background to the research problem, it is clear that in South Africa, the trade balance (deficit) and the nominal effective exchange rate (NEER) seem to be moving in tandem. Thus, the problem for which an answer is sought in this study is whether the movements in the NEER (which feeds directly into the REER) have an impact on South Africa's trade balance.

The nominal effective or multilateral exchange rate is defined by Dornbusch and Fischer (2010) as the price of a representative basket of foreign currencies with each currency weighted by its importance to the country in terms of international trade. However, in order to know whether South African goods are becoming more expensive or cheaper, we have to take into account what happened to prices both in South Africa and abroad. To do so, we look at the real effective exchange rate (REER), which is essentially, the NEER adjusted for domestic and foreign inflation differentials. It measures the country's competitiveness in international trade. Thus, since movements in the NEER will result in changes in the REER, this study shall adopt the real effective exchange rate (REER) as the explanatory variable.

1.3. THE PURPOSE OF THE STUDY

1.3.1. The aim of the study

i. The aim of the study is to analyse the impact of the real effective exchange rate on South Africa's trade balance.

1.3.2. Objectives of the study are the following:

i. To analyse the pattern of trade between RSA and the rest of the world.
ii. To determine the impact of the REER on the RSA Trade Balance.
iii. To determine if the J-Curve phenomenon exists in the RSA economy.
iv. To determine if the Marshal – Lerner condition holds in the RSA economy.

1.4. SIGNIFICANCE OF THE STUDY

Many studies which have been conducted have focused on the real bilateral exchange rate and its impact on the trade balance and the corresponding import demand and export supply functions (Edwards and Lawrence, 2006; Ibikunle and Akhanolu, 2011). In South Africa, the impact of the real effective exchange rate (REER) on the trade balance (and thus, on the balance of payments via the current account) as well as its impact on the export supply and import demand functions has seldom been explored. Gumede (2000) estimated the import demand function for South Africa and focused mainly on the income elasticity of import demand but excluded the exchange rate. Thus, the proposed paper aims to also fill the gap in the literature by incorporating the real effective exchange rate in the trade balance model and determining if the Marshal Learner condition holds in the South African economy. It is believed therefore that when completed, the study will shed some light on the dynamics of exchange rates and how they impact South Africa's trade performance.

This in turn will enable policy makers at the department of trade and industries (DTI) and the South African Reserve Bank (SARB) to draft a better commercial policy as well as review the exchange rate policy to better improve SA's trade performance.

The rest of the dissertation is structured as follows: Chapter 2 looks at the pattern of trade between South Africa and its top 10 main trading partners both at aggregate and regional levels. The evolution of South Africa's Monetary and exchange rate policy is also looked at in the chapter. Chapter 3 provides a theoretical framework for the study targeting exchange rate theories, a trade balance theory, theories of balance of payments adjustment and an empirical framework. Chapter 4 discusses the research methodology. Chapter 5 provides an analysis of the results based on the methods discussed in chapter 4. Chapter 6 provides conclusions and recommendations.

CHAPTER 2: SOUTH AFRICA'S PATTERN OF TRADE AND EXCHANGE RATE POLICY

2. INTRODUCTION

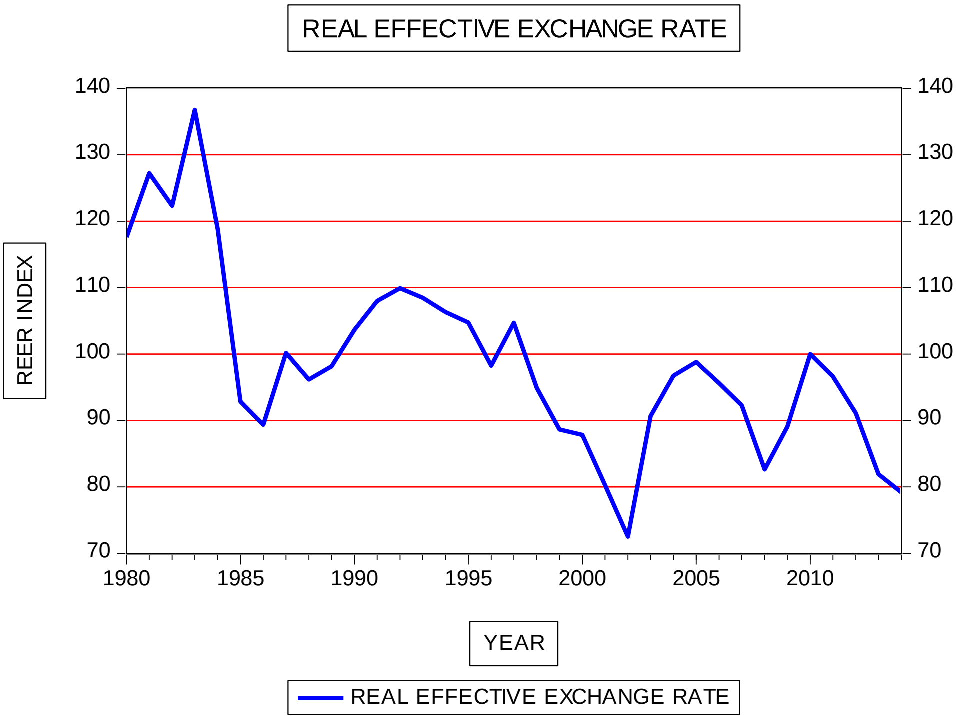
This chapter deals mainly with the analysis of the patterns of trade between South Africa and its main trading partners. It starts with a brief discussion of the trends of the REER, exports and imports during the period 1980 - 2014. Then the analysis of trading patterns between South Africa and its main trading partners follows. The export component is then discussed with emphasis on total aggregate exports to the rest of the world. The analysis of exports to Africa on a country by country basis is next, followed by exports to Asia, Eurozone, the Americas and Oceania. Thereafter, we discuss aggregate total imports to South Africa; especially their main sources. These will include imports from Africa, Asia, Eurozone, the Americas and Oceania. The chapter is rounded up by a discussion of South Africa's monetary and exchange rate policy.

2.1. TRENDS OF THE REAL EFFECTIVE EXCHANGE RATE, REAL MERCHANDISE EXPORTS AND REAL MERCHANDISE IMPORTS

We look at three selected variables, namely REER, Total Exports and Total Imports during the period 1980 -2014.

2.1.1. Trend of the Real Effective Exchange Rate (REER)

Figure 2-1: The trend of the Real Effective Exchange Rate during 1980 – 2014.

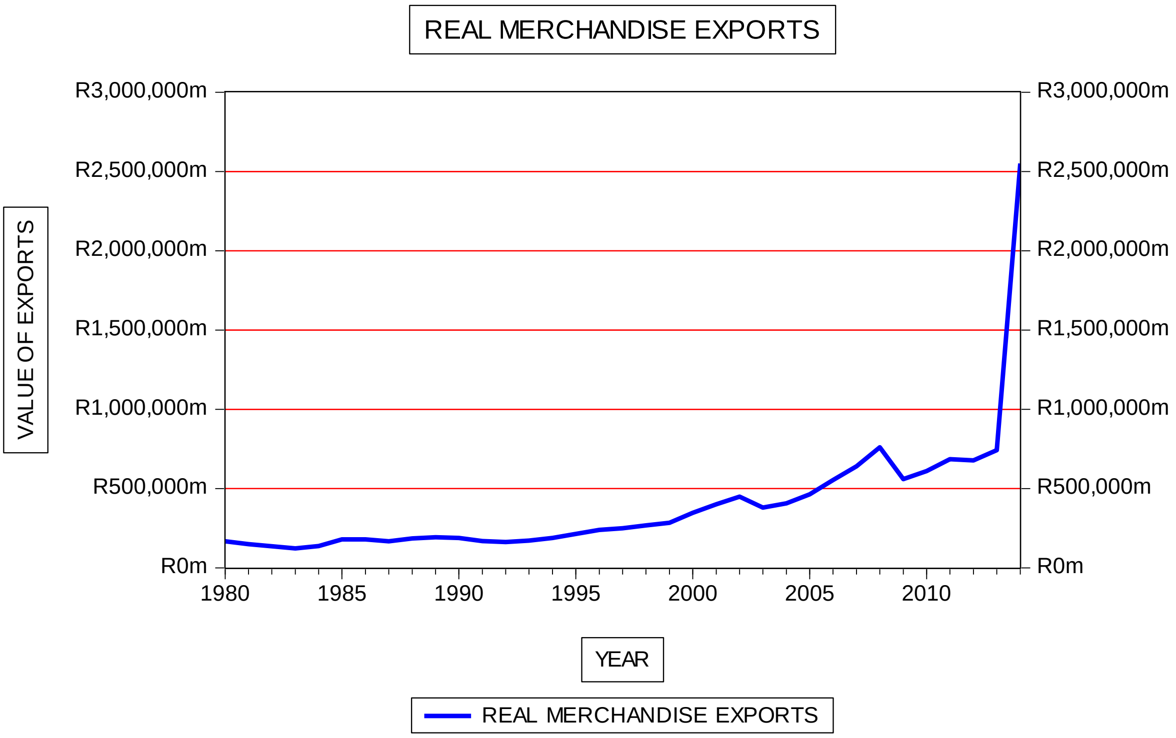


Source: Computation based on data obtained from the South African Reserve Bank (SARB). The year 2010 is used as the base year in the calculation of the REER.

Figure 2-1 shows the trend and behaviour of the real effective exchange rate for the period 1980 - 2014. It is clear from the figure that the Rand was at its strongest levels during the period 1980 to 1984 and then weakened sharply in the mid 1980's, reaching its lowest level on 28 February 1985 when it depreciated to R2.23 against the dollar (Bronkhorst, 2012). From 1985, it appreciated steadily against most major currencies until the crash of 2002 where the Rand reached its lowest levels in history. It recovered after that until it depreciated sharply in 2008 (as mentioned in chapter 1) and again in 2014.

2.1.2. Trend of Real Merchandise Exports

Figure 2-2: The trend of Real Merchandise Exports during 1980 - 2014.

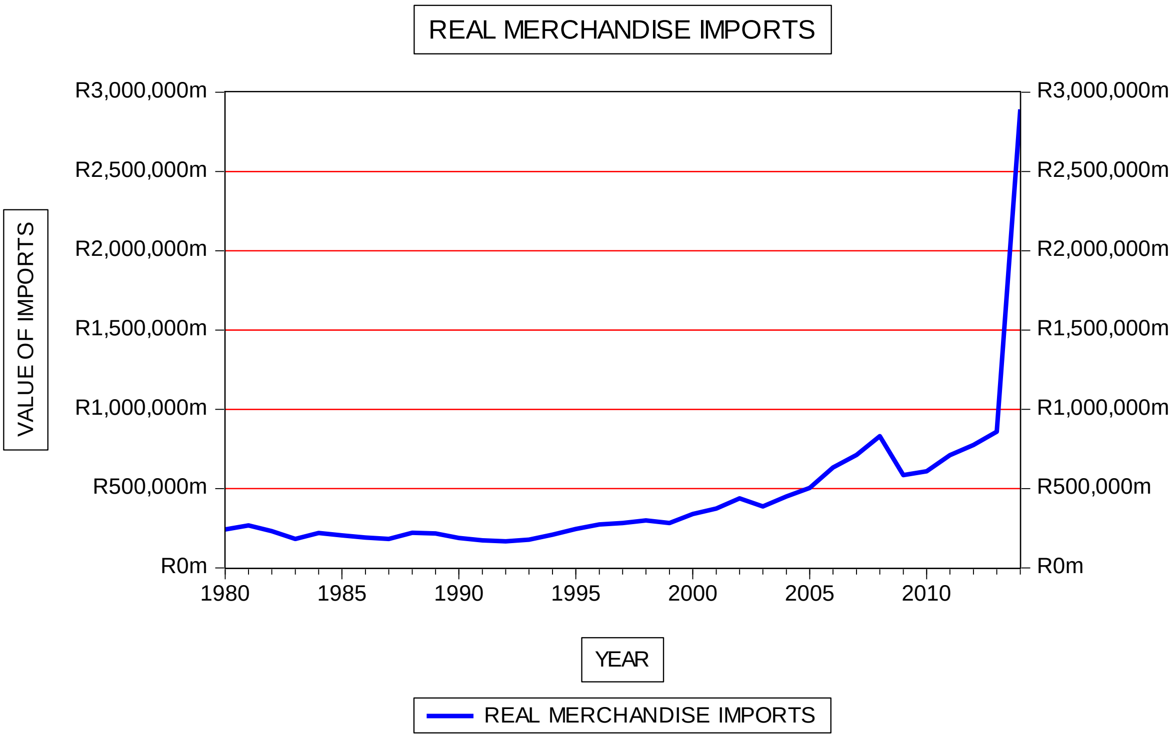


Source: Computation based on data obtained from the South African Revenue Services (SARS). All data is in constant 2010 prices.

Figure 2-2 shows the trend of real merchandise exports for the period 1980 to 2014. The figure shows that exports have steadily been increasing from 1980, with the greatest increase experienced between 2004 and 2008 peaking at R759.8 billion in 2008 from R406.9 billion in 2004. It is no coincidence that exports declined sharply during 2009 as South Africa felt the effects of the world financial crisis which had gripped most economies for two consecutive years preceding 2009. Exports picked up again in 2010 boosted by the recovering World economy, including South Africa's, peaking at R2.54 trillion in 2014. South Africa's increasing trade with China is argued to have contributed significantly to the tremendous export increase (Ensor, 2014). It is also very interesting to note that during the greatest surges in exports, the South African Rand was depreciating rather sharply (see 2008 and 2014).

2.1.3. Trend of Real Merchandise Imports

Figure 2-3: The trend of Real Merchandise Imports during 1980 – 2014.



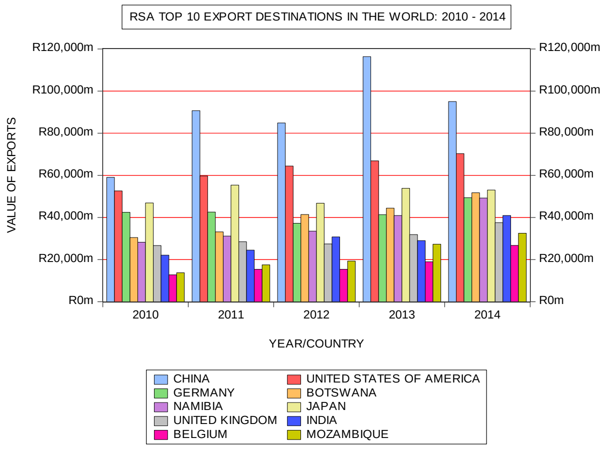
Source: Computation based on data obtained from the South African Revenue Services (SARS). All data is in constant 2010 prices.

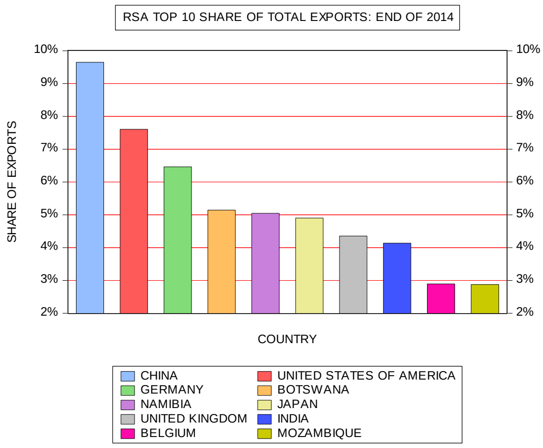
Figure 2-3 shows the trend of real merchandise imports for the period 1980 – 2014. The figure shows a steady increasing trend from 1992 until around 2008. During the mid-/late 2000's, South Africa experienced a surge in imports reaching a peak of R830.3 billion in 2008. Imports declined sharply during 2009 due to the world financial crisis, but started picking up again in 2010 and peaking at R2.89 trillion in 2014.

2.2. SOUTH AFRICA'S MAIN EXPORTS DESTINATIONS DURING 2010 - 2014

2.2.1. RSA top 10 export destinations in the world

Figure 2-4: RSA top 10 export destinations in the world.





(a) (b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-1(a): RSA top 10 export destinations and export values in nominal terms.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF EXPORTS	NOMINAL EXPORT GROWTH
CHINA	59 056	90 714	84 839	116 335	95 013	9.6%	60.9%
USA	52 633	59 675	64 422	66 881	70 293	7.6%	33.6%
GERMANY	42 424	42 539	37 244	41 327	49 420	6.5%	16.5%
BOTSWANA	30 451	33 176	41 416	44 451	51 755	5.1%	70.0%
NAMIBIA	28 276	31 147	33 528	40 943	49 219	5.0%	74.1%
JAPAN	46 894	55 355	46 744	53 827	53 028	4.95	13.1%
UNITED KINGDOM	26 673	28 481	27 411	31 875	37 538	4.4%	40.7%
INDIA	22 122	24 492	30 743	29 015	40 928	4.1%	85.0%
BELGIUM	12 739	15 367	15 377	18 966	26 704	2.9%	109.6%
MOZAMBIQUE	13 764	17 485	19 315	27 316	32 541	2.9%	136.4%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-1(b): RSA top 10 export destinations and export values in real terms.

COUNTRY	2010	2011	2012	2013	2014	REAL EXPORT GROWTH: 2010 – 2014
CHINA	59056	86398	76479	99455	76359	29.3%
USA	52633	56836	58074	57177	56492	7.3%
GERMANY	42424	40515	33574	35331	39717	-6.4%
BOTSWANA	30451	31598	37335	38001	41594	36.6%

NAMIBIA	28276	29665	30224	35002	39556	39.9%
JAPAN	46894	52721	42138	46017	42617	-9.1%
UNITED KINGDOM	26673	27126	24710	27250	30168	13.1%
INDIA	22122	23327	27713	24805	32893	48.7%
BELGIUM	12739	14636	13862	16214	21461	68.5%
MOZAMBIQUE	13764	16653	17412	23353	26152	90.0%

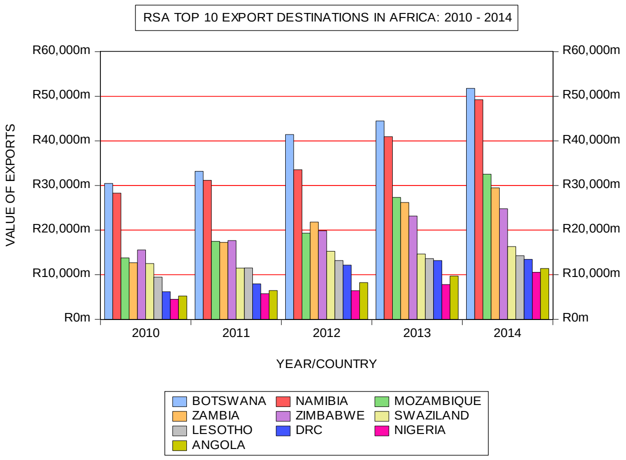
Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

Figure 2-4 and tables 2-1(a) and (b) present South Africa's top 10 export destinations, with panel (a) in figure 2-4 showing the main export destinations during 2010 – 2014 and panel (b) showing the total share of South African exports those countries commanded as at 31 December 2014. Table 2-1(a) also shows the nominal growth rate of exports to those countries during 2010 – 2014. Some highlights from the figures show that trade between China and South Africa has been on an upward trend during 2010 - 2014. In nominal terms, China gets the lion's share of South African exports at 9.6% of the total as exports to the country grew from just over R59 billion in 2010 to peak at just over R116 billion in 2013, though the value declined to around R95 billion in 2014. Again in nominal terms, exports to China grew by 60.9% between the years 2010 – 2014. However, the figures in table 2-4(b) show that when the export figures are adjusted for inflation, the growth rate is actually much lower and declined by as much as 51.9% to about 29.3% during the period. Exports to the USA have also increased peaking at just over R70 billion in 2014 and accounting for a 7.6% share overall and a 33.6% nominal growth rate with the figure declining to 7.3% when adjusted for inflation.

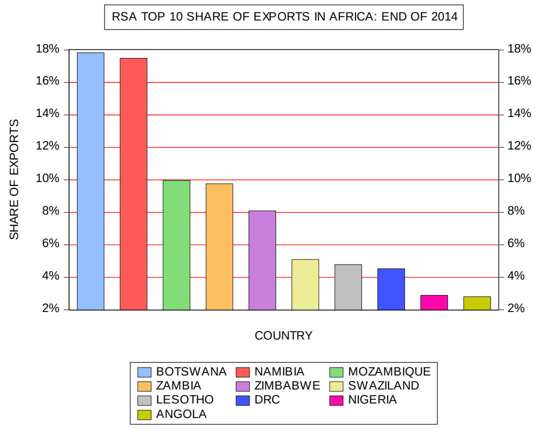
Germany is South Africa's largest export destination in the Eurozone with a share of 6.5% of total exports and peaking at R49.42 billion in 2014 from R42.42 billion in 2010, representing a 16.5% nominal growth rate during the period 2010-2014. However, exports to Germany have actually declined by as much as -6.4% from 2010-2014 in real terms, which is a reminder that nominal values should always be taken with a pinch of salt. It is also important to note that from the top 10 export destinations; about 13% go to African countries, namely, Botswana, Namibia and Mozambique and with Mozambique the only African country whose real growth was exponential from 2010-2014 at about 90%.

2.2.2. RSA top 10 export destinations in Africa

Figure 2-5: RSA top 10 export destinations in Africa.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-2(a): RSA top 10 export destinations in Africa with export values in nominal terms.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF EXPORTS	NOMINAL EXPORT GROWTH
BOTSWANA	30 451	33 176	41 416	44 451	51 755	17.8%	70.0%
NAMIBIA	28 276	31 147	33 528	40 943	49 219	17.5%	74.1%
MOZAMBIQUE	13 764	17 485	19 315	27 316	32 541	10.0%	136.4%
ZAMBIA	12 674	17 224	21 784	26 191	29 460	9.8%	132.4%
ZIMBABWE	15 542	17 636	19 850	23 143	24 789	8.1%	59.5%
SWAZILAND	12 500	11 467	15 250	14 640	16 305	5.1%	30.4%
LESOTHO	9 464	11 512	13 177	13 614	14 242	4.8%	50.5%
DRC	6 188	7 951	12 149	13 181	13 443	4.5%	117.2%
NIGERIA	4 499	5 746	6 430	7 802	10 546	2.9%	134.4%
ANGOLA	5 212	6 460	8 221	9 702	11 401	2.8%	118.7%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-2(b): RSA top 10 export destinations in Africa with export values in real terms.

COUNTRY	2010	2011	2012	2013	2014	REAL EXPORT GROWTH: 2010 – 2014
BOTSWANA	30451	31598	37335	38001	41594	36.6%
NAMIBIA	28276	29665	30224	35002	39556	39.9%
MOZAMBIQUE	13764	16653	17412	23353	26152	90.0%
ZAMBIA	12674	16405	19637	22391	23676	86.8%

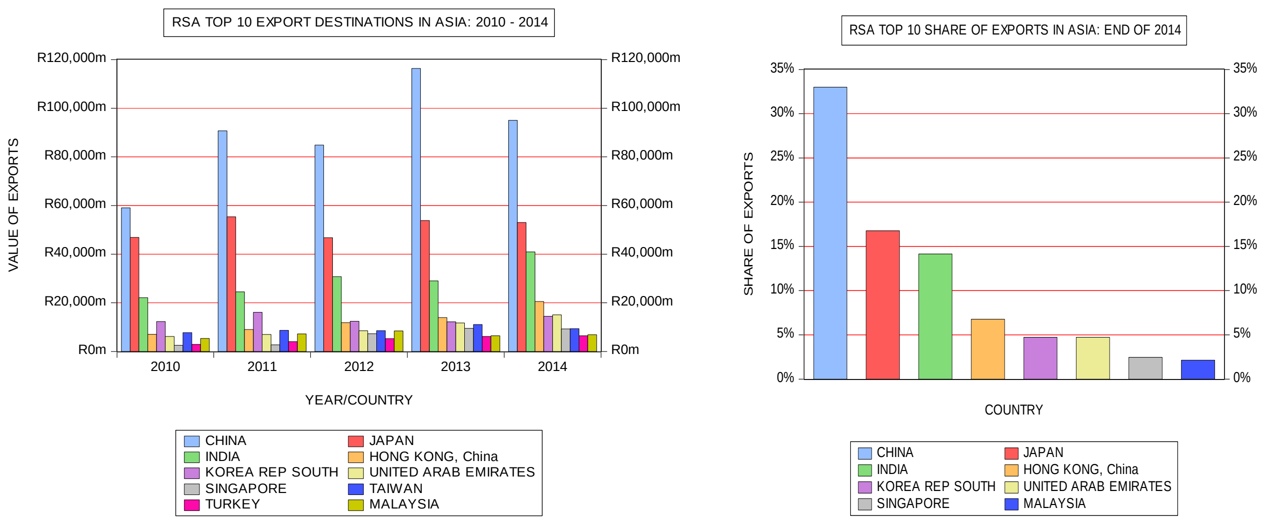
ZIMBABWE	15542	16797	17894	19785	19922	28.2%
SWAZILAND	12500	10921	13747	12516	13104	4.8%
LESOTHO	9464	10964	11878	11639	11446	20.9%
DRC	6188	7573	10952	11269	10804	74.6%
NIGERIA	4499	5473	5796	6670	8475	88.4%
ANGOLA	5212	6153	7411	8294	9163	75.8%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

Figure 2-5 and tables 2-2(a) and (b) present South Africa's top 10 export destinations on the African continent, with panel (a) in figure 2-5 showing the main export destinations during 2010 – 2014 and panel (b) showing the total share. Out of the top 10 countries, nine countries are in the Southern African Development Community (SADC) region and account for about 80.4% of all total exports to Africa. The figures and tables show that six SADC countries and the RSA's immediate neighbours, namely, Botswana, Namibia, Mozambique, Zimbabwe, Swaziland and Lesotho account for about 63.3% of all total exports to Africa. Notwithstanding Swaziland with a meagre 4.8% real export growth rate, overall, exports have continued on an upward trend with not a single country recording a decline in the value of export during the period, both in nominal and in real terms.

2.2.3. RSA top 10 export destinations in Asia

Figure 2-6: RSA top 10 export destinations in Asia.



(a) (b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-3(a): RSA top 10 export destinations in Asia with export values in nominal terms.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF EXPORTS	NOMINAL EXPORT GROWTH
CHINA	59 056	90 714	84 839	116 335	95 013	33.0%	60.9%
JAPAN	46 894	55 355	46 744	53 827	53 028	16.8%	13.1%
INDIA	22 122	24 492	30 743	29 015	40 928	14.1%	85.0%
HONG KONG	7 046	9 041	11 826	13 957	20 541	6.8%	191.5%
SOUTH KOREA	12 296	16 110	12 412	12 201	14 459	4.7%	17.6%
UNITED ARAB EMIRATES	6 188	6 957	8 501	11 719	15 068	4.7%	143.5%
SINGAPORE	2 561	2 728	7 251	9 501	9 285	2.5%	262.5%
TAIWAN	7 729	8 702	8 578	11 058	9 390	2.4%	21.5%
TURKEY	2 883	4 052	5 294	6 176	6 468	2.3%	124.3%
MALAYSIA	5 370	7 239	8 434	6 469	6 861	2.1%	27.8%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-3(b): RSA top 10 export destinations in Asia with export values in real terms.

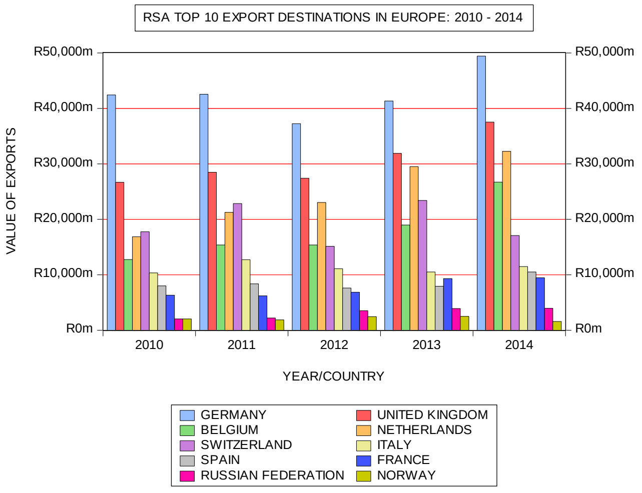
COUNTRY	2010	2011	2012	2013	2014	REAL EXPORT GROWTH: 2010 - 2014
CHINA	59056	86398	76479	99455	76359	29.3%
JAPAN	46894	52721	42138	46017	42617	-9.1%
INDIA	22122	23327	27713	24805	32893	48.7%
HONG KONG	7046	8611	10661	11932	16508	134.3%
SOUTH KOREA	12296	15344	11189	10431	11620	-5.5%
UNITED ARAB EMIRATES	6188	6626	7663	10019	12110	95.7%
SINGAPORE	2561	2598	6536	8122	7462	191.4%
TAIWAN	7729	8288	7733	9454	7546	-2.4%
TURKEY	2883	3859	4772	5280	5198	80.3%
MALAYSIA	5370	6895	7603	5530	5514	2.7%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

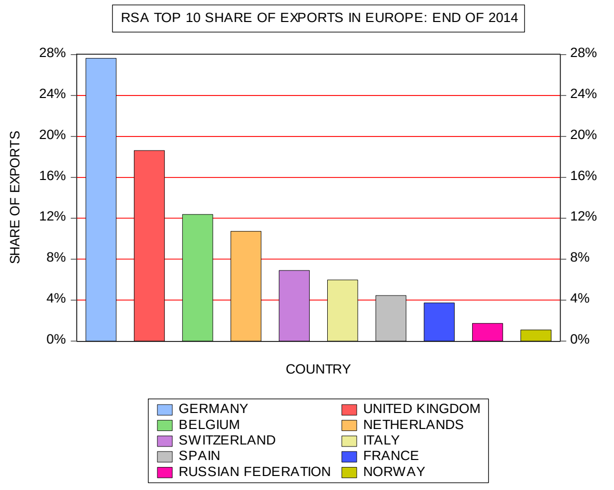
Figure 2-6 and tables 2-3(a) and (b) present South Africa's top 10 export destinations in Asia, with panel (a) in figure 2-6 showing the main export destinations during 2010 – 2014 and panel (b) showing the total share. Exports to China have continued to grow from just over R59 billion in 2010 to peak at over R116 billion in 2013, though the value declined to around R95 billion in 2014. Nominal and real growth values for China are as discussed in section 2.2.1 earlier. This confirms China as the RSA's largest export destination in Asia and indeed in the whole world during the period. 33% of all merchandise exported to Asia goes to China with Japan and India also commanding double digit shares of RSA exports to that region. However, in real terms, Japan, South Korea and Taiwan showed a decline in export values during the period. Overall, exports to Asia have been on the rise.

2.2.4. RSA top 10 export destinations in the Europe

Figure 2-7: RSA top 10 export destinations in Europe.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-4(a): RSA top 10 export destinations in Europe and export values in nominal terms.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF EXPORTS	NOMINAL EXPORT GROWTH
GERMANY	42 424	42 539	37 244	41 327	49 420	27.6%	16.5%
UNITED KINGDOM	26 673	28 481	27 411	31 875	37 538	18.6%	40.7%
BELGIUM	12 739	15 367	15 377	18 966	26 704	12.4%	109.6%
NETHERLANDS	16 844	21 260	23 036	29 495	32 249	10.7%	91.5%
SWITZERLAND	17 739	22 843	15 128	23 406	17 076	6.9%	-3.7%
ITALY	10 339	12 704	11 082	10 501	11 462	6.0%	10.9%
SPAIN	8 002	8 349	7 611	7 924	10 503	4.4%	31.2%
FRANCE	6 320	6 189	6 837	9 311	9 458	3.7%	49.7%
RUSSIA	2 028	2 203	3 507	3 894	3 965	1.7%	95.5%
NORWAY	2 033	1 862	2 449	2 484	1 559	1.1%	-23.3%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-4(b): RSA top 10 export destinations in Europe and export values in real terms.

COUNTRY	2010	2011	2012	2013	2014	REAL EXPORT GROWTH: 2010 - 2014
GERMANY	42424	40515	33574	35331	39717	-6.4%
UNITED KINGDOM	26673	27126	24710	27250	30168	13.1%
BELGIUM	12739	14636	13862	16214	21461	68.5%
NETHERLANDS	16844	20248	20766	25215	25918	53.9%
SWITZERLAND	17739	21756	13637	20010	13723	-22.6%
ITALY	10339	12100	9990	8977	9212	-10.9%
SPAIN	8002	7952	6861	6774	8441	5.5%

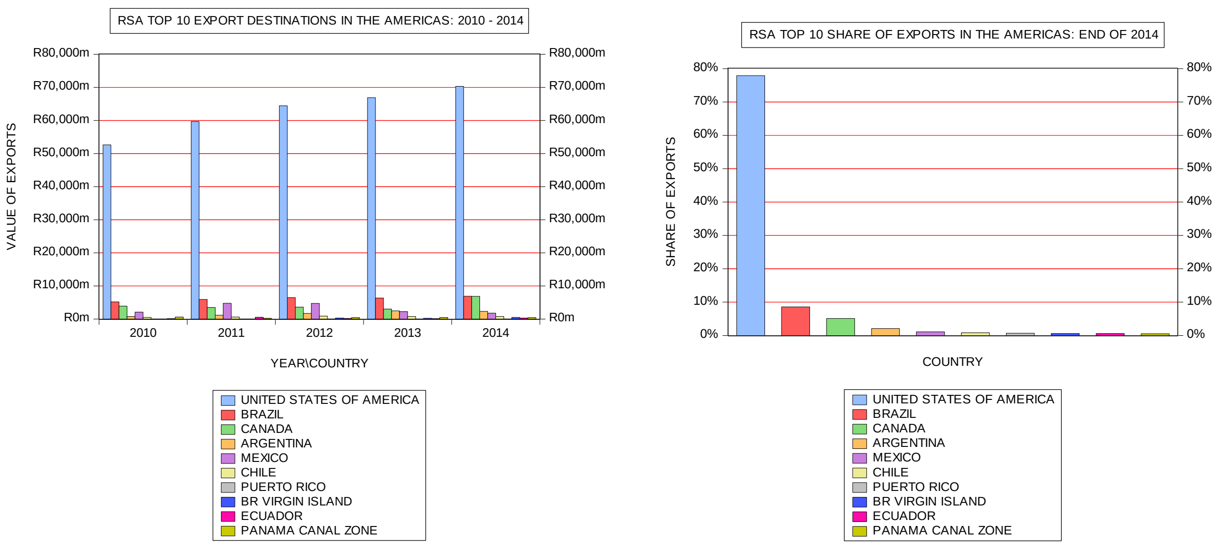
FRANCE	6320	5895	6163	7960	7601	20.3%
RUSSIA	2028	2098	3161	3329	3187	57.1%
NORWAY	2033	1773	2208	2124	1253	-38.4%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

Figure 2-7 and tables 2-4(a) and (b) present South Africa's top 10 export destinations in Europe, with panel (a) in figure 2-7 showing the main export destinations during 2010 – 2014 and panel (b) showing the total share. The numbers show that out of 50 countries in Europe, 10 countries account for 93.1% of South African exports to that continent. Germany continues to be the largest single consumer of South African goods in Europe with a 27.6% share followed by the United Kingdom with 18.6%. Even though Germany did show a nominal growth rate of 16.5% from 2010 to 2014, the growth rate in constant prices actually declined to -6.4% during the period. Belgium has also shown its relative importance to RSA with exports to that country showing a 68.5% real growth rate from 2010-2014. Exports to Switzerland, Italy and Norway have also declined sharply in real terms during the period. It is also worth noting that exports to Russia continued to grow from 2010 with a real growth rate of 57.1% and this can be attributed to the formation of the partnership alliance, comprising the following countries, Brazil, Russia, India, China and South Africa, the alliance popularly known as BRICS.

2.2.5. RSA top 10 export destinations in the Americas

Figure 2-8: RSA top 10 export destinations in the Americas.



(a) (b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-5(a): RSA top 10 export destinations in the Americas with export values in nominal terms.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF EXPORTS	NOMINAL EXPORT GROWTH
UNITED STATES OF AMERICA	52 633	59 675	64 422	66 881	70 293	77.9%	33.6%
BRAZIL	5 181	5 903	6 469	6 349	6 861	8.6%	32.4%
CANADA	3 904	3 461	3 566	3 022	6 858	5.1%	75.7%
ARGENTINA	764	1 131	1 687	2 465	2 324	2.1%	204.2%
MEXICO	2 092	4 731	4 718	2 219	1 763	1.1%	-15.7%
CHILE	469	601	888	761	762	0.8%	62.6%
PUERTO RICO	12	4	4	7	6	0.7%	-45.4%
BR VIRGIN ISLAND	14	13	282	219	495	0.6%	3344.4%
ECUADOR	92	511	162	113	296	0.6%	221.3%
PANAMA CANAL ZONE	583	224	409	459	412	0.5%	-29.3%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-5(b): RSA top 10 export destinations in the Americas with export values in real terms.

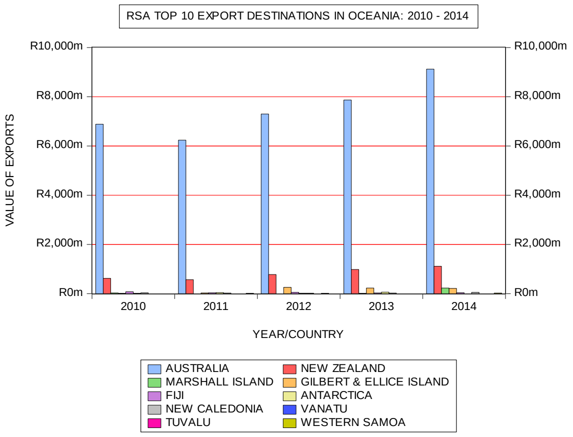
COUNTRY	2010	2011	2012	2013	2014	REAL EXPORT GROWTH: 2010 – 2014
UNITED STATES OF AMERICA	52633	56836	58074	57177	56492	7.3%
BRAZIL	5181	5622	5832	5428	5514	6.4%
CANADA	3904	3296	3215	2584	5512	41.2%
ARGENTINA	764	1077	1521	2107	1868	144.5%
MEXICO	2092	4506	4253	1897	1417	-32.3%
CHILE	469	572	800	651	612	30.6%
PUERTO RICO	12	4	4	6	5	-59.8%
BR VIRGIN ISLAND	14	12	254	187	398	2741.5%
ECUADOR	92	487	146	97	238	158.6%
PANAMA CANAL ZONE	583	213	369	392	331	-43.2%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

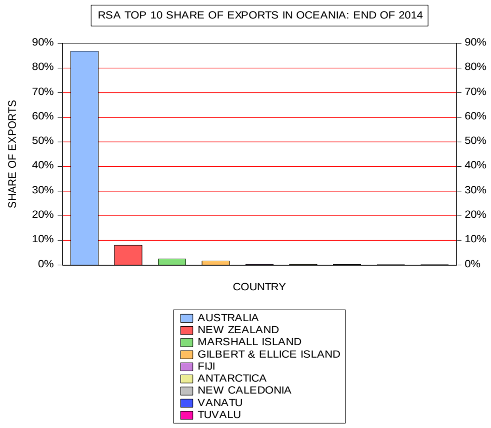
Figure 2-8 and tables 2-5(a) and (b) present South Africa's top 10 export destinations in the Americas, comprising South America, Central America, The Caribbean and North America, with panel (a) in figure 2-8 showing the main export destinations during 2010 – 2014 and panel (b) showing the total share. The export values show that trade is heavily lopsided towards the United States with that country getting 77.9% of South African exports to that region. Exports to Brazil have continued to grow, albeit unevenly, with the country consuming 8.6% of South African exports to the region, though one would perhaps have hoped for greater export penetration in light of the 2010 BRICS formation. Generally, exports have shown an increasing trend for all the countries in the top 10, with the exception of three countries, namely, Mexico, Puerto Rico and Panama whose export volumes and growth values declined both in nominal and in real terms from 2010 - 2014.

2.2.6. RSA top 10 export destinations in Oceania

Figure 2-9: RSA top 10 export destinations in Oceania.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-6(a): RSA top 10 export destinations in Oceania and nominal export values.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF EXPORTS	NOMINAL EXPORT GROWTH
AUSTRALIA	6 883	6 235	7 295	7 865	9 122	86.9%	32.5%
NEW ZEALAND	619	567	776	979	1 111	8.0%	79.5%
MARSHALL ISLAND	28	9	7	10	228	2.4%	728.9%
GILBERT & ELLICE ISLAND	13	25	257	225	211	1.6%	1539.5%
FIJI	73	33	53	26	36	0.3%	-50.8%
ANTARCTICA	12	40	17	59	6	0.2%	-51.4%
NEW CALEDONIA	32	21	15	22	51	0.2%	59.2%
VANUATU	6	3	6	6	2	0.1%	-59.8%
TUVALU	1	3	10	4	7	0.1%	374.7%
WESTERN SAMOA	3	11	4	3	22	0.0%	682.0%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-6(b): RSA top 10 export destinations in Oceania with real export values.

COUNTRY	2010	2011	2012	2013	2014	REAL EXPORT GROWTH: 2010 – 2014
AUSTRALIA	6883	5938	6576	6724	7331	6.5%
NEW ZEALAND	619	540	700	837	893	44.2%
MARSHALL ISLAND	28	9	6	9	183	554.4%
GILBERT & ELLICE ISLAND	13	24	232	192	170	1204.4%
FIJI	73	31	48	22	29	-60.4%
ANTARCTICA	12	38	15	50	5	-59.8%
NEW CALEDONIA	32	20	14	19	41	28.1%
VANUATU	6	3	5	5	2	-73.2%
TUVALU	1	3	9	3	6	462.6%

WESTERN SAMOA	3	10	4	3	18	489.4%

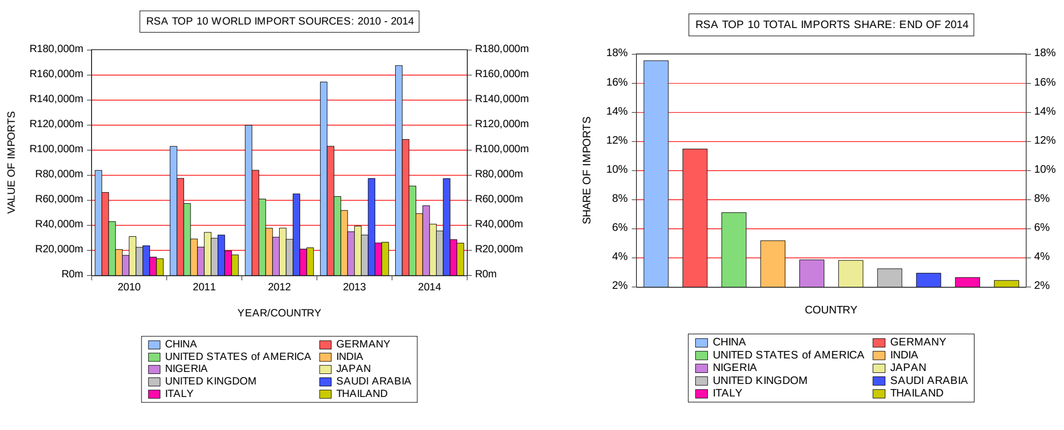
Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

Figure 2-9 and tables 2-6(a) and (b) present South Africa's top 10 export destinations in Oceania, with panel (a) in figure 2-9 showing the main export destinations during 2010 – 2014 and panel (b) showing the total share. Of the total exports to Oceania, 86.9% end up in Australia which has shown a 6.5% real growth rate compared to the 32.5% unadjusted rate from 2010-2014, with New Zealand a distant 2nd at 8% and a positive 44.2% real growth rate during the period. Together, these two countries account for 95% of South African exports to that region. Apart from Australia and New Zealand, all the other countries in the top 10 are just tiny island nations, thus, the paltry export values are not surprising although some island nations such as the Marshall Island, Gilbert & Ellice Island, Tuvalu and Western Samoa showed exponential growth in real terms from about 462.6% for Tuvalu to as much as 1204.4% for Gilbert & Ellice Island. On the other hand, Fiji, Antarctica and Vanuatu all showed a sharp real decline in export growth during the period.

2.3. SOUTH AFRICA'S MAIN IMPORT SOURCES FOR THE PERIOD 2010 – 2014

2.3.1. RSA top 10 world import sources

Figure 2-10: RSA top 10 world import sources.



(a) (b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-7(a): RSA top 10 world import sources and nominal import values.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF IMPORTS	NOMINAL IMPORT GROWTH
CHINA	83 894	103 143	119 945	154 445	167 600	17.6%	99.8%
GERMANY	66 293	77 469	83 962	103 227	108 591	11.5%	63.8%
UNITED STATES of AMERICA	43 015	57 438	61 047	63 032	71 391	7.1%	66.0%
INDIA	20 762	29 172	37 700	51 894	49 368	5.2%	137.8%
NIGERIA	16 080	22 660	30 550	34 898	55 704	3.9%	246.4%
JAPAN	31 033	34 377	37 815	39 393	40 967	3.8%	32.0%
UNITED KINGDOM	22 443	29 711	28 834	32 283	35 493	3.2%	58.1%
SAUDI ARABIA	23 674	32 295	65 148	77 440	77 327	2.9%	226.6%
ITALY	14 696	19 595	21 086	25 975	28 652	2.6%	95.0%
THAILAND	13 373	16 450	22 137	26 537	25 775	2.4%	92.7%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-7(b): RSA top 10 world import sources with real import values.

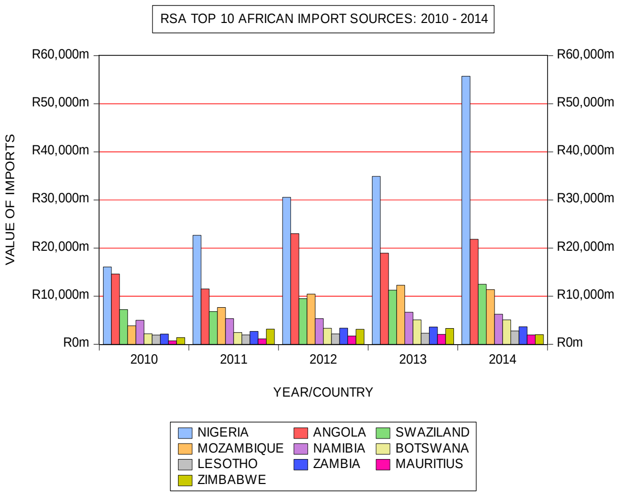
COUNTRY	2010	2011	2012	2013	2014	REAL IMPORT GROWTH: 2010 – 2014
CHINA	83894	98236	108125	132036	134695	60.6%
GERMANY	66293	73783	75688	88249	87271	31.6%
UNITED STATES of AMERICA	43015	54705	55031	53886	57375	33.4%
INDIA	20762	27784	33985	44364	39676	91.1%
NIGERIA	16080	21582	27540	29834	44768	178.4%
JAPAN	31033	32741	34089	33677	32924	6.1%
UNITED KINGDOM	22443	28297	25993	27599	28525	27.1%
SAUDI ARABIA	23674	30758	58728	66204	62145	162.5%
ITALY	14696	18663	19008	22206	23027	56.7%
THAILAND	13373	15667	19956	22687	20715	54.9%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

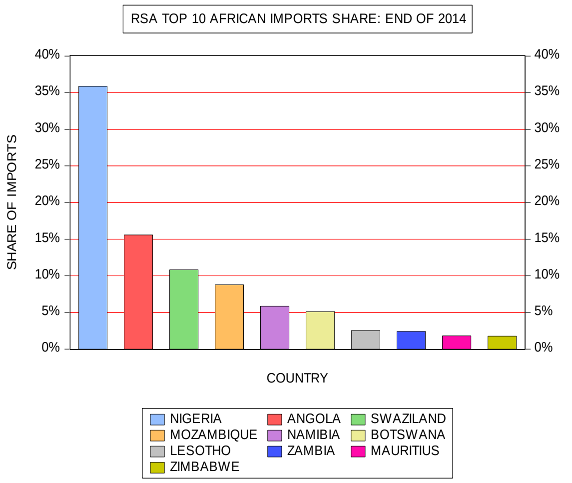
Figure 2-10 and tables 2-7(a) and (b) present South Africa's top 10 import sources from around the world, with panel (a) in figure 2-10 showing the main import sources during 2010 – 2014 and panel (b) showing the total share. China continues to underline its importance to South Africa with R167.6 billion of South African imports at the end of 2014 coming from that country, representing a 17.6% share, a 99.8% nominal and 60.6% real growth rates during the period. Germany also underlines its position as South Africa's largest trading partner in Europe with imports from that country reaching R108.59 billion in 2014 from R66.29 billion in 2010, representing a nominal growth rate of 66.8% and a real growth rate of 31.6% during the period accounting for an 11.5% share of all imports from the rest of the world for South Africa. Overall, imports from South Africa's major trading partners increased during the period, especially Saudi Arabia, which had nominal and real growth rates of 226.6% and 162.5% respectively between 2010 and 2014. Nigeria also showed its importance as RSA's top import source on the African continent which will be discussed in section 2.3.2.

2.3.2. RSA top 10 African import sources

Figure 2-11: RSA top 10 African import sources.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-8(a): RSA top 10 African import sources and nominal import values.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF IMPORTS	NOMINAL IMPORT GROWTH
NIGERIA	16 080	22 660	30 550	34 898	55 704	35.9%	246.4%
ANGOLA	14 602	11 515	23 001	18 921	21 832	15.6%	49.5%
SWAZILAND	7220	6791	9482	11244	12464	10.8%	72.6%
MOZAMBIQUE	3854	7642	10424	12269	11348	8.8%	194.5%
NAMIBIA	4976	5326	5342	6650	6235	5.8%	25.3%
BOTSWANA	2171	2451	3307	5069	5076	5.1%	133.8%
LESOTHO	1927	1957	2144	2304	2775	2.5%	44.0%
ZAMBIA	2115	2689	3340	3577	3627	2.4%	71.5%
MAURITIUS	706	1135	1710	2076	1953	1.8%	176.4%
ZIMBABWE	1396	3142	3113	3304	2008	1.8%	43.8%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-8(b): RSA top 10 African import sources with real import values.

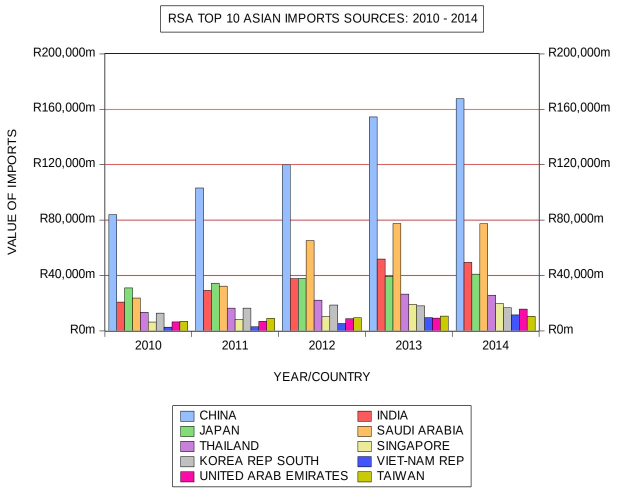
COUNTRY	2010	2011	2012	2013	2014	REAL IMPORT GROWTH: 2010 – 2014
NIGERIA	16080	21582	27540	29834	44768	178.4%
ANGOLA	14602	10967	20734	16176	17546	20.2%
SWAZILAND	7220	6468	8548	9613	10017	38.7%
MOZAMBIQUE	3854	7278	9397	10489	9120	136.6%
NAMIBIA	4976	5073	4816	5685	5011	0.7%
BOTSWANA	2171	2334	2981	4334	4079	87.9%
LESOTHO	1927	1864	1933	1970	2230	15.7%
ZAMBIA	2115	2561	3011	3058	2915	37.8%
MAURITIUS	706	1081	1541	1775	1570	122.3%
ZIMBABWE	1396	2993	2806	2825	1614	15.6%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

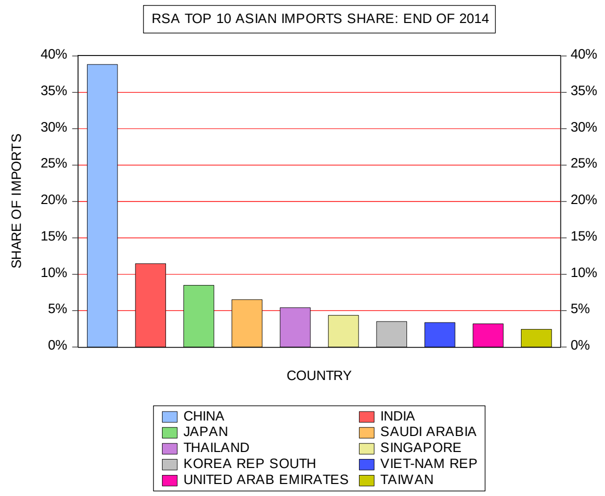
Figure 2-11 and tables 2-8(a) and (b) present South Africa's top 10 import sources from the African continent, with panel (a) in figure 2-11 showing the main import sources during 2010 – 2014 and panel (b) showing the total share. 35.9% of RSA's total imports from the continent are sourced from Nigeria, with import volumes (converted to Rands) increasing from R16.08 billion in 2010 to R55.70 billion in 2014, representing a nominal growth rate of 246.4% and real growth of 178.4% during the period. Angola and Swaziland also account for double digit shares of South African imports from the continent. Apart from Namibia with a paltry 0.7%, overall, imports from the continent have increased in real terms, prompting the South African Reserve Bank (SARB) to include three African countries in the computation of the Real Effective Exchange Rate as will be discussed in Chapter 3.

2.3.3. RSA top 10 Asian import sources

Figure 2-12: RSA top 10 Asian import sources.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-9(a): RSA top 10 Asian import sources and nominal import values

COUNTRY	2010	2011	2012	2013	2014	SHARE OF IMPORTS	NOMINAL IMPORT GROWTH
CHINA	83 894	103 143	119 945	154 445	167 600	38.8%	99.8%
INDIA	20 762	29 172	37 700	51 894	49 368	11.4%	137.8%
JAPAN	31 033	34 377	37 815	39 393	40 967	8.5%	32.0%
SAUDI ARABIA	23 674	32 295	65 148	77 440	77 327	6.5%	226.6%
THAILAND	13 373	16 450	22 137	26 537	25 775	5.4%	92.7%
SINGAPORE	6 360	8 196	10 268	19 024	19 748	4.4%	210.5%
SOUTH KOREA	12 762	16 442	18 612	18 109	16 742	3.5%	31.2%
VIETNAM	2 713	2 937	5 279	9 568	11 517	3.4%	324.5%
UNITED ARAB EMIRATES	6 494	6 894	8 853	9 208	15 736	3.2%	142.3%
TAIWAN	6 831	8 995	9 499	10 664	10 496	2.4%	53.6%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices

Table 2-9(b): RSA top 10 Asian import sources with real import values.

COUNTRY	2010	2011	2012	2013	2014	REAL IMPORT GROWTH: 2010 – 2014
CHINA	83894	98236	108125	132036	134695	60.6%
INDIA	20762	27784	33985	44364	39676	91.1%
JAPAN	31033	32741	34089	33677	32924	6.1%
SAUDI ARABIA	23674	30758	58728	66204	62145	162.5%
THAILAND	13373	15667	19956	22687	20715	54.9%
SINGAPORE	6360	7806	9256	16264	15871	149.5%

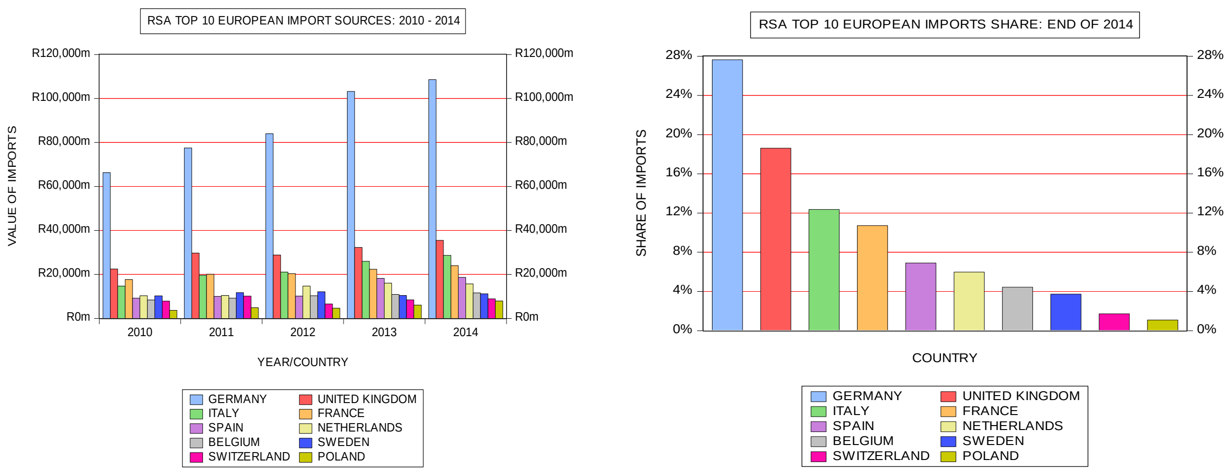
SOUTH KOREA	12762	15660	16778	15481	13455	5.4%
VIETNAM	2713	2797	4759	8180	9256	241.2%
UNITED ARAB EMIRATES	6494	6566	7981	7872	12647	94.7%
TAIWAN	6831	8567	8563	9117	8435	23.5%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

Figure 2-12 and tables 2-9(a) and (b) present South Africa's top 10 import sources from Asia, with panel (a) in figure 2-12 showing the main import sources during 2010 – 2014 and panel (b) showing the total share. South Africa's trade relationship with China is reflected by the 38.8% share of RSA imports from that region. Imports from China have continued to grow, peaking at R167.6 billion at the end of 2014 and a real growth of 60.6%. India has also increasingly become an important trade partner to RSA as imports from that country have surged from R20.76 billion in 2010 to R49.36 billion in 2014, which is a 137.8% nominal growth and 91.1% real growth rate between 2010 and 2014, perhaps a result of the BRICS bloc. Overall, South African imports from its major trade partners have continued on an upward trend during 2010 – 2014.

2.3.4. RSA top 10 European import sources

Figure 2-13: RSA top 10 European import sources.



(a) (b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-10(a): RSA top 10 European import sources and nominal import values.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF IMPORTS	NOMINAL IMPORT GROWTH
GERMANY	66 293	77 469	83 962	103 227	108 591	27.6	63.8%
UNITED KINGDOM	22 443	29 711	28 834	32 283	35 493	18.6	58.1%
ITALY	14 696	19 595	21 086	25 975	28 652	12.4	95.0%
FRANCE	17 688	20 043	20 351	22 367	23 979	10.7	35.6%
SPAIN	9 226	10 017	10 117	18 203	18 644	6.9	102.1%
NETHERLANDS	10 319	10 429	14 674	16 023	15 664	6.0	51.8%
BELGIUM	8 382	9 180	10 315	10 904	11 622	4.4	38.7%
SWEDEN	10 274	11 715	12 116	10 457	11 197	3.7	9.0%
SWITZERLAND	7 865	10 136	6 563	8 422	8 919	1.7	13.4%
POLAND	3 634	4 872	4 660	6 044	7 923	1.1	118.0%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-10(b): RSA top 10 European import sources with real import values.

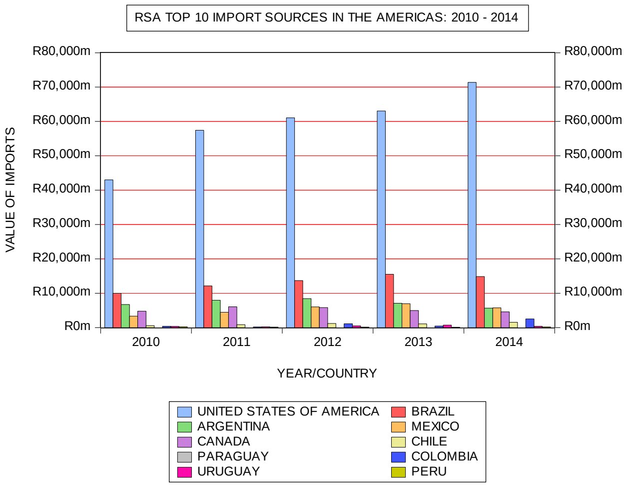
COUNTRY	2010	2011	2012	2013	2014	REAL IMPORT GROWTH: 2010 – 2014
GERMANY	66293	73783	75688	88249	87271	31.6%
UNITED KINGDOM	22443	28297	25993	27599	28525	27.1%
ITALY	14696	18663	19008	22206	23027	56.7%
FRANCE	17688	19089	18346	19122	19271	9.0%
SPAIN	9226	9540	9120	15562	14984	62.4%
NETHERLANDS	10319	9933	13228	13698	12589	22.0%
BELGIUM	8382	8743	9299	9322	9340	11.4%
SWEDEN	10274	11158	10922	8940	8999	-12.4%
SWITZERLAND	7865	9654	5916	7200	7168	-8.9%
POLAND	3634	4640	4201	5167	6367	75.2%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

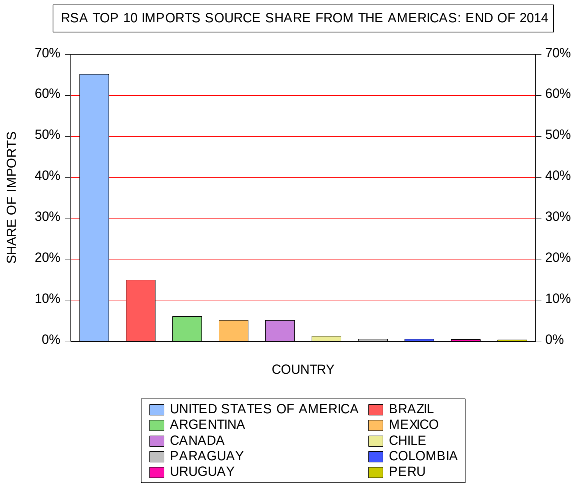
Figure 2-13 and tables 2-10(a) and (b) present South Africa's top 10 import sources from Europe, with panel (a) in figure 2-13 showing the main import sources during 2010 – 2014 and panel (b) showing the total share. Imports from the region have increased overall, with imports from Germany at R108.59 billion topping the rest in 2014, thus accounting for 27.6% of South Africa's total imports from that region. Unlike most of the other regions in the analysis, RSA seems to source a significant amount of its goods from a variety of countries with the UK, Italy and France all providing double digit shares of South African imports from that region. Apart from Switzerland and Sweden which posted negative real growth rates during the period, overall, imports from all the other countries in the top ten have been on an upward trend since the world financial crisis both in nominal and real terms. There's an absentee from the analysis, namely, Russia which does not feature in the top ten despite participating with the RSA in the BRICS bloc. According to The Economist (2014), this could be attributed to the falling Russian currency (Rouble), high inflation, big current-account deficits and slow growth in Russia. Sanctions imposed by the USA and Europe on Russia for its annexation of Crimea in Ukraine could also be blamed for the weak trade between RSA and Russia (Bisseker, 2014).

2.3.5. RSA top 10 import sources from the Americas

Figure 2-14: RSA top 10 import sources from the Americas.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-11(a): RSA top 10 import sources from the Americas and nominal import values.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF IMPORTS	NOMINAL IMPORT GROWTH
UNITED STATES OF AMERICA	43 015	57 438	61 047	63 032	71 391	65.2	66.0%
BRAZIL	10 003	12 115	13 668	15 510	14 852	14.9	48.5%
ARGENTINA	6 707	7 967	8 419	7 069	5 674	6.0	-15.4%
MEXICO	3 338	4 441	6 004	6 965	5 756	5.0	72.5%
CANADA	4 760	6 069	5 836	4 978	4 567	5.0	-4.1%
CHILE	579	832	1 189	1 084	1 540	1.2	165.8%
PARAGUAY	38	51	39	52	44	0.5	14.2%
COLOMBIA	351	171	1 099	456	2 520	0.5	617.3%
URUGUAY	318	229	505	737	355	0.4	11.5%
PERU	215	140	123	117	190	0.3	-11.8%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices.

Table 2-11(b): RSA top 10 import sources from the Americas with real import values.

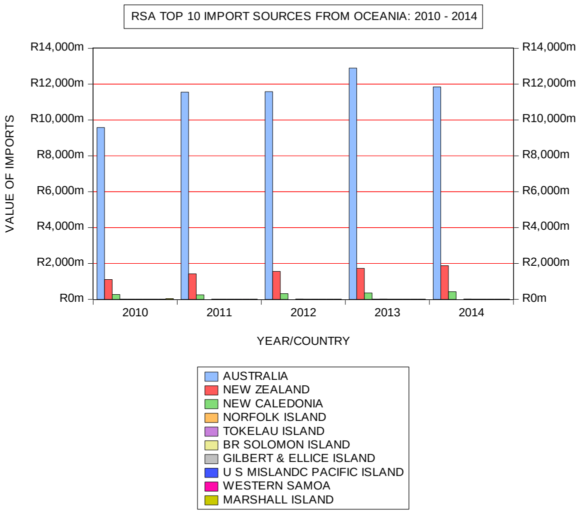
COUNTRY	2010	2011	2012	2013	2014	REAL IMPORT GROWTH: 2010 – 2014
UNITED STATES OF AMERICA	43015	54705	55031	53886	57375	33.4%
BRAZIL	10003	11539	12321	13260	11936	19.3%
ARGENTINA	6707	7588	7589	6043	4560	-32.0%
MEXICO	3338	4230	5412	5954	4626	38.6%
CANADA	4760	5780	5261	4256	3670	-22.9%
CHILE	579	792	1072	927	1238	113.8%
PARAGUAY	38	49	35	44	35	-6.9%
COLOMBIA	351	163	991	390	2025	477.0%
URUGUAY	318	218	455	630	285	-10.3%
PERU	215	133	111	100	153	-29.0%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

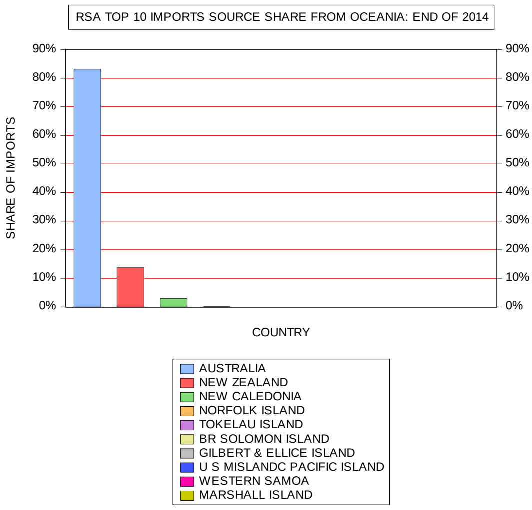
Figure 2-14 and table 2-11(a) and (b) present South Africa's top 10 import sources from the Americas, with panel (a) in figure 2-14 showing the main import sources during 2010 – 2014 and panel (b) showing the total share. South Africa imports mainly from the U.S.A and Brazil with both countries accounting for over 80% of total imports from that region. South Africa also has a sizeable amount of imports coming from Argentina, Mexico and Canada, with the three countries each, accounting for about 6%, 5% and 5% of RSA imports from that region respectively. Apart from Columbia which recorded a 617.3% nominal and 477% real growth rates in imports to RSA from 2010-2014, imports from the Americas have shown a bit of a decline in recent years. Argentina, Canada, Paraguay, Uruguay and Peru all showed negative real growth from 2010-2014.

2.3.6. RSA top 10 import sources from Oceania

Figure 2-15: RSA top 10 import sources from Oceania.



(a)



(b)

Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-12(a): RSA top 10 import sources from Oceania and nominal import values.

COUNTRY	2010	2011	2012	2013	2014	SHARE OF IMPORTS	NOMINAL IMPORT GROWTH
AUSTRALIA	9 580	11 552	11 579	12 898	11 849	83.2%	23.7%
NEW ZEALAND	1 105	1 423	1 559	1 729	1 874	13.7%	69.6%
NEW CALEDONIA	270	245	314	356	421	2.9%	56.0%
NORFOLK ISLAND	0	0	0	7	0	0.1%	-100.0%
TOKELAU ISLAND	10	13	18	17	17	0.0%	67.1%
BR SOLOMON ISLAND	0	0	3	0	0	0.0%	177.7%
GILBERT & ELLICE ISLAND	11	3	4	7	8	0.0%	-22.4%
U S MISLANDC PACIFIC ISLAND	0	0	0	0	0	0.0%	-72.0%
WESTERN SAMOA	0	0	0	1	0	0.0%	901.7%
MARSHALL ISLAND	39	0	1	0	0	0.0%	-99.3%

Source: The South African Revenue Services (SARS). All data is in millions of ZAR and stated in current South African prices

Table 2-12(b): RSA top 10 import sources from Oceania with real import values.

COUNTRY	2010	2011	2012	2013	2014	REAL IMPORT GROWTH: 2010 – 2014
AUSTRALIA	9580	11002	10438	11027	9523	-0.6%
NEW ZEALAND	1105	1355	1405	1478	1506	36.3%
NEW CALEDONIA	270	233	283	304	338	25.3%

NORFOLK ISLAND	0	0	0	6	0	0%
TOKELAU ISLAND	10	12	16	15	14	36.6%
BR SOLOMON ISLAND	0	0	3	0	0	0%
GILBERT & ELLICE ISLAND	11	3	4	6	6	-41.6%
U S MISLANDC PACIFIC ISLAND	0	0	0	0	0	0%
WESTERN SAMOA	0	0	0	1	0	0%
MARSHALL ISLAND	39	0	1	0	0	-100.0%

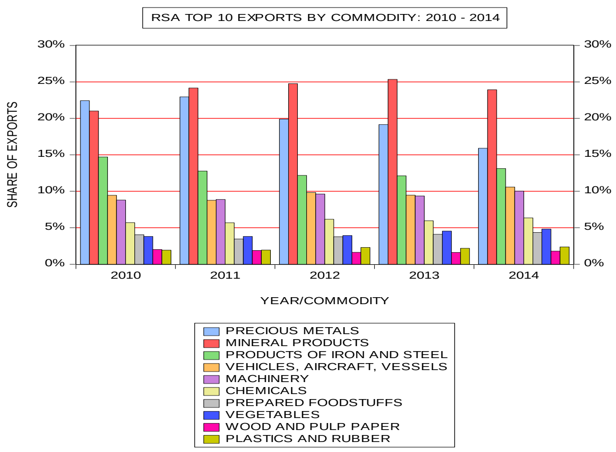
Source: The South African Revenue Services (SARS). All data is in millions of ZAR and is stated in constant 2010 prices.

Figure 2-15 and tables 2-12(a) and (b) present South Africa's top 10 import sources from the Oceania region, with panel (a) in figure 2-15 showing the main import sources during 2010 – 2014 and panel (b) showing the total share. About 99.8% of South Africa's imports from the region are sourced from only three countries, namely, Australia, New Zealand and New Caledonia, with Australia accounting for the biggest share at 83.2%, followed by New Zealand in a distant second place at 13.7%. In real terms, Australia has shown a decline of about -0.6% in 2014 from the 2010 import value even though nominal growth stood at 23.7%. New Zealand, New Caledonia and Tokelau Island all showed positive real growth rates while imports from most of the countries/islands in the region are very negligible indeed.

2.4. RSA'S TOP 10 COMMODITY EXPORTS AND IMPORTS FOR THE PERIOD 2010 – 2014

2.4.1. RSA top 10 Exports by commodity

Figure 2-16: RSA top 10 Exports by commodity, 2010 – 2014.



Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-13: RSA top 10 Exports by commodity, 2010 – 2014 with percentage shares.

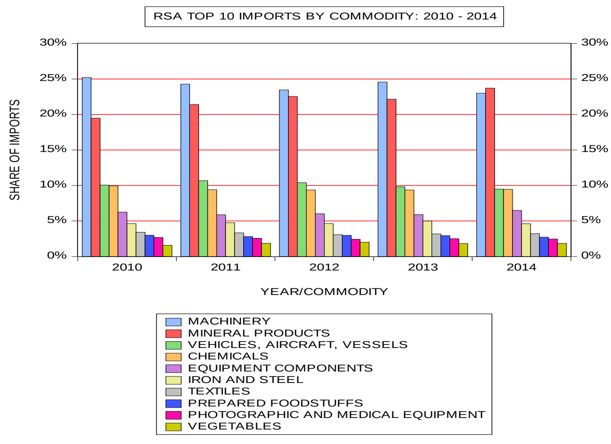
COMMODITY	2010	2011	2012	2013	2014
PRECIOUS METALS	22.42%	22.95%	19.89%	19.15%	15.9%
MINERAL PRODUCTS	21.02%	24.17%	24.77%	25.34%	23.92%
PRODUCTS OF IRON AND STEEL	14.71%	12.78%	12.18%	12.12%	13.12%
VEHICLES, AIRCRAFT, VESSELS	9.45%	8.77%	9.84%	9.46%	10.59%
MACHINERY	8.8%	8.89%	9.62%	9.36%	10.01%
CHEMICALS	5.7%	5.69%	6.17%	5.97%	6.36%
PREPARED FOODSTUFFS	4.05%	3.46%	3.77%	4.11%	4.35%
VEGETABLES	3.82%	3.82%	3.93%	4.54%	4.82%
WOOD AND PULP PAPER	2.01%	1.88%	1.63%	1.62%	1.79%
PLASTICS AND RUBBER	1.92%	1.94%	2.3%	2.19%	2.37%

Source: The South African Revenue Services (SARS).

Figure 2-16 and table 2-13 show South Africa's top 10 exports by commodity. During 2010-2013, the export of mineral products showed an upward trend, declining in 2014. During the year 2010, the export of precious metals (Gold, Silver and Platinum) was actually 22.42% of all total exports to the rest of the world, but declined to about 15.9% in 2014, which is a 29% drop on the 2010 value. As at the end of 2014, mining sector exports (precious metals, mineral products and products of iron and steel) accounted for just over 52% of total exports to the rest of the world, proving that the South African economy is heavily dependent on the mining sector. Hence, any turbulence in the sector tends to stall economic growth in the country. Overall all the other commodities in the top 10 showed growth during the period.

2.4.2. RSA top 10 Imports by commodity

Figure 2-17: RSA top 10 Imports by commodity, 2010 – 2014.



Source: Computation based on data obtained from the South African Revenue Services (SARS).

Table 2-14: RSA top 10 Imports by commodity, 2010 – 2014 with percentage shares.

COMMODITY	2010	2011	2012	2013	2014
MINERAL PRODUCTS	19.49%	21.41%	22.54%	22.16%	23.72%
MACHINERY	25.22%	24.28%	23.46%	24.58%	23.01%
VEHICLES, AIRCRAFT, VESSELS	10.06%	10.68%	10.39%	9.82%	9.49%
CHEMICALS	9.94%	9.4%	9.36%	9.37%	9.45%
EQUIPMENT COMPONENTS	6.26%	5.87%	6.02%	5.91%	6.48%
IRON AND STEEL	4.64%	4.76%	4.64%	4.99%	4.61%
TEXTILES	3.41%	3.32%	3.07%	3.18%	3.22%
PREPARED FOODSTUFFS	3.0%	2.81%	2.97%	2.94%	2.72%
PHOTOGRAPHIC AND MEDICAL EQUIPMENT	2.68%	2.57%	2.42%	2.51%	2.46%
VEGETABLES	1.58%	1.85%	2.01%	1.83%	1.84%

Source: The South African Revenue Services (SARS).

Figure 2-17 and table 2-14 show South Africa's top 10 imports by commodity during the period 2010 – 2014. Perhaps noteworthy is that in 2010, 25.22% of total imports were made up of machinery, including mechanical appliances. There was a decline thereafter until 2014. Mineral imports have actually caught up with imports of machinery as they both accounted for about 46.73% of all total imports at the end of 2014. Interestingly, exports of goods such as vehicles, aircraft and vessels have increased while imports have decreased during the period which augurs well for the trade balance. Fluctuations have been recorded in the other commodities during the period.

2.5. THE EVOLUTION OF SOUTH AFRICA'S MONETARY AND EXCHANGE RATE POLICY

This section discusses South Africa's different monetary and exchange rate policies from the 1920's.

2.5.1. 1920 to 1931: The period of the reinstatement of the gold standard

According to Wijnholds (1995), there were restrictions on gold exports from November 1914 because of the RSA's participation in World War One. This embargo represented a partial abolition of the gold standard because the freedom to export gold was an essential element of the efficient functioning of this standard which was used during the time. This however did little to deter other features of the Gold standard from being kept. For example, banknotes held by the public could still be converted into gold and South Africa was still allowed to import gold, and gold coins continued to circulate freely in the country.

Most countries discontinued with the gold standard, without formally abolishing it. In addition of the prohibition to gold exports, some countries also suspended the convertibility of their currencies into gold. Only the United States and Japan maintained the gold standard during World War One.

These adjustments of the gold standard worked relatively well while the British pound remained close to parity with the US dollar. However, in March 1919 the peg of the British pound to the US dollar was terminated and the British pound depreciated substantially. As a result, a large premium could be earned by buying gold in South Africa and selling it in London. This led to extensive smuggling of gold coins out of South Africa and into the United Kingdom, forcing South African commercial banks to buy gold at a premium in London and sell it in South Africa at par. The huge loses made by banks led to a decision by the government to issue inconvertible gold certificates in 1920, and thereby to the end of the gold standard. The suspension of the gold standard in South Africa was regarded as a temporary measure, as indicated by the decision that the inconvertibility of gold certificates would lapse on 30 June 1923. This was later extended by another two years (Van Der Merwe and Mollentze, 2010).

As stated in the SARB (1971), the debate on the gold standard and its related issues dominated economic discussions for several years after its suspension. Ultimately, the Kemmerer-Vissering Commission was established to investigate whether it would be desirable for South Africa to return to the gold standard irrespective of what the United Kingdom decided to do. The recommendation of the commission was that South Africa should again adopt the gold standard, and that it should do this no later than 30 June 1925. South Africa announced that from May 1925 the gold specie standard would apply in the country, and gold coins would come into circulation again. In contrast, the United Kingdom decided to apply the gold bullion standard (SARB, 1971).

Under the gold standard, the target of monetary policy was to maintain the exchange rate as close to its mint parity as possible (in other words, the official price of gold in terms of the national currency). A deviation from this mint parity could occur if there was any disturbance in BOP equilibrium. The ‘rules of the game’ determined that if a country experienced an overall BOP deficit, it should increase its official discount rate. The general increase in interest rates would then attract financial flows or credit from abroad, which would prevent excessive gold movements. The United Kingdom was generally prepared to this kind of credit to countries with a shortfall in their overall balance of payments. Where a surplus appeared on the balance of payment, countries had to reduce their discount rates, with just the opposite effect. So the rules of the game were that with an inflow of gold to a country, the authorities were expected to increase interest rates, and with an outflow of gold the authorities were expected to reduce interest rates (Van Der Merwe and Mollentze, 2010).

According to Stals (2000), monetary policy under this system was determined exogenously by the internationally revered rules of the gold standard. When a country experienced an overall balance of payment deficit, gold (which is money) automatically flowed out of the economy, liquidity was drained from the system and interest rates rose. The reverse occurred in case of balance of payment surpluses.

The convertibility of the currency into gold ensured that the money supply or stock of a country depended directly on the amount of gold reserves of its monetary authority. If the discount-rate policy of a country was successful in bringing about equilibrium in its BOP, this promoted long-term stability of a nation's money supply. It was argued that such long-term stability in the money stock should lead to long-term stability of real output, prices and the exchange rate (Van Der Merwe and Mollentze, 2010).

Rossouw (2007) states that the South African Reserve Bank not only successfully restored the gold standard and currency convertibility, but also succeeded in establishing a reasonably close relationship between Bank rate and the lending rates to commercial banks, which ensured that the South African Reserve Bank had an influence over domestic interest rates and credit conditions, necessary to apply effective monetary policy

However, the reinstatement of the gold standard was doomed to fail as according to Franzsen (1983), the harmonious application of the 'rules of the game' had broken down. This was because the UK used its pre-war parity rate upon its return to the gold standard, while other countries such as France, returned at much lower values. As a result, this created expectations that the British pound would become overvalued. The United Kingdom, as well as South Africa, was accordingly forced to apply high interest rates and endure high unemployment in an effort to maintain its gold parity rate. At the same time, the United States economic position became very strong and gold flowed across the Atlantic Ocean. No steps were taken to discourage this flow of gold. Moreover, the United States increased import tariffs in 1930 to promote domestic economic activity, while

France had already increased its import tariffs in 1928 for a similar purpose. The political costs of maintaining the British pound became too great, and the United Kingdom abandoned the gold standard in September 1931. This was followed by most of the other industrialised countries in the early 1930s.

2.5.2. 1932 to 1945: The period of the demise of the gold standard and stimulatory monetary policy.

South Africa gave up the Gold standard in December 1932 because of disagreements between several stakeholders in the economy. Between September 1931 and December 1932 the Reserve Bank experienced difficulties in formulating an appropriate exchange rate policy, but it continued to conform to the obligations of the gold standard. The SARB (1971:38) stated that its *"interest rate and credit policies remained of a typically conventional gold standard kind during this period. Priority tended to be given to considerations of exchange rate stability rather than to measures more expressly calculated to re-stimulate the economy"*.

The South African pound was allowed to depreciate by the SARB after the abandonment of the gold standard. From January 1933 the South African pound was linked at a fixed rate to the British pound, and South Africa became part of a group of counties that became known as the sterling area. It was anticipated that this link would lead to an accumulation of sterling balances at commercial banks and the Reserve Bank, and it was feared that this exchange risk would become unacceptable. According to Franzsen (1983), the Reserve Bank was willing to accept surplus British pounds as long as the government guaranteed that the risks of holding such balances would be taken care of. This guarantee by the government came to life in the Currency and Exchanges Act (Act No. 09 of 1933). This arrangement had a serious detrimental effect on the development of the foreign-exchange market.

Franzsen (1983:98-99) states that *"the notion that it was incumbent on the government to shoulder the risk involved in the holding of sterling balances has had an inhabiting effect on the development of the domestic financial system. It removed the incentive that would otherwise have existed for market operators to develop a viable exchange market based on the principle of supply and demand structured in such a manner as to spread exchange risks arising from the buying and selling of foreign exchange. What emerged was not a 'market', but an 'administrated price system'. It was not foreseen in the fullness of time* *that this kind of 'administrated exchange dealing', would give rise to recurring unbalanced forward exchange positions underwritten by government, and, therefore, the taxpayer, involving cumulative losses amounting to billions of rand"*.

As a result of these international development and domestic response, the main objective of the monetary policy over the subsequent period was to peg the South African currency to the British Pound in order to stimulate an economy affected by the great depression, and to finance the war in a non-inflationary manner as possible. Interest rates were accordingly reduced considerably from the beginning of 1933 and averaged to 3.5% per year from 1933 to 1940. From 1932 to 1945, the narrowly defined money supply increased from R73 000 000 to R628 000 000 or 14.5% to 38.8% of gross domestic product respectively. The considerable increase in domestic liquidity was mainly brought about by the development in the BOP of the country. Despite a substantial rise in merchandise imports over this period, a rise in merchandise and gold exports was sufficient to ensure surpluses in the current account, while maintaining inflows of capital for development purposes (Van Der Merwe and Mollentze, 2010).

South Africa's entry into World War II (WWII) also led to the introduction of exchange control. At that time, free international payments were only allowed between South Africa and other members of the sterling area. These measures empowered the Reserve bank as an agent of the national treasury *"to control all dealings in gold and foreign currency, to acquire foreign currencies and certain securities in the possession of South African residents, and to control the export of gold, securities and currency"* (SARB, 1971:41). These measures were mainly intended to prevent transactions with enemy countries and capital transfers to outside the sterling area; they were though not particularly severe.

2.5.3. 1946 to 1960: The period of the revival of monetary policy

Right after World War II, South Africa was confronted with a situation of very high inflation, a substantial growth in the supply of money, bank credit extensions as well as large budget and current account deficits. This led to what the then RSA Central Bank chief, DR M.H. de Kock termed, the 'revival' of monetary policy, stating that, *"after having been relegated to the background for many years following upon the world-wide abandonment of the gold standard, monetary policy has staged a vigorous revival over a large part of the world and again accepted as having an important and essential role to play in any* *programme of economic policy, despite its existing limitations of technique and management"* (De Kock, 1954:169).

De Kock (1981) has later referred to this period as a time in which the conventional approach to monetary policy was again adopted. The authorities could not apply independent monetary-policy measures completely, but still had to take exchange-rate arrangements into consideration. The use of the interest rate as a policy instrument was improved somewhat by steps to develop the money market. For this purpose, the South African government established an institution called the National Finance Corporation to encourage the shift of call money deposits of large domestic companies from London to South Africa. Upward pressure was placed on interest rates. Thus, the Reserve Bank rate was changed for the first time in eight years, going from 3 per cent to 3.5% in October 1949, and further in two steps to 4,5 per cent in 1955.

Credit control was exercised mainly through moral suasion and rediscount policy during the years 1946 to 1960, but the Reserve Bank also attempted to affect the cash reserves and liquid-asset requirements of commercial banks. These latter measures were, however, hampered by the lack of a well-developed money market. Moral persuasion was applied with some success because there were only two large commercial banks with a nation-wide branch network, but there were times in which it proved to be ineffective. This called for the amendment of the Reserve Bank Act in 1956 so that the Central Bank could additional instruments for credit control. However De Kock (1981:4) observed that this amendment:

"Provided that a commercial bank could deduct from any supplementary reserve balance it was required to hold, any net increase after a specified date in the aggregate amount of its holdings of Treasury bills, government stock with maturity not exceeding three years, bills of or advances to the Land Bank, and other approved assets. This meant that the new instrument was in reality more of a variable liquid asset than a variable cash reserve requirement"

Monetary policy was directed mainly at commercial banks. This approach was based on the argument that commercial banks were the only private financial institution that could create money on a multiple basis. This interest in money stood in sharp contrast to views in most parts of the world, which saw fiscal policy as the preferable instrument for stability purposes. According to De Kock (1981:4), the South African monetary authorities assigned a key role to money because it was regarded to be:

"*Firstly ... an essential condition for an increase in expenditure, income and prices. Secondly, it was held that changes in money supply could exert a significant influence on interest rates and that this, in turn, could affect investment and consumption. Thirdly, the authorities explicitly recognised the link between an increase in money supply and the 'general availability of credit: And, fourthly, it was even accepted that changes in money supply could at times directly influence spending*"

These policies achieved considerable success with bringing the inflation rate down from about 8 per cent at the beginning of the 1950s to 1,5 per cent in 1960. Real gross domestic product (GDP) increased at high rates during this period, the growth in bank credit extension subsided, and the deficits on the current account were reduced to low levels. Unfortunately, these good economic results were marred at the end of the period by the Sharpeville Massacre of 21 March 1960, and other subsequent upheavals and riots.

2.5.4. 1961 to 1979: The period of direct monetary controls.

The political events of March 1960 resulted in a large net outflow of funds, the depletion of foreign reserves, a decline in liquidity, damaged business confidence and recessionary economic conditions. Action was therefore required to protect the currency. The authorities reacted by raising the Bank rate, increasing the commercial banks' minimum cash-reserve ratio, tightening import control and applying higher customs and excise duties on certain luxury and semi-luxury goods. In addition, exchange controls were tightened on residents and the proceeds of non-residents' sales of securities were 'blocked' from leaving the country from June 1961 (Franzsen, 1983). In accordance with this restriction the proceeds of sales of securities on the domestic stock exchange had to be deposited in an account at a South African bank or reinvested in other securities. However, securities could still be sold abroad to other non-residents and blocked funds could be used to purchase certain securities which mature in five years and longer (Van Der Merwe, 1996).

When the Bretton Woods exchange rate system collapsed in the early 1970s, the stability of the rand was seriously disturbed. As part of the adjustments to the post Bretton Woods era, the rand was devalued by 12.3% in December 1971. The new system of floating exchange rates in the world presented serious problems for South Africa because the underdeveloped FOREX market of the rand made it impossible for an independently floating exchange rate system to be adopted. Various methods of quoting the rand exchange rate were adopted, while the authorities took steps to develop a sophisticated domestic foreign-exchange market. At first the rand was linked to the US dollar in August 1971, then to sterling from June 1972, and again to the US dollar from October 1972. This was followed by a policy of independently managed floating exchange rates from March 1975 (Van Der Merwe, 2003).

In accordance with the new policy, the rand was fixed for a long time and only adjusted based on both international and domestic situations. According to Correia, Flynn, Uliana and Wormald (2011), there was a fall in the gold price in world markets and with the RSA's BOP position weakened, this necessitated the devaluation of the Rand by 17.9% in September 1975. From there, the Rand's link with the US$ was kept in place until the exchange-rate system was completely revamped from the beginning of 1979. All these exchange-rate regimes were applied under numerous restrictive exchange control measures.

In contrast to these restrictive exchange control measures, import control applied for BOP purposes were terminated in December 1969. According to Franzsen (1983) these controls were tightened and relaxed depending on the cyclical policy stance and developments in the BOP of the country. A substantial improvement in the overall BOP position in the second half of the 1960s made this form of control redundant.

However, other direct and semi-market oriented monetary-policy instruments were applied extensively over this period, and were aimed at controlling the quantity rather than the cost of money. The authorities attempted to control both the credit-creating ability of banks and the money supply by means of liquidity-base management. This was achieved by changing the banks' total holdings of liquid assets and by varying the ratio of required liquid assets that they had to hold. Changes were occasionally made to the cash-reserve requirements, but these usually presented adjustments of required liquid-asset holdings, and therefore still constituted a form of liquid-asset control (Van Der Merwe and Mollentze, 2010).

In January 1965, Act No. 23 of 1965, which is the new Banks Act, was signed into law and it allowed the Reserve Bank working in consultation with the National Treasury, to raise or lower the liquid-asset requirement of banking institutions, except on discount houses which still existed at that stage. Pre the new Banks Act, only commercial banks were bound by these liquid-asset requirements. The Act made these requirements also applicable to other significant banking institutions because of their money creation abilities.

Van Der Merwe and Mollentze (2010) state that these requirements were unable to restrain large increases in credit extension during the mid- 1960s owing to a number of reasons. Firstly, they were not applied in an effective manner as the banks still had surplus liquid assets at all times. Secondly, commercial banks could create additional liquid assets such as trade bills and bankers' acceptances by just extending credit as a way to be in compliance with the Central Bank on the issue of higher liquid-asset requirements. Finally, the banks’ liquid assets were affected by the financing operations of government as an increase in their short-term government securities raised their liquid assets.

In view of these problems credit ceilings were introduced in November 1965 as a temporary measure to restrict the total amount of banks' discounts and advances to the private sector, excluding those to the Land Bank. Although theses ceilings were abolished in 1972, they were re-imposed in February 1976 because bank credit extension continued to rise excessively. In the period in which they were in force, the coverage of the credit ceilings was amended several times, exemptions were granted, and the administration of the system became complex. In the end it was generally concluded that these ceilings were on the whole not as effective as was originally envisaged by the authorities.

Other direct measures applied by the authorities in the period 1961 to 1979 included deposit-rate control, import deposit schemes, hire-purchase conditions, and requests made to banks to apply selective extension of credit (Van Der Merwe and Mollentze, 2010). The emphasis on these direct measures of control could largely be attributed to the relative underdevelopment of the South African markets at that stage, which made it difficult to employ Open-Market Operations (OMO) and public-debt management. Various attempts were made however to develop conditions conducive to the application of these measures, including the broadening of the gilts market, the placing at the disposal of the

Reserve Bank tap securities, as well as putting the marketing of government stock out to tender processes. The bank rate was changed only infrequently to avoid pressures on mortgage rates, and so as not to disrupt the rigid interest-rate pattern maintained on government debt instruments (Van Der Merwe and Mollentze, 2010).

Despite various attempts by the authorities to improve the monetary control system, the system devised in the period 1961 to 1979 was unable to achieve the macroeconomic objectives of the government.

2.5.5. 1980 to 1989 - The period of market oriented monetary policy and monetary targeting.

In view of the deficiencies of direct monetary controls, the government, based on the De Kock Commission's recommendations, decided to conduct monetary policy in a different way. The intention was to replace the quantitative controls applied in the previous period of nearly twenty years with instruments such as OMO, management of public debt, FOREX market intervention and rediscount policy. Meijer (1992) states that with these market-oriented measures, the authorities set themselves an objective to encourage commercial banks to engage in appropriate lending and borrowing practices. The authorities set the prices and interest rate incentives in the financial markets so that the private decision makers would respond 'voluntarily and spontaneously' (Meijer, 1992:293) in the ways that seemed to them to be in their own best interests.

It was thus decided to avoid as far as possible quantitative or direct measures of monetary policy that attempted to bypass the operations of the financial markets.

It was further stated that this approach would be applied to reach the ultimate policy objectives of (De Kock, 1983):

- a relatively stable price level
- an optimal and relatively stable level of economic growth
- a high and relatively stable level of employment
- Balance-of-payments equilibrium, coupled with the maintenance of the external value of the currency and a satisfactory level of gold and other foreign reserves (both gross and net).

In formulating these ultimate objectives, RSA authorities realised that conflicts could occur between them over the short term, but stated that they should be in harmony over the long term. Where conflicts did occur over the short term, the intention was to prioritise the objectives in order of importance at that specific stage.

By stating this view of the ultimate objectives of monetary policy, the authorities clearly indicated that they were following a combination of Keynesian demand management and monetarism in applying monetary policy in the country (De Kock, 1983). The notion of switching priorities over the short term and using monetary policy in certain circumstances to promote rapid economic growth is basically Keynesian. The market oriented approach that was decided on, and the expected harmony in the policy objectives over the long term, were partly in line with monetarism. Pure monetarists would of course have preferred to describe the objective of monetary policy as the achievement of a relatively stable rate of growth of the money supply so that reasonable price stability is attained over the long term.

The transition to OMO, management of public debt, FOREX market intervention and rediscount policy started in 1980 when bank credit ceilings, the import deposit scheme and deposit-rate controls were eradicated. After the eradication of the aforementioned interventions, the Reserve Bank allowed for a more flexible interest rates regime. Later when the interest rate became the operational variable of the new system, changes in interest rates were applied much more aggressively. For instance, the official Bank rate was increased from 10% in December 1983 up to 22% in December 1984 to adjust domestic expenditure to a more sustainable level, to strengthen the BOP and the exchange rate, to repay loans that were withdrawn from the country as a result of financial sanctions, and to ultimately lower the inflation rate.

From September 1982 the statutory liquid-asset requirements were gradually lowered in a number of steps. On occasions the progressive reductions in liquid-asset requirements were influenced partly by a tightening of domestic liquidity, but these cuts were actually aimed at substituting the liquid assets system of monetary control with a cash reserve system. This was finally achieved in September 1985, from which date, these requirements were used purely for prudential purposes.

The financial institutions act of 1984 (Act no 39 of 1984), which provided for this change, also revoked the Reserve Bank's power to impose supplementary liquid-asset requirements and improved on the definition of liquid assets to include only assets that are highly liquid. The cash-reserve system that was introduced in South Africa was the 'classical cash-reserve system'. In this system the authorities seek to regulate the public's demand for money and credit rather than the banks' ability to supply money and credit. The Reserve Bank therefore influences the cash reserves of the banks by operating on the costs of these reserves, rather than operating directly on the amount of these reserves. It was regarded as essential to use the interest rate as the operational variable because of the role that the discount houses at that stage still performed in the money market.

Surplus cash balances of banks were placed on call at discount houses, while any shortfalls were financed by withdrawing the call money again from the discount houses. Any shortfall that the discount houses experienced had to be financed automatically by the Reserve Bank for the system to work effectively. This made it impossible to control the quantity of cash reserves. Interest-rate flexibility in this system is of the utmost importance. The system cannot function effectively if interest rates are not free to reflect accurately the varying degrees of tightness in the financial markets. In the middle of 1979, the securities rand was replaced with the financial rand. After the adoption of the financial Rand, non-residents were allowed to utilise the new currency to purchase equities in RSA companies. The financial-rand system was terminated in February 1983 when exchange controls over non-residents were abolished. Important changes were also made to improve the functioning of not only the spot FOREX market, but the forward foreign-exchange market as well. However, heightened economic sanctions forced the Reserve Bank to reintroduce the financial-rand system, to reinstate strict exchange-control measures, and to halt the repayment of certain foreign debts from September 1985. In accordance with the recommendations of the De Kock Commission a major objective of the new monetary system was to establish a single currency over time: "*…… under which an independent and flexible rand finds its own level in well-developed and competitive spot and forward FOREX markets in South Africa, subject to Reserve Bank 'intervention' or 'management' by means of purchases and sales of foreign exchange (mainly US dollars), but with no exchange control over non-residents and only limited control over residents" (1984:A51).*

At the beginning of 1983 dual exchange rates characterised the RSA financial system, with the 'commercial rand' having a market-determined exchange rate (all transactions other than those that were controlled by the financial-rand requirements), and the ‘financial-rand’ being a more freely floating rate of the two. In 1983 exchange controls were scrapped and the financial rand disappeared only to re-emerge in September 1985, meaning that the country was back to a dual exchange rate system which remained in place throughout the rest of the 1980s.

In this dual exchange rate system, the spot-exchange rate for the commercial rand was determined by demand and supply in the FOREX market, even though the Reserve Bank had a penchant for intervening in the market by buying or selling spot or forward dollars to smooth out undue fluctuations in the exchange rate. At times, the SARB intervened directly in the financial rand market by trading the financial rand. However, by far the largest part of the transactions in the financial-rand market took place without Reserve Bank interference (Van Der Merwe and Mollentze, 2010). This flexibility by the SARB allowed the authorities to introduce formal monetary assets in South Africa as an intermediate objective of monetary policy in 1985. This flexibility was regarded as necessary because interest rates could not be determined apart from the money supply and money supply couldn’t be determined independent of the interest rate.

This process of stating intermediate targets in South Africa was delayed because rapid financial innovations in the financial system. According to Van Der Merwe and Mollentze (2010), the Reserve Bank was of the opinion that these intermediate targets should form part of the monetary system despite the delay in implementation, because:

- They provided advance guidance to the business community and the public at large about the likely monetary-policy stance that would be pursued by the Reserve Bank. In this way the Reserve Bank could assist private enterprises in decision-making and could facilitate appropriate adjustments in wage and salary claims.
- They provided a yardstick against which the actual performances of monetary policy could be judged, and thus imposed more discipline on the reserve bank.

2.5.6. 1990 to 2000: The period of informal inflation targeting

An informal inflation targeting framework was adopted during the period 1990 – 2000, with the primary objective being to protect the internal and external value of the ZAR. During this period, the SARB was able to complete the liberalisation of financial markets due to the normalisation of international relations after years in isolation because of apartheid

In the mid 1990's, a system of unilateral exchange rates was put in place in South Africa just after exchange controls were abolished on non-residents. From that moment, the exchange rate of the ZAR was determined by forces of demand and supply in the FOREX market. Under a system of informal inflation targeting the SARB leaves the exchange rate to the market to determine its correct level.

2.5.7. 2000 till present - The period of inflation targeting

In February 2000, the then Minister of Finance, Mr Trevor Manuel announced that South Africa was to become the 15th country to adopt formal inflation targeting as its monetary policy framework to replace the existing monetary policy framework of informal inflation targeting (Mohr and Associates, 2015). Thus, the primary aim of monetary policy would be to protect the value of the ZAR in the interest of balanced and sustainable economic growth. This was interpreted by the SARB in its mission, as the achievement and maintenance of price stability in South Africa. The operational variable under inflation targeting is the repurchase rate (REPO). By setting this rate, the SARB directly affects the market's short-term interest rates. The inflation target, after 2009 is specified in terms of Consumer Price Index and it is a continuous target of 3 -6 percent (Mohr and Associates, 2015). Exchange rates and asset price changes are also monitored carefully under the inflation targeting framework, but the SARB does not attempt to stabilise them (Van Der Merwe and Mollentze, 2010).

2.6. Conclusion

This chapter discussed South Africa's trends of the real effective exchange rate, merchandise exports and merchandise imports, patterns of trade in aggregate terms as well as on a regional basis. Trade with countries on the African continent, Asia, Europe, the Americas and Oceania was analysed. The chapter concluded with the analysis of the evolution of South Africa's Monetary and Exchange rate policy from 1920 - present.

With the trends, the South African Rand was found to have depreciated rather sharply in 1985, 2002, 2008 and again in 2014. It was found that exports have steadily been increasing from 1980, with the greatest increase experienced between 2004 and 2008 till declining sharply during 2009 as South Africa felt the effects of the world financial crisis which had gripped most economies for two consecutive years preceding 2009. It is also worth noting that South African exports topped R2.54 trillion in 2014 for the first time in history buoyed by RSA's increasing trade with China. Imports were found to have also increased from around 1992 till the world financial crisis of 2008, and breaking R2.89 trillion in 2014.

Of particular importance on the trade side, South Africa was found to have very strong trade ties with China, which has replaced the United States as RSA's single largest trading partner since the world financial crisis. Trade patterns also show that countries in the SADC region of Africa account for about 80.4% of all South Africa's exports to the continent and 54.6% of South Africa's imports from the continent. Botswana (Africa), China (Asia), Germany (Europe), United States of America (Americas) and Australia (Oceania) emerged as South Africa's largest export destinations for their regions. Import patterns reveal that Nigeria (Africa), China (Asia), Germany (Europe), United States of America (Americas) and Australia (Oceania) are the largest sources of South Africa's imports in their regions. From the growth analysis in this chapter, it was found that inflation can seriously distort growth values if not properly accounted, thus real values ought to be used whenever possible.

The analysis of both exchange rate and monetary policies has shown that both policies have evolved rather drastically over time. South Africa was, for a long time, under a system of fixed exchange rates which was later replaced by the Bretton Woods monetary Agreement. When the Bretton Woods system collapsed in the early 1970's, South Africa adopted a system of managed floating exchange rates. This was characterised by the dual nature of the system as it consisted of the commercial rand and the financial rand, with the commercial rand used for international trade purposes and the financial rand used for investment purposes. This system remained till the abolishment of the financial rand in 1995, when the country started using a single commercial rand exchange rate. Since the year 2000, South Africa has been using the inflation targeting framework to keep inflation in check with the aim of protecting the ZAR under a system of managed floating exchange rates.

CHAPTER 3: THEORETICAL DISCUSSIONS

3. INTRODUCTION

This chapter details both the theoretical literature as well as the empirical evidence. It starts with an exposition of exchange rate theories, namely, the nominal bilateral exchange rate, the real bilateral exchange rate, the nominal effective exchange rate and the real effective exchange rate (with special emphasis on how South Africa calculates these effective rates). The theoretical framework outlining the theories underpinning the relationship between the exchange rate and the balance of payments (trade balance) follows, discussing the elasticities approach, the absorption approach and the monetary approach. The chapter then proceeds to discuss the determinants of the trade balance in a small open economy, how fiscal policies influence the trade balance, the relationship between the real exchange rate and net exports (trade balance), the determinants of the real exchange rate in a small open economy, how fiscal policies influence the real exchange rate and finally a discussion of how trade policies influence the trade balance (net exports). The chapter then concludes with the empirical literature which outlines the findings of previously conducted studies focusing on the impact of the exchange rate on the trade balance.

3.1. EXCHANGE RATE THEORIES

3.1.1. Nominal Exchange Rate

A nominal exchange rate can be defined as "*the relative price of one currency in terms of another currency*" (Burda and Wyplosc, 2009; Abel, Bernanke and Croushore, 2011). When one currency is quoted or given in the other currency, this is referred to as a nominal 'bilateral' exchange rate. The bilateral exchange rate of the South African Rand (ZAR) against the British Pound Sterling shows the value of the ZAR in terms of the Pound and vice versa.

This bilateral nature of the exchange rate denotes that the exchange rate can be quoted in one of two ways, namely, the direct quotation and indirect quotation. Most countries are using the direct quotation method, and under this method, the value of the foreign currency is expressed in terms of the domestic currency. For example, £1 = R20.45 or one British Pound can be exchanged for R20.45 South African Rands. In an indirect quotation method, which is also a reciprocal of the direct quotation method, the domestic currency is defined in terms of the foreign currency. For example, R1 = £0.04889, or one South African Rand can be exchanged for £0.04889 British Pounds.

3.1.2. Real Exchange Rate

Ito (1996), states that "*the real exchange rate is one of the key relative prices in an economy, defining the rate of exchange between domestic goods and their foreign counterparts"*. When prices are not constant, problems may arise when trying to explain changes between two currencies. When goods' prices change either domestically or in the trading partner country (or in both countries simultaneously), it would be impossible to know the changes in the relative prices of foreign goods and services just by observing the changes in the nominal bilateral exchange rate except if one takes into account, the new price levels domestically and in the trade partner country. To further explain this, if the ZAR appreciates by 10% against the Pound, we would expect that *ceteris paribus*, British goods would be more or less, 10% more competitive against South African goods in world markets than was the case before the appreciation. However if we allow South African prices to rise more swiftly than British prices, then the decline in the competitiveness of South African goods would be more than the stated 10% and the nominal 10% appreciation of the ZAR would be misleading. Thus, it is because of these inflation differentials in both countries that the real bilateral exchange Rate (RER) is calculated.

Appleyard and Field (2014) provide this example to illustrate:

YEAR	**YEN (¥)**	**DOLLAR ($)**	**CPI**$_{JAPAN}$	**CPI**$_{USA}$
1995	93.96	1	100	100
2011	79.70	1	117.50	224.90

Source: *Economic report of the president: February 2012, in Appleyard and Field (2014)*

The average ¥/$ exchange rate in 1995 was ¥93.96 for $1 and in 2011; the same bilateral exchange rate was ¥79.70 for $1. This meant that the USD depreciated by about 15.5% compared to the ¥ from 1995 to 2011, thus, leading one to expect greater competitiveness of USA goods against their Japanese counterparts. To calculate the RER, one must also take into account, the inflation differentials in the two countries during the period under consideration. With the consumer price index (CPI) in the year 1995 equalling 100 in both countries, U.S. CPI rose to 224.90 in the year 2011, whereas by 2011, the Japanese CPI rose to 117.50. Thus, the calculation of the RER between the Yen and Dollar is as follows:

$$RER_{2011} = e_{¥/\$,2011} \times \left(\frac{U.S.\ price\ index}{Japanese\ price\ index} \right) \quad (3.1)$$

$$RER_{2011} = 79.70 \times \left(\frac{224.90}{117.50} \right) = 152.50$$

The example provided and the RER calculated at 152.50 suggests that, compared to goods from Japan, USA goods are actually disadvantaged rather than at an advantage as suggested by the nominal bilateral exchange rate depreciation of 15.5% calculated earlier.

3.1.3. Nominal Effective Exchange Rate

The nominal effective or multilateral exchange rate is defined by Dornbusch and Fischer (2010) as "*the price of a representative basket of foreign currencies with each currency weighted by its importance to the country in terms of international trade*". For the purposes of this paper, the calculation of the Effective Exchange Rates will be from a South African perspective.

Table: 3-1: Trade weights for South Africa's 20 major trading partners:

COUNTRY	BILATERAL EXPORT WEIGHT	BILATERAL IMPORT WEIGHT	REVISED WEIGHTS 2010–2012 PER CENT
1. Euro area	30.83	26.87	29.26
2. China	24.82	2.85	20.54
3. United States	12.19	18.14	13.72
4. Japan	6.04	2.97	6.03
5. United Kingdom	5.12	5.94	5.82
6. India	4.39	2.29	3.98
7. Republic of Korea	3.57	0.74	3.10
8. Botswana	0.41	10.28	2.09
9. Thailand	2.14	0.81	1.86
10. Sweden	2.21	0.55	1.81
11. Switzerland	1.94	0.13	1.78
12. Zambia	0.13	7.66	1.42
13. Malaysia	1.48	0.28	1.27
14. Zimbabwe	0.15	6.36	1.25
15. Australia	0.86	3.04	1.19
16. Brazil	1.18	1.74	1.16
17. Canada	0.90	5.29	0.98
18. Mozambique	0.08	1.07	0.97
19. Poland	0.92	1.01	0.89
20. Israel	0.63	1.78	0.88
TOTAL			**100**

Source: SARB (2014)

Table 3–1 shows South Africa's 20 largest trade partners in terms of the flow and volume of trade as at May 2014. The countries are ranked from the Eurozone as South Africa's largest trading partner (even though China is RSA's single largest trading partner) to Israel as South Africa's smallest trading partner. As elaborated in the SARB Quarterly bulletin of (June 2014), the 20 countries in the table account for 86.9% of all manufactured imports and 81.7% of all manufactured exports.

Calculating appropriate exchange rate weights for South Africa:

$$S_J^K(M) = \frac{X_J^K(M)}{\sum_{1 \neq K} X_i^K(M)} \qquad (3.2)$$

$$W_i^K(M) = \frac{X_i^K(M)}{\sum_{n \neq i} X_i^n(M)} \qquad (3.3)$$

$X_i^K(M)$ in equation (3.2) represents country i's exports of manufactured goods to market k. $S_J^K(M)$, also in equation (3.2), represents country j's share of all manufactured exports to market k and $W_i^K(M)$ in equation (3.3) is the share of country i's exports of manufactured goods shipped to market k.

$$\beta_i^m(M) = \frac{\sum_{1 \neq i} X_1^i}{\sum_{1 \neq i} X_1^i + \sum_{n \neq i} X_i^n(M)} \qquad (3.4)$$

$$\beta_i^x(M) = \frac{\sum_{n \neq i} X_1^n(M)}{\sum_{1 \neq i} X_1^i(M) + \sum_{n \neq i} X_i^n(M)} \qquad (3.5)$$

$\beta_i^m(M)$ and $\beta_i^x(M)$ in equation (3.4) and (3.5) represent the share of imports and exports in country i's international trade in manufactured goods.

$W_{ij}(M) = \beta_i^m(M) \quad MW_{ij}(M) + \beta_i^x(M) \quad XW_{ij}(M)$, where: (3.6)

$MW_{ij}(M) = S_j^i(M)$, and: (3.7)

$$XW_{ij}(M) = \frac{1}{2} BXW_{ij}(M) + \frac{1}{2} TXW_{ij}(M) \qquad (3.8)$$

$$XW_{ij}(M) = \frac{1}{2}W_i^{\,j}(M) + \tfrac{1}{2}\frac{\Sigma_{k\neq ij}W_j^k(M) \quad S_j^k(M)}{\Sigma_{k\neq i}W_j^k(M) \quad (1-S_i^k(M))} \tag{3.9}$$

$W_{ij}(M)$ in equation (3.6) represents the sum of two components: the import component $\beta_i^m(M) \quad MW_{ij}(M)$ which denotes competition in the home market (country i), and the export component $\beta_i^x(M)$ and $XW_{ij}(M)$ which denotes competition in all foreign markets.

The import weight, $MW_{ij}(M)$ in equation (3.6) is denotes the share of country i's imports of manufactured goods coming from country j. The bilateral export weight $BXW_{ij}(M)$ in equation (3.8) denotes the share of country i's exports of manufactured goods going to country j. The third-market export weight $TXW_{ij}(M)$ also in equation (3.8) denotes the weighted average over all third-country markets of country j's import share divided by a weighted average of the combined import share of all country i's competitors, where the weights are the shares of country i's exports to the various markets. The bilateral and third-market export weights are subjectively given equal importance in the computation of the overall export weight $XW_{ij}(M)$

Thus, the NEER is calculated as follows, as shown in Chiloane (2012):

$$NEER_{jit} = \sum_{i-1}^{k} w_{it} \times e_{it} \tag{3.10}$$

From equation (3.10), *j, i, t* denote the home country, the trading partner and the trading period respectively. The (e_{it}) denotes the average nominal bilateral exchange rates between two trading nations in period (*t*). (w_{it}) denotes the trade weight of each selected trading partner, *i*, of which in South Africa, 20 countries would be used in the computation. i.e. *i*(*i=1, 2, 3, 4…..k*)

3.1.4. Real Effective Exchange Rate

In order to know whether South African goods are becoming more expensive or cheaper, we have to take into account what happened to prices both in South Africa and in 20 of South Africa's largest trading partners. To do so, we look at the real effective exchange rate (REER), which the World Bank (2005), defines as the nominal effective exchange rate

(NEER) divided by a price deflator or an index of costs. It measures the country's competitiveness in international trade.

According to Opoko – Afari (2004), the REER is calculated as follows:

$$REER_{jt} = \sum_{i-1}^{k} NEER \times \left(\frac{P^{*}_{it}}{P_{jt}} \right) \quad (3.11)$$

From equation (3.11), *j,* denotes the home country, *i* denotes the trading partner and *t,* denotes the period under consideration. (P^{*}_{it}) denotes the weighted price index of South Africa's 20 major trade partners. (P_{jt}) denotes the price deflator for the home country.

3.2. THEORIES OF BALANCE OF PAYMENTS ADJUSTMENT

Economic theories explaining the relationship between the exchange rate and the balance of payments (via the trade balance in the current account) have applied different approaches, including the elasticities approach, the absorption approach and the monetary approach. These approaches are discussed in this section.

3.2.1. The elasticities approach

The elasticities approach to the balance of payment features a Keynesian analysis. It puts emphasis on how changes in the exchange rate affect the price elasticity of demand for exports and imports. According to this approach, following currency depreciation, the demand for imports falls and so does the volume of imports, thus improving the trade balance on the import front in the process (import price effect). Imports denominated in domestic currency make the foreign exporting firm less profitable immediately following the currency depreciation; the supply and volume of imports fall, resulting in an improvement in the trade balance on the import front once again due to the value effect of imports (Wang, 2009).

Exports become cheaper from the foreign country's viewpoint of consumption, leading to a higher demand for exports. Consequently, the volume of exports increases, so does the value of exports in terms of the domestic currency, improving the trade balance on the export front due to the price effect of exports (Wang, 2009).

The timing and sequence of the effects discussed in section 3.2.1. produce the so called J-effect, reflecting the relative price effects of depreciation on the BOP, which it analyses in terms of export supply and import demand. Exports are assumed to account for the supply of foreign currency and imports for the total demand of foreign currency (Wang, 2009).

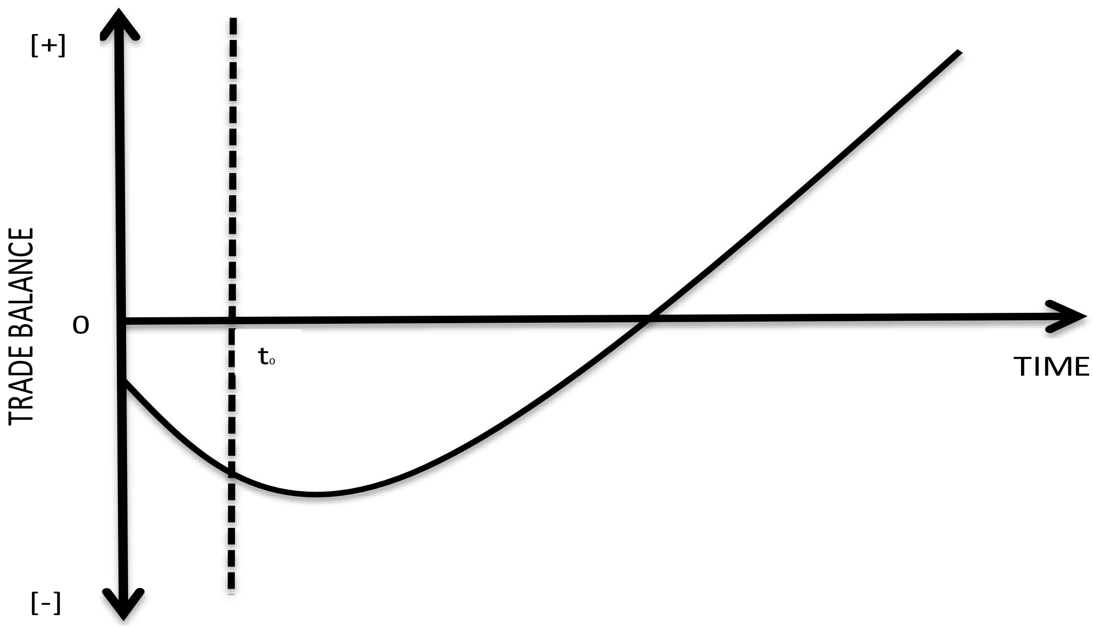
3.2.1(a). The J-Curve effect

The J-curve effect describes the time lag after which currency depreciation improves the trade balance. Although the trade balance may improve in the long run, it may worsen initially so that it follows the pattern of a tilted J-curve to the right (see figure 3-1). The origin of the J-curve is usually attributed to Magee's (1973) attempt to find an explanation for the short run behaviour of the USA trade balance in the early 1970's. In 1971, a balance of trade surplus turned into a deficit, and although the USA dollar was devalued, the trade balance continued to worsen, (Reinert and Rajan, 2009).

Salvatore (2007) argues that the deterioration in the trade balance is particularly due to the tendency of imports prices to increase faster than export prices soon after currency depreciation, while quantities change only by a small margin.

The theoretical basis of the J-curve is the elasticities approach to the BOP. Reinert and Rajan (2009) state that currency depreciation is expected to alter the balance of trade by changing the relative prices of both domestic goods and foreign goods.

Figure 3-1: The J-Curve



Source: Author, adapted from Lindert and Pugel (2000)

3.2.1(b). The Marshall-Lerner condition

Depending on the demand elasticities of the country's exports, the country's trade balance may improve, worsen or remain unchanged in response to the depreciation of the home country's currency. It [Marshall-Lerner condition] states that depreciation will improve the trade balance if the currency-depreciating nation's demand elasticities for imports plus the foreign demand elasticity for the nation's exports exceeds 1.0, (Carbaugh, 2013).

If the sum of the demand elasticities is less than 1.0, depreciation will worsen the trade balance. The trade balance will neither be improved nor worsened if the sum of the demand elasticities is equal to 1. The M-L condition may be stated in terms of the currency of either the nation undergoing depreciation or its trading partner.

Below is a thorough derivation and explanation of the Marshall-Lerner (M-L) condition as postulated by Appleyard and Field (2014).

The (M-L) condition starts with the definition of the home country trade balance which is given as:

$$TB = V_x - V_m = Q_x P_x - Q_m P_m \qquad (3.12)$$

Where TB is the trade balance, V_x is the value of exports, V_m the value of imports, Q_x the quantity of exports, P_x the domestic exports price, Q_m the quantity of imports and P_m the domestic imports price.

Any change in the balance of trade is denoted as:

$$\Delta TB = P_x \Delta Q_x + Q_x \Delta P_x - P_m \Delta Q_m - Q_m \Delta P_m \qquad (3.13)$$

Provided that there is no change in the supply prices of traded goods, then any change in the prices of traded goods will only be attributable to changes in the exchange rate. As the analysis focuses on the trade balance in terms of domestic currency, ΔP_x automatically equal to zero, whereas P_m changes by the percentage increase in the exchange rate, k. This means that the change in the price of imports, denoted by, ΔP_m, is equal to the exchange rate multiplied by the price of imports,, i.e. kP_m. This concludes that a domestic exchange rate depreciation of 10% will lead to a 10% increase in the price of imports.

Under the M-L condition, the following export and import demand elasticities are utilised:

$$\eta_x = \frac{\left(\Delta Q_x / Q_x\right)}{\left[\Delta\left(P_x / e\right) / \left(P_x / e\right)\right]} \tag{3.14}$$

$$\eta_m = \frac{\left(\Delta Q_m / Q_m\right)}{\left(\Delta P_m / P_m\right)} \tag{3.15}$$

Where, P_x / e is the domestic export price denominated in foreign currency. Going back to equation (3.14), we can alter how the elasticity is defined so as to obtain an expression for ΔQ_x in terms of η_x:

$$\eta_x = \frac{\left(\Delta Q_x / Q_x\right)}{\left\{\left[\left(e\Delta P_x - P_x \Delta e\right) / e^2\right] / \left(P_x / e\right)\right\}}$$

$$\eta_x = \frac{\left[\left(\Delta Q_x / Q_x\right)\left(P_x / e\right)\right]}{\left[\left(e\Delta P_x - P_x \Delta e\right) / e^2\right]}$$

$$\eta_x = \frac{\left(\Delta Q_x / Q_x\right)}{\left[\left(\Delta P_x / P_x\right) - \Delta e / e\right]}$$

Because $\Delta P_x / P_x$ is assumed to be zero, then:

$$\eta_x = \frac{\left(\Delta Q_x / Q_x\right)}{\left(-\Delta e / e\right)}$$

Thus:

$$\eta_x = \frac{\left(\Delta Q_x / Q_x\right)}{\left(-k\right)}$$

And:

$$\eta_x \left(-k\right) Q_x = \Delta Q_x \tag{3.16}$$

Using equation (3.15), ΔQ_m can thus be rewritten in terms of the import elasticity η_m, i.e.:

$$\frac{\left(\eta_m Q_m \Delta P_m\right)}{P_m} = \eta_m Q_m k = \Delta Q_m \qquad (3.17)$$

In order for the trade balance to improve after depreciation, the increase in the value of export should be greater than the increase in the value of imports. If the demand for imports is elastic, that is not defying expectations, and thus an improvement in the trade balance would be expected. However, if import demand is inelastic, then depreciation may or may not improve the trade balance.

Now going back to equation (3.13) and altering it in terms of the two demand elasticities using equation (3.16) and (3.17) and also taking note that if depreciation is to improve the trade balance, $\Delta TB > 0$, then:

$$\Delta TB = P_x \eta_x (-k) Q_x - P_m \eta_m k Q_m - Q_m k P_m > 0 \qquad (3.18)$$

Or:

$$P_x \eta_x k Q_x + P_m \eta_m k Q_m + Q_m k P_m < 0 \qquad (3.19)$$

Thus, dividing all terms by k, we get:

$$P_x \eta_x Q_x + P_m \eta_m Q_m < -Q_m P_m \qquad (3.20)$$

Dividing all terms by $P_m Q_m$, we get:

$$\eta_x \left(P_x Q_x / P_m Q_m\right) + \eta_m < -1 \qquad (3.21)$$

Stating the elasticities in absolute terms:

$$\left|\eta_x\right| \left(P_x Q_x / P_m Q_m\right) + \left|\eta_m\right| > 1 \qquad (3.22)$$

Equation (3.21) and (3.22) constitute the Marshal Learner condition. When exports equal imports, then, $\left(P_x Q_x / P_m Q_m\right) = 1$ and thus, for there to be an improvement in the trade balance after depreciation, then the sum of the demand elasticities must be greater than 1. When trade is not balanced, which is often the case for countries like South Africa, then the condition is modified as per equation (3.21) and (3.22).

3.2.2. The Absorption approach

The short-comings of the elasticities approach to a currency devaluation (depreciation) analysis led to the development of what is called the absorption approach, (Alexandra, 1952). It builds on the elasticities approach by pointing out that the elasticities in question are just partial elasticities .i.e. the effects of price variations on the quantities supplied and demanded when other relevant variables remain unchanged. It then completes the analysis based on what it calls the total elasticities, that is, the effects of price variations on the quantities supplied and demanded when other relevant variables have been allowed to change. In other words, the absorption approach takes into consideration the variations in income and consumption caused by the devaluation (Bouchet, Clark and Groslambert, 2003).

The absorption approach to the BOP is also associated with a major development in macroeconomic analysis-the "Keynesian revolution". In line with Keynes, the proponents of this approach assume that expenditure is determined by national income. Therefore their main concern is about the change in exports and import expenditures, which may be caused by a change in relative prices as well as a change in income. In other words, they are interested in a general equilibrium analysis of the balance of payment adjustment (Ugur, 2002). In doing so, they implicitly accept the basic argument of elasticity approach which states that a change in relative price (devaluation) affects the demand for exports and imports and hence the balance of payments. It is on this basis that the absorption approach can proceed to elevate the effects of the devaluation on income, which are called the idle resources effect, the resources allocation effect and the terms of trade effect.

Alexandra (1952) has based the absorption approach on the well-known national accounts identity:

$$Y = C + G + I + X - M \tag{3.23}$$

Where, (Y) denotes Gross domestic Product, (C) total consumption spending, (I) total investment spending, (X) total exports and (M) total imports.

Total domestic expenditure is then grouped together by Alexander and termed 'absorption' (A) or that part of GDP that is absorbed by residents of the home country. This can be denoted by equation (3.24):

$$Y = C + G + I \qquad (3.24)$$

The current account balance (Ca) is formed from exports minus imports, which is the trade balance. Thus, equation (3.24) can be reduced to equation (3.25) below:

$$Y = A + Ca \qquad (3.25)$$

Therefore, the current account balance must be the difference between GDP and GDE as shown below in equation (3.26):

$$Ca = Y - A \qquad (3.26)$$

Thus, the change in the current account balance can therefore be represented by equation (3.27) below:

$$\Delta Ca = \Delta Y - \Delta A \qquad (3.27)$$

From this theory it follows then that where a country's aggregate income exceeds its absorption, then there will be a surplus in the current account of the BOP, which should increase the value of its currency if the surplus is not offset by a larger net financial outflow. On the other hand, where income falls short of absorption the country will record a deficit in the current account and its currency would be expected to depreciate if the country did not at least get a compensating net financial inflow.

According to this approach, the current account will only be in balance when income is equal to absorption. Further, it is interesting to note that according this equation (3.27), a country's current account, and hence its exchange rate can improve during periods of rapid economic growth provided that its aggregate production grows faster than its absorption, and that its current account can worsen during periods of contraction if absorption grows faster than production.

The impact of devaluation on the use of idle resources (if any exist) and on resource allocation between tradable and non-tradable goods will depend on elasticities. This impact will be positive if the M-L condition is confirmed and vice versa. In the case of the TOT effect, the role of elasticities and the M-L condition may be obvious, but still important. The impact of the devaluation on the terms of trade and (hence) on income, would depend on the supply and demand elasticities. If the product of the supply elasticities of exports and imports is larger than the product of demand elasticities for imports and exports, devaluation will lead to deterioration in income. On the other hand, if the product of the supply elasticities of exports and imports is smaller than the product of demand elasticities for imports and exports, devaluation will lead to an improvement in income (Ugur, 2002).

Despite similarities with the elasticities approach, the absorption approach separates itself for the following reason: it argues that the net effect depreciation on the BOP would not only depend on elasticities but also on the change in income and absorption which will have repercussions on the balance of payments. Any increase in income due to an improvement in the BOP is bound to lead to a surge in imports and hence a deterioration in the current account.

3.2.3. The Monetary Approach

At the end of the 1950's, the monetarist view of the balance of payments emerged. Fundamentally, this approach postulates that the balance of payments is nothing but a monetary phenomenon as advanced by (Polak, 1957; Hahn, 1959; Mundell, 1968). This means that greater emphasis is placed on the demand for money as well as the supply of money when analysing the BOP of the country. In the framework of international payments, according to Appleyard and Field (2014), attention is placed on category III in the BOP in the so called "official short term capital account". This account is organised as the "portfolio investment" section in the South African balance of payments (Mohr and Associates, 2015). If the country has a BOP deficit, then there is an outflow of international reserve assets. An outflow of international reserves shows that money supply exceeds money in the economy. Correspondingly, when there is a surplus, then that money demand is greater than money supply. Thus, to analyse the forces causing a BOP deficit or surplus, focus should be given to the supply and demand for money in the economy.

Money Supply in the economy:

According to Appleyard and Field (2014), the country's money supply can be expressed as:

$$M_s = a\left(BR + C\right)$$
$$M_s = a\left(DR + IR\right) \quad (3.28)$$

Where:

$M_s =$ *money supply*

$$\left.\begin{array}{l} BR = \text{reserves of commercial banks (depository institutions)} \\ C = \text{currency held by the non-bank public} \end{array}\right] \text{Central Bank liabilities}$$

$a = \text{money multiplier}$

$$\left.\begin{array}{l} DR = \text{domestic reserves} \\ IR = \text{international reserves} \end{array}\right] \text{Central Bank Assets}$$

The monetary approach utilises either M1 or M2 definitions of money supply. According to M1 is regarded as a conventional measure of money and includes *"coins and notes (in circulation outside the monetary sector) as well as all demand deposits (including cheque and transmission deposits) of the domestic private sector with monetary institutions"* (Mohr and Associates, 2015). M2 on the other hand is regarded as a broader definition of money and "*is equal to M1 plus all other short-term and medium-term deposits of the domestic private sector with monetary institutions"* (Mohr and Associates, 2015). Mishkin (2010) further states that M2 "includes the components of M1 but includes other assets that are not quite as liquid as those included in M1, that is, assets that have check-writing features (money market deposit accounts and money market mutual fund shares) and other assets (savings deposits and small-denomination time deposits) that can be turned into cash quickly at very little cost".

The money multiplier reflects the process of multiple expansion of bank deposits. The reserves held by banks plus the currency outside the banks $(BR + C)$, is termed the monetary base and is from the liabilities side of the reserve bank balance sheet. Currency itself is issued by the country's reserve bank, and part of the reserves of commercial banks is held by the central bank. Looking at the reserve bank's balance sheet's asset side, the most important assets in the analysis of the monetary approach are (i) domestic reserves and (ii) international reserves held by the central bank.

It is important to understand the relationship between the reserve bank's assets and money supply. If for example, the reserve bank engages in open market operations and purchases government bonds or securities, this will increase the reserves of domestic commercial banks and expand the country's money supply. Furthermore, if the reserve bank acquires foreign exchange from an exporter, this acquisition will also increase money supply. Thus, increases in central bank reserves permit a multiple expansion of money supply and correspondingly, decreases in these reserves will lead to a multiple decrease in the money supply.

The demand for money in the economy:

This section deals with money demand. This has nothing to do with the demand for wealth or the demand for income, but rather the desire to hold wealth in the form of money balances.

The demand for money can be specified as follows:

$$L = f\left[Y, P, i, W, E(p), O\right] \quad (3.29)$$

Where:

$Y = \text{Level of real income in the economy}$

$P = \text{Price level in the economy}$

$i = \text{Interest rate in the economy}$

$W = \text{Level of real wealth in the economy}$

$E(p) = \text{Expected percentage change in the price level in the economy}$

$O = \text{All other variables that can influence the amount of money balances a country's citizens wish to hold}$

The following are the predicted relationships between the aforementioned variables:

Real income (Y): The relationship between real income and money demand is expected to be positive. As income levels rise, consumption spending will rise. Thus, requiring more money balances to fund these increase in consumption.

Price level (P): The relationship with money demand is expected to be positive because a higher price level, the higher the amount to of cash balances is required to buy goods and services.

Interest rate (i): The relationship is expected to be negative between the variables. The higher the level of interest rates on other assets, the smaller the quantity of money demanded. Similarly, a fall in the interest rate will force people to hold more of their wealth in the form of money because there isn't enough incentive to buy bonds or securities when the interest rate on those assets has fallen. This relationship between the interest rate and money demand is often called the asset demand for money (Makinen, 1981).

Real wealth (W): The relationship is expected to be positive between the variables. The higher the level of real wealth, the higher the quantity of money demanded as the person wants to hold more of all assets including in money balances.

Expected inflation rate ($E(p)$) is hypothesised to have a negative relationship with money demand. If one expects prices to rise, the person would lean towards holding non money assets whose prices may rise with inflation.

(O) term is included to account for other variables which influence the demand for money. The (O) term reflects institutional features of the economy such as the frequency with which people receive paycheques. If one is paid weekly, then the person's average money balances will be smaller than if the person was paid monthly.

The general functional in (3.29) can be rewritten using a more simple formulation of the demand for money as stated in (3:30):

$$L = kPY \tag{3.30}$$

Where, (P) and (Y) are as stated as explained above and k is a constant that represents other determinants of money demand.

Money market equilibrium

When money supply and money demand are equal, the money market is said to be in equilibrium. Generally, this entails using equation (3.28) which defines money supply and equation (3.29) which defines money demand, to obtain:

$$M_s = L \tag{3.31}$$

And thus:

$$M_s = kPY \tag{3.32}$$

More often than not, equation (3.32) specifies that money demand primarily depends on two things, that is, the price level and real income (Appleyard and Field, 2014).

With all the background provided, we can discuss how money supply and money demand are used to explain BOP surpluses and deficits under the monetary approach. Making simplified assumptions that there is a fixed exchange rate and money market equilibrium. The central bank may increase money supply by engaging in open market operations. This means that domestic reserves (DR) will increase. Because one of the simplified assumptions was that there was equilibrium in the money market, this expansionary monetary policy will lead to an excess supply of money, through the subsequent increase in the reserves of commercial bank (BR) and/or (C).

When $M_s > L$, the money which people have on hand and in bank accounts exceeds their actual desired cash balances. When this happens, people attempt to reduce their cash balances. Reducing their cash balances will have important effects on the BOP. Of particular importance, we look at the current account of the BOP (as that is where international trade transactions are recorded).

Firstly, excess cash balances will lead to a rise in price levels of goods and services as people increase their spending on goods and services. i.e. (P) rises. Additionally, if part of any new real income Y is saved, then the level of real wealth (W**)** in the economy increases. A rise in the price level (P) will lead to increased imports as home goods become relatively more expensive compared to foreign goods. The rise in (P) will also make it more difficult to export to other countries. Additionally, the increase in real income, (Y) induces more spending, and some of that spending will be on imports. Finally, increased wealth enables individuals to purchase more of all goods, some of which are imports and some of which are goods that might otherwise have been exported. Thus the excess supply of money generates pressures leading to a current account deficit (Appleyard and Field, 2014).

3.3. DETERMINANTS OF THE TRADE BALANCE

3.3.1. Building a model for a small open economy

In order to understand what exactly determines the trade balance, there is a need to build a model for a small open economy, using the production function and the Keynesian framework (Mankiw, 2012).

The economy's output Y is fixed by the factors of production and the production function. Thus, this can be written as:

$$Y = \overline{Y} = F(\overline{K}, \overline{L}) \qquad (3.33)$$

Where *K* and *L* represent fixed amounts of both Capital and Labour, whereas $Y = F(\overline{K}, \overline{L})$ represents the production function, determining the quantity of output supplied to the economy.

The consumption function *C* is positively related to the level of disposable income $Y - T$. We can then write the consumption function as:

$$C = c(Y - T), \qquad (3.34)$$

Where (*c)* is the marginal propensity to consume and ($Y - T$) is the disposable income

Investment is negatively related to the real interest rate *(r)*. The investment function can be written as:

$$I = I(r) \qquad (3.35)$$

The demand for output in the economy comes from consumption, investment, government purchases and net exports, thus, we can write this identity in symbols as follows:

$$Y = C + I + G + NX \qquad (3.36)$$

Therefore, making Net Exports the subject of the formula, we obtain:

$$NX = (Y - C - G) - I \qquad (3.37)$$

The term (*Y – C – G)*, represents the output that remains after demands by consumers and the government have been met, and is called national saving or simply saving, hence:

$$Y - C - G = S \qquad (3.38)$$

Thus, substituting (*Y – C – G)* in equation (3.37), the NX equation can be rewritten as:

$$NX = S - I \qquad (3.39)$$

Substituting equations (3.33), (3.34) and (3.35) in (3.37), and the assumption that the interest rate in the domestic economy is equal to the world interest rate, we get:

$$NX = [\overline{Y} - c(\overline{Y} - T) - G] - I(r^*) \quad (3.40)$$

Meaning that:

$$NX = \overline{S} - I(r^*) \quad (3.41)$$

Equation (3.41) shows that the trade balance depends on those variables which determine savings and investment. Because savings depend on fiscal policy (lower government spending or higher taxes raise national saving) and investment depends on the world interest rate r* (a higher interest rate makes some investment projects unprofitable), the trade balance depends on these variables as well.

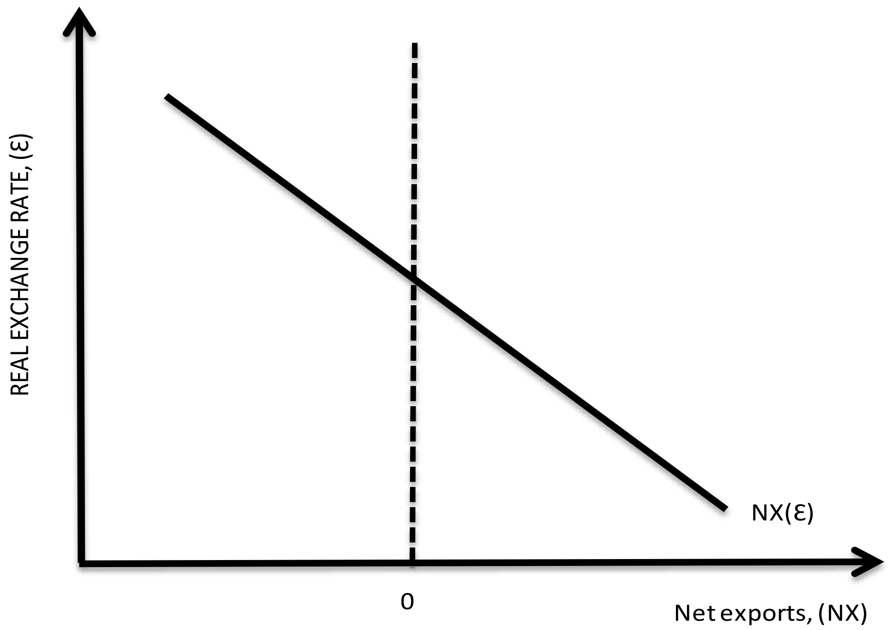
3.4. THE RELATIONSHIP BETWEEN REAL EXCHANGE RATE AND NET EXPORTS

The relationship between the RER and net exports can be written as:

$$NX = NX(\varepsilon) \quad (3.42)$$

Equation (3.42) models net exports as a function of the RER and illustrate the negative relationship between the trade balance and the RER, which can also be depicted in figure 3-2.

Figure 3-2: Net exports and the real exchange rate

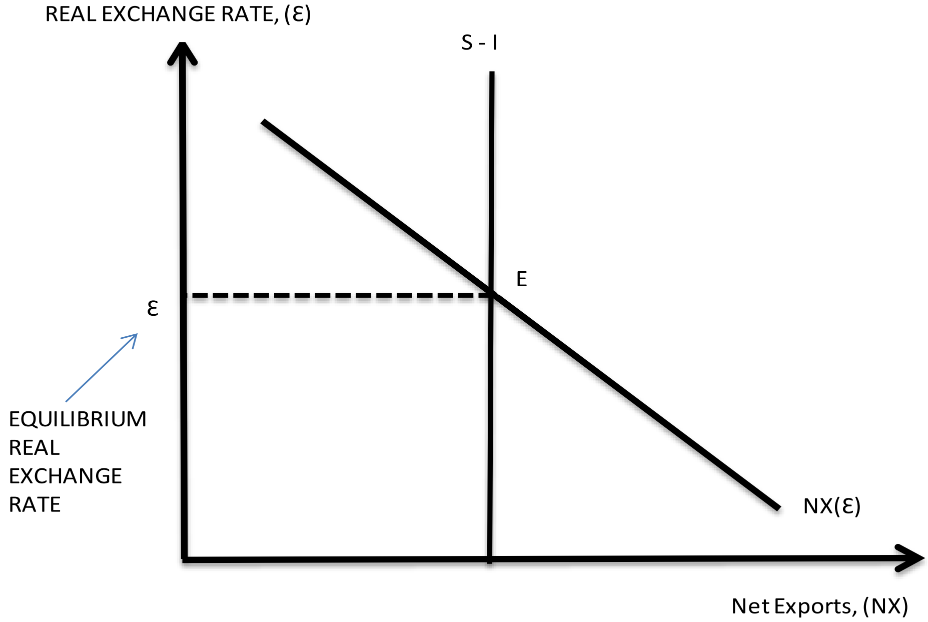


Source: Author, adapted from Mankiw (2012)

3.5. THE DETERMINANTS OF THE REAL EXCHANGE RATE

We now have all the pieces needed to construct a model that explains what factors determine the RER. In particular, we combine the trade balance and exchange rate relationship already discussed with the trade balance model earlier developed in equation (3.41). We can now conclude that the RER is related to net exports. When the domestic currency appreciates, domestic goods become cheaper compared to foreign goods and the trade balance improves. Net exports equal capital inflows minus capital outflows which in turn equals saving minus investment. The trade balance must equal the net capital outflow, which in turn equals saving minus investment. Saving is fixed by the consumption function and fiscal policy; whereas investment is fixed by the investment function and the world interest rate.

Figure 3-3: How the real exchange rate is determined



Source: Author, adapted from Mankiw (2012)

Figure 3-3 illustrates these two conditions. The $NX(\varepsilon)$ curve showing the relationship between net exports and the RER slopes downward because a low RER makes domestic goods relatively inexpensive. The $S-I$ curve is vertical because neither saving nor investment depends on the RER. The intersection of these two curves determines the equilibrium RER (Mankiw, 2012).

Figure 3-3 looks like an ordinary demand-supply diagram. In fact, this diagram can be thought of as representing the supply and demand of foreign currency exchange. The vertical line $S-I$ represents the net capital outflow of and the supply of the domestic currency to be exchanged into foreign currency and invested abroad. $NX(\varepsilon)$ represents the net demand of the domestic currency coming from foreigners who want the domestic currency to buy RSA's goods. At the equilibrium RER, the supply of the domestic currency available from the net capital outflow equals or balances the demand for the domestic currency by foreigners buying our net exports (Mankiw, 2012).

3.6. THE EFFECTS OF TRADE POLICIES ON THE TRADE BALANCE

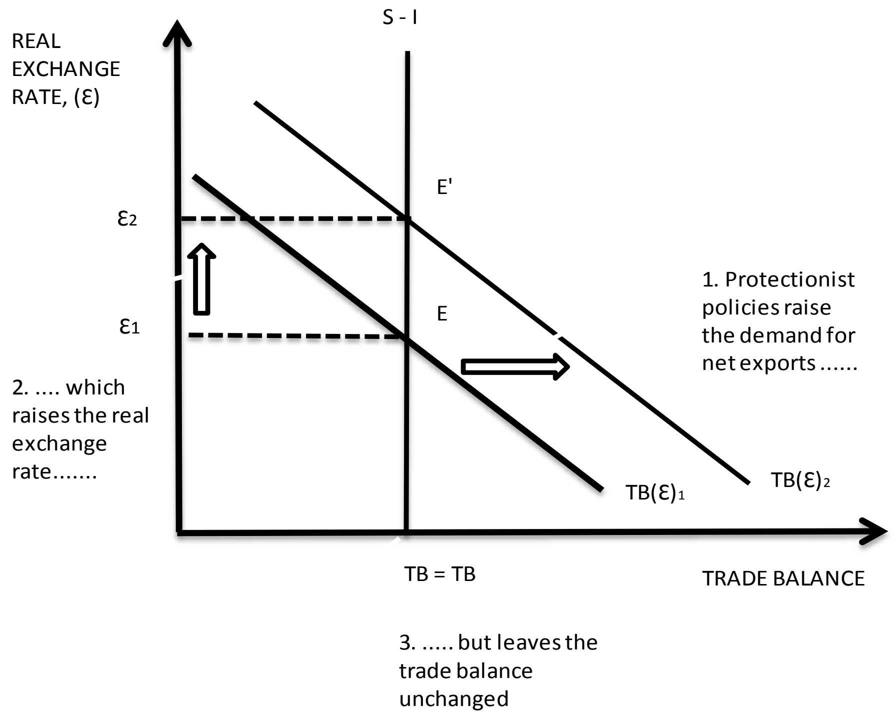
Now that we have a model that explains relationship between the trade balance and the RER, we have the tools to examine the macroeconomic effects of the trade balance. Trade policies, broadly defined, are policies designed to directly regulate the amount of goods and services exported or imported.

3.6.1. Protectionist trade policies

Most often, trade policies take the form of protecting domestic industries from foreign competition, either by placing a tax on foreign imports (a tariff) or restricting the amount of goods and services that can be imported (a quota).

As an example of a protectionist trade policy, we consider what would happen if the government prohibited the import of foreign cars. For any given RER, imports would now be lower, implying that net exports (exports minus imports) would be higher. Thus, the net-exports schedule would shift outward, as in figure 3-4.

Figure 3-4: The effect of protectionist trade policies



Source: Author, adapted from Mankiw (2012)

To see the effect of the policy, we compare the old equilibrium (E) and the new equilibrium (E'). In the new equilibrium, the RER is higher, and net exports are unchanged. Despite the shift in the net-exports schedule, the equilibrium of net exports remains the same, because the protectionist policy does not alter either savings or investment.

This analysis shows that protectionist trade policies do not affect the trade balance. This surprising conclusion is often overlooked in the popular debate over trade policies. Because a trade deficit reflects an excess of imports over exports, one might guess that reducing imports, such as by prohibiting the imports of foreign cars, would reduce a trade deficit and ultimately lead to a trade surplus. Yet the model of the protectionist policies led only to an appreciation of the RER. When there is a rise in the price of domestic goods compared to foreign goods, this would tend to lower the net exports by stimulating imports and depressing exports. Thus, the appreciation offset the increase in net exports that is directly attributed to the trade restrictions (Mankiw, 2012).

Although protectionist trade policies do not alter the trade balance, they do not affect the amount of trade. As we have seen, because the RER appreciates, the goods and services we produce become more expensive relative to foreign goods and services. We therefore export less in the new equilibrium. Because net exports are unchanged, we must import less as well. (The appreciation of the exchange does not stimulate imports to some extent, but this only partly offset the decrease in imports due to trade restriction). Thus, protectionist policies reduce both the quantity of imports and the quantity of exports.

This fall in the total amount of trade is the reason economists almost always oppose protectionist policies. International trade benefits all countries by allowing each country to specialise in what it produces best and by providing each country with a greater variety of goods and services. Protectionist policies diminish these gains from trade. Although these policies benefit a certain group within society, for example, a ban on imported cars helps domestic car producers; society on average is worse off when policies reduce the amount of international trade (Mankiw, 2012).

3.7. EMPIRICAL LITERATURE

This section discusses the empirical literature looking specifically at how exchange rate depreciation relates to the trade balance.

Gupta-Kapoor and Ramakrishnan (1999) have employed the Johansen cointegration procedure using quarterly data from 1975 through 1996 and found a long run cointegrating relationship between the exchange rate, foreign GDP, domestic GDP and the trade balance and concluded that depreciation improves the trade balance in the Japanese economy. The study went further to estimate the ECM and results show that the trade balance actually worsens in the first 5 quarters, but improves to reach equilibrium in the following 13 quarters. Noland (1989)'s study on the Japanese economy for the period 1970 through 1985, also supports the results obtained by Gupta-Kapoor and Ramakrishnan (1999), i.e. in the long run, a depreciation of the Japanese currency improves the trade balance, thus confirming the Marshall – Learner condition in the process but worsens initially, thus confirming the J-curve effect. The study also confirms that it takes 7 quarters from depreciation for the trade balance to start improving and it reaches equilibrium after 16 quarters.

A study by Bahmani-Oskooee and Kantipong (2001) on the Thailand economy using quarterly data from 1973 to 1997 and ARDL cointegration has found that the J-curve phenomenon exists in bilateral trade between Thailand and USA and Japan and none with its other major trading partners, namely Germany, Singapore and the United Kingdom,. This means that Thailand's trade balance worsened initially before showing improvement, thus depicting the J-curve phenomenon.

An extensive study by Bahmani-Oskooee and Kutan (2007) of predominantly Eastern European countries including Slovakia, Bulgaria, Poland, Hungary, Ukraine ,Croatia, Cyprus, Czech Republic, Russia, Romania and Turkey was done. The study employed the ARDL cointegration approach and the Error Correction Model and it was found that the J-curve pattern was empirically supported in three countries: Bulgaria, Croatia and Russia, meaning that the trade balances worsened in the short run and improved in the long-run. The J-curve pattern could not be established for the rest of the countries in the study.

Lencho (2013) has undertaken a study on the Ethiopian economy and found that the REER was positive and statistically significant at a 5% level confirming the hypothesis that real depreciation succeeds in improving trade balance in the long run. The elasticity of real effective exchange rate was found to be 0.83, indicating that depreciation of the REER by 10% would result in about 8.3% increase (improvement) in the trade balance per year.

A study by Ogbonna (2010) on the Benin economy has shown that the estimated long-run exchange rate elasticity has a positive sign showing that a devaluation/depreciation of the exchange rate of the local currency (CFA) leads to a positive adjustment in the trade balance.

In a study on the Croatian economy employing the ARDL cointegration approach, Stučka (2003) proved that there exists a J-curve in Croatia. The study also showed that in the long run, a 1% depreciation of the domestic currency improves the trade balance by 0.9%.

There are exceptions to the notion of the power of the REER on the trade balance. Several studies have found that a depreciation of the exchange rate does not always result in an improvement of the trade balance. In a study by Rose and Yellen (1989) covering the period 1960 - 1985 between the USA and six of its largest trading partners, it was shown that the J-curve phenomenon and the Marshal – Learner condition did not hold. Marwah and Klein (1996) also did not find the J-curve and the Marshal-Learner condition between the United States of America and Canada with five of their largest trading partners while using quarterly data covering the period between 1977 and 1992.

The study found that after depreciation, the trade balance, both in the US and Canada, follows an S-curve pattern, meaning that after the initial J-curve shape, the trade balance has a tendency to worsen again at the end. A reason for this contrasting result is not given by the study; however Bahmani-Oskoee and Brooks (1999) later blamed the result on the use of non-stationary data.

3.8. CONCLUSION

This chapter laid down the theoretical framework for the paper. Exchange rate theories in the form of, the nominal bilateral exchange rate, the real bilateral exchange rate, the nominal effective exchange rate and the real effective exchange rate (where special emphasis is given on how South Africa calculates these effective rates) were discussed as well as the three theories which outline the relationship between the exchange rate and the balance of payments (trade balance), that being the elasticities approach, the absorption approach and the monetary approach. The chapter also discussed the determinants of the trade balance in a small open economy, the relationship between the RER and net exports (trade balance), the determinants of the RER in a small open economy, and how trade policies influence the trade balance (net exports). The chapter then concluded with the empirical literature which outlined the findings of previously conducted studies focusing on the impact of the exchange rate on the trade balance.

CHAPTER 4: RESEARCH METHODOLOGY

4. INTRODUCTION

This chapter sets the econometric analytical framework used in this study. The research design, area of study and data collection is explained first. Data analysis follows, explaining unit root tests, the Johansen Cointegration procedure and the standard version of the trade balance model. This is followed by an explanation of the Auto-Regressive Distributed Lag model (ARDL). The ARDL trade balance model is developed. The chapter ends with the ARDL Error Correction Model (ECM) specification for the trade balance model.

4.1. Research design

The study is quantitative in nature in order to be able to achieve the objectives mentioned earlier in chapter 1. This means that through a quantitative study, the researcher is able to capture the impact of the real effective exchange rate on the trade balance in the South African economy.

4.2. Area of the study

The study is set in a South African context, in an attempt to find out the impact of the real effective exchange rate on the aggregate South African trade balance. It is hoped that when completed, the study would set a precedent for trade balance – exchange rate studies in South Africa going forward.

4.3. Data collection

The study relies on quarterly secondary data spanning the period 1980Q1 – 2014Q4. The data for the following variables: merchandise exports, merchandise imports, money supply, South African foreign reserves, real effective exchange rate and South African GDP in Rands is obtained from the South African Reserve Bank (SARB) online statistical query. Data for the terms of trade is sourced from Quantec.

4.4. Data analysis

In this section, all the econometric methods used in the study are explained. These include unit root tests, Johansen cointegration test, ARDL bounds test, and ARDL error correction models.

4.4.1. Unit root tests.

One of the first steps in econometric analysis is to test for the unit roots of the series, for which different tests are described in the literature. For the purposes of this study, the standard versions of the Augmented Dickey-Fuller (ADF) (Dickey, 1976; Dickey and Fuller, 1979) and the Phillips - Perron (Phillips, 1986; Phillips and Perron, 1988) unit root tests will be employed to check for the stationarity of the variables in order to ensure that spurious results are avoided.

4.4.1.1. Augmented Dickey-Fuller (ADF) unit root test.

The equation for the ADF is given by:

$$\Delta y_t = a_0 + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + ... + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (4.1)$$

Where a is a constant, β, the coefficient on a time trend and p is the lag order of the autoregressive process. Maggiora and Skerman (2009) state that it must be noted that in order to select the optimal lag length for the model, the log-likelihood function must be maximized. That is done by selecting the model with the lowest Schwartz Bayesian Information Criterion (SBC) and confirming the results with the Akaike Information Criterion (AIC) in order to ensure accuracy.

4.4.1.1. Phillips - Perron unit root test.

The Phillips - Perron unit root test is one of the most widely used alternatives to the ADF test in the analysis of time series data. The difference in the tests (ADF & PP) lies in how issues of serial correlation and heteroskedasticity are dealt with. Whereas the ADF test uses a parametric autoregression to approximate the ARMA structure of the errors in the test regression, the PP modifies the test statistic so that no additional lags of the dependant variable are needed in the presence of serially – correlated errors (Phillips and Perron, 1988). An advantage with the test is that it assumes no functional form for the error process of the variable which means that it is applicable to a very wide set of problems. A disadvantage of the test is that it relies on large samples to give reliable results and hence it will perform rather poorly in small sample sizes.

The test regression for the Phillips - Perron tests is given by:

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t \tag{4.2}$$

Where u_t is $I(0)$ and may be heteroskedastic. The PP test corrects for any serial correlation and heteroskedasticity in the errors u_t of the test regression by modifying the test statistic $t_{\pi=0}$ and $T_{\hat{\pi}}$ so that no additional lags of the dependant variable are needed in the presence of serially – correlated errors.

4.4.2. Johansen Cointegration Test.

After completion of unit root testing on the time series and assuming that all time series are integrated of the same order, a bivariate Johansen cointegration test is conducted between each of the variables in the trade balance model. The Johansen process is actually *"a maximum likelihood method that determines the number of cointegrating vectors in a non-stationary time series Vector Auto Regression (VAR) with restrictions imposed, known as a vector error correction model (VEC)"* (Johansen and Juselius, 1990).

The equation is given by:

$$y_t = \mu + A_1 y_{t-1} + ... + A_p y_{t-p} + \varepsilon_t \tag{4.3}$$

Where y_t is an (n x 1) vector of variables that are I(1). ε_t, denotes the (n x 1) vector of innovations. This VAR equation can also be written as follows:

$$\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + \varepsilon_t \tag{4.4}$$

Where,

$$\prod = \sum_{i=1}^{p} A_i - I \; and \; \Gamma_i = -\sum_{j=i+1}^{p} A_J \tag{4.5}$$

If the coefficient matrix Π has reduced rank r<n, then there exist nxr matrices α and β each with rank *r* such that Π = αβ′ and β y_t' is stationary. *r* is the number of cointegrating relationships, the elements of α are known as the adjustment parameters in the vector error correction model and each column of β is a cointegrating vector. It can be shown that

for a given *r*, the maximum likelihood estimator of β defines the combination of y_{t-1} that yields the r largest canonical correlations of Δy_t with y_{t-1} after correcting for lagged differences and deterministic variables when present. Johansen proposes two different likelihood ratio tests in the form of the trace test and maximum eigenvalue test, shown in equations (4.5) and (4.6) (Maggiora and Skerman, 2009).

$$J_{trace} = -T \sum_{i=r+1}^{n} \ln(1-\hat{\lambda}) \qquad (4.6)$$

$$J_{\max} = -T \ln(1-\hat{\lambda}_{r+1}) \qquad (4.7)$$

In equations (4.6) and (4.7), T is the sample size and λ is the i'th largest recognized correlation. The trace test checks the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of r + 1 cointegrating vectors. Neither of these test statistics follows a chi square distribution in general; asymptotic critical values can be found in Johansen and Juselius (1990) and are also given by most econometric software packages such as Eviews.

4.4.3. Model Specifications.

4.4.3.1. The trade balance model.

Incorporating the elasticities, absorption and monetary approaches to the balance of payments into the model utilised by Agbola (2004), Rawlins and Praveen (2000) as well as Sugman (2005), the standard trade balance model can be specified as follows:

$$LnTB_t = \beta_0 + \beta_1 LnREER_t + \beta_2 LnGDP_t + \beta_3 LnMS_t + \beta_4 LnTOT_t + \beta_5 LnFR_t + \varepsilon_t \qquad (4.8)$$

Where,

$LnTB_t$, denotes the log of the Trade Balance, which is computed as a ratio of merchandise exports to merchandise imports. The data for both merchandise exports and merchandise imports is obtained from the SARB.

The reason the trade balance is transformed into a ratio is that, more often than not, countries such as South Africa face a trade deficit, which in turn becomes difficult to analyse statistically because the variable would not be in its natural log form (negative instead of positive). Therefore the regression equation can be expressed in constant elasticity form which will give the elasticities of the model specified. Onafowora (2003) and Rincon (1998) have also used the same trade balance transformation.

$LnREER_t$, denotes the log of the Real Effective Exchange Rate, which is calculated by the SARB based on the flow of trade between South Africa and 20 of its major trading partners as discussed in chapter 3. Wang (2009) states that when the exchange rate is directly quoted, an increase in the REER index is equivalent to an appreciation of the local currency or a depreciation of the foreign currency and a decrease in the REER index is considered depreciation of the domestic currency or an appreciation of the foreign currency. Chiloane (2012) notes that South Africa indirectly quotes the exchange rate, hence an increase in the REER index is considered an appreciation and a decrease in the index is considered depreciation. Thus, β_1 is expected to be negative in the long run in order to improve the trade balance.

$LnGDP_t$, denotes the log of the country's Gross Domestic Product at constant 2010 prices denominated in South African Rands, which is used as a proxy for national income. The coefficient can be either positive or negative. A rise in domestic income levels would make foreign produced goods more desirable to domestic consumers and that is expected to worsen the trade balance, thus, β_2 can assume either a positive or negative sign.

$LnMS_t$, denotes the log of the Money Supply and the M2 measure of money supply is used. Appleyard and Field (2014) state that the Monetary approach to the balance of payments uses either the M1 or M2 measure of money supply, thus, the paper uses M2. The data is sourced from Quantec and is compiled by the International Monetary Fund (IMF). Under the monetary approach to the BOP, excess cash balances will lead to a rise in price levels of goods and services as people increase their spending on goods and services. If the economy is not at full employment, the level of real income rises. Additionally, if part of any new real income Y is saved, then the level of real wealth in the economy increases. Imports would increase spurred by any increase in domestic prices as domestic consumers shift their spending towards cheaper foreign produced goods. The increase in domestic prices would also make it hard for exports to be competitive in world markets. Additionally, the increase in real income, induces more spending, and some of that spending will be on imports. Finally, increased wealth enables individuals to purchase more of all goods, some of which are imports and some of which are goods that might otherwise have been exported. Thus, excess money supply generates pressures leading to a current account deficit (Appleyard and Field, 2014). Therefore β_3 is expected to be negative as an increase in money supply is expected to worsen the trade balance (Appleyard and Field, 2014).

[$LnTOT_t$] = the log of South Africa's Terms of Trade, computed as the ratio between the relative price of exports to the price of imports. β_4 is expected to be positive in order to improve the trade balance according to the Harberger-Laursen-Metzler effect (HLME) as proposed by Laursen and Metzler (1950) and Harberger (1950).

$LnFR_t$, denotes the log of South Africa's Real Foreign Exchange Reserves denominated in Rands, and

[ε] = the Error term.

4.5. Auto-Regressive Distributed Lag Approach (ARDL)

Pesaran and Shin (1999) proposed an approach that has really gained traction in recent times called the Auto Regressive Distributed Lag approach (ARDL). This approach was further expounded by Pesaran, Shin and Smith (2001), and it is also known as bound testing approach. It is used to investigate the existence of cointegration relationships among variables. When compared to other cointegration procedures like the Engle and Granger (1987) and Johansen and Juselius (1990) approaches, the bounds testing approach (ARDL) is favoured based on the fact that both the long-and short run parameters of the model specified can be estimated simultaneously (Oyinlola *et al*, 2010). Oyinlola *et al*, 2010 further state that this approach is applicable regardless of the order of integration whether the variables under consideration are I(0) (i.e. the variables are stationary at level form) or purely I(1) (i.e. the variables become stationary at first difference). Thus, this paper will use the ARDL method to estimate the long and short run parameters of the models.

4.5.1. ARDL specification for the Trade Balance model

.

$$\Delta LnTB_t = \beta_0 + \beta_1 LnTB + \beta_2 LnREER_{t-1} + \beta_3 LnGDP_{t-1} + \beta_4 LnMS_{t-1} + \beta_5 LnTOT + \beta_6 LnFR_{t-1}$$
$$+\sum_{i=1}^{p}\beta_7 i\Delta LnTB_{t-i} + \sum_{i=1}^{q}\beta_8 i\Delta LnREER_{t-i} + \sum_{i=1}^{r}\beta_9 i\Delta LnGDP_{t-i} + \sum_{i=1}^{s}\beta_{10} i\Delta LnMS_{t-i} + \sum_{i=1}^{t}\beta_{11} i\Delta LnTOT_{t-i}$$
$$+\sum_{i=1}^{u}\beta_{12} i\Delta LnFR_{t-i} + \varepsilon_t \quad (4.9)$$

Where,

Δ symbolises the first difference [i.e. D(LnTB)],,

β_0 is the drift component,

ε_t is the usual white noise residuals.

On the left hand side of equation (4.8) is denoted the trade balance, with ($\beta_1 - \beta_6$) on the right hand side representing the long-run relationship between the variables and the coefficients thereof. The remaining parameters ($\beta_7 - \beta_{12}$) in equation (4.9) denote the short-run relationship between the variables as well as the coefficients of the model in the short run.

4.5.2. ARDL Cointegration Test.

The ARDL bound test for cointegration has its roots in the Wald-test (F-statistic). Pesaran *et al.* (2001) gives two critical values for the ARDL test of cointegration. The lower bound critical value which assumes all the variables are I(0) meaning that there is no cointegration relationship between the examined variables as well as the upper bound critical value which assumes that all the variables are I(1), meaning that there is cointegration among the variables. When the computed F-statistic is greater than the upper bound critical value, then the H_0 is rejected, meaning that the variables in the model are cointegrated). If the F-statistic is below the lower bound critical value, then the H_0 cannot be rejected (meaning that there is no cointegration among the variables). When the computed Wald-test F-statistic falls between the lower and upper bound, then the results are indecisive, meaning that the relationship between the variables cannot be ascertained.

The null hypothesis of no cointegration (H_0) and the alternative hypothesis (H_1) of cointegration amongst the variables in equation (4.8) are shown in table 4-1:

Table 4-1: Null Hypothesis [H_0] and Alternative Hypothesis [H_1]

Model	Null Hypothesis [H_0]	Alt Hypothesis [H_1]	Function
Equation (4.8)	$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$	$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$	*(LnTB), LnREER, LnGDP, LnMS, LnTOT, LnFR,*

The F-test is simply a test of the hypothesis of no cointegration among the variables against the existence of cointegration among the variables, denoted as:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$$

When the above situation exists, there is NO cointegration among the variables.

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$$

Should the above persist, then there is cointegration among the variables.

4.5.3. Error Correction Model (ECM)

This paper also develops the error correction model (ECM) in order to test for the speed of adjustment and how the variables in the data set converge towards equilibrium in the long run. Therefore, the ARDL version of the ECM for the Trade balance model can be expressed as equation (4.9) below:

$$\Delta LnTB_t = \beta_0 + \sum_{i=1}^{p} \beta_1 i \Delta LnTB_{t-i} + \sum_{i=1}^{q} \beta_2 i \Delta LnREER_{t-i} + \sum_{i=1}^{r} \beta_3 i \Delta LnGDP_{t-i} + \sum_{i=1}^{s} \beta_4 i \Delta LnMS_{t-i}$$
$$+ \sum_{i=1}^{t} \beta_5 i \Delta LnTOT_{t-i} + \sum_{i=1}^{u} \beta_6 i \Delta + \sum_{i=1}^{v} \beta_7 i \Delta LnFR_{t-i} + \lambda ECT + \varepsilon_t$$

(4.10)

Where, λ explains the speed of adjustment and *ECT* denotes the Error Correction Term, and is derived from the residuals obtained in equation (4.9).

4.6. CONCLUSION

This chapter presented a clear explanation of the Unit root tests, the Johansen cointegration test and all the procedures involved in the Auto-Regressive Distributed Lag Approach (ARDL), both for cointegration as well as the long/short run coefficient estimation. The ARDL method is chosen as the preferred method of estimation for the several advantages it offers when compared to other alternative approaches. The trade balance model will be estimated based on ARDL. The Error Correction Model (ECM) is also developed based on ARDL in order to check the speed of adjustment and how the variables converge to equilibrium in the long run. In the ensuing chapter, all the techniques outlined in this chapter will then be applied to quarterly South African data in order to achieve the objectives already set out in chapter 1.

CHAPTER 5: PRESENTATION AND DISCUSSION OF FINDINGS

5.1. INTRODUCTION

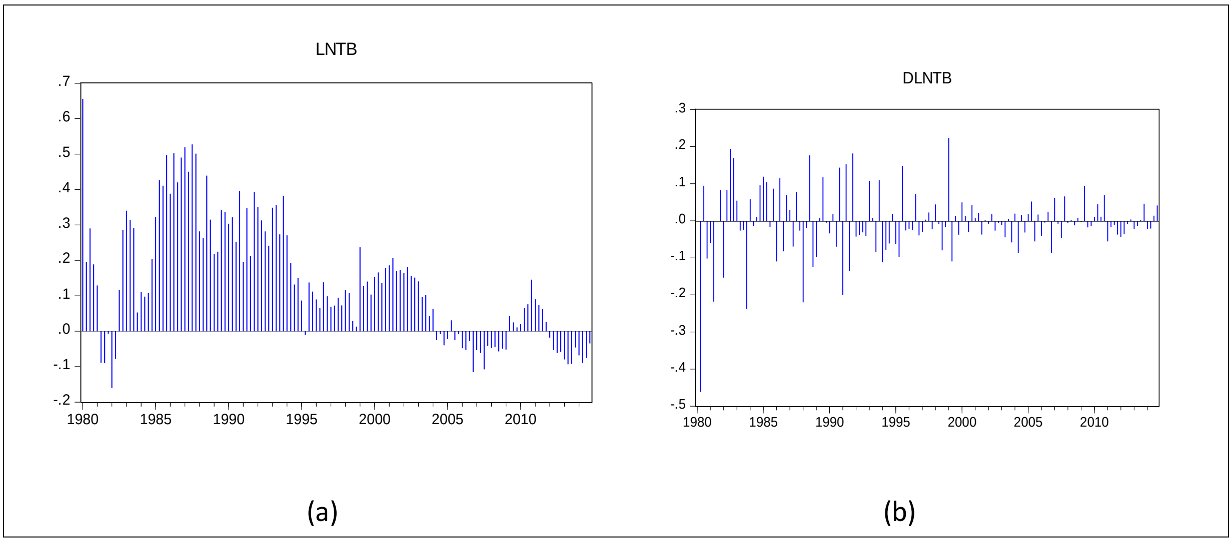
This chapter applies the methodology that was discussed in chapter 4. The time-series characteristics of the data are discussed first followed by the augmented Dickey–Fuller test (ADF) and Phillips – Perron unit root tests to check for the stationarity of the series. The paper then adopts the Johansen test of cointegration and the Bounds testing approach to test for the long run relationship between the variables in the trade balance model. Rounding off the chapter is the estimation of both the long run and short run parameters of the ARDL model as well as the discussion of the model diagnostics. All the tests are carried out using the Eviews 9 econometrics statistical package.

5.2. The Trade Balance model

5.2.1. Time series characteristics of the data.

To allow for proper analysis of econometric models, it is required that the data under consideration be stationary. More specifically, the bounds testing procedure requires that none of the variables be integrated of the 2nd order, that is, the variables should be stationary either at level form or at 1st difference and not at 2nd difference (Pesaran *et al*, 2001). Figure 5-1 to figure 5-6 offer a subjective visual inspection of the variables in their levels and first differences before proceeding to the unit root tests.

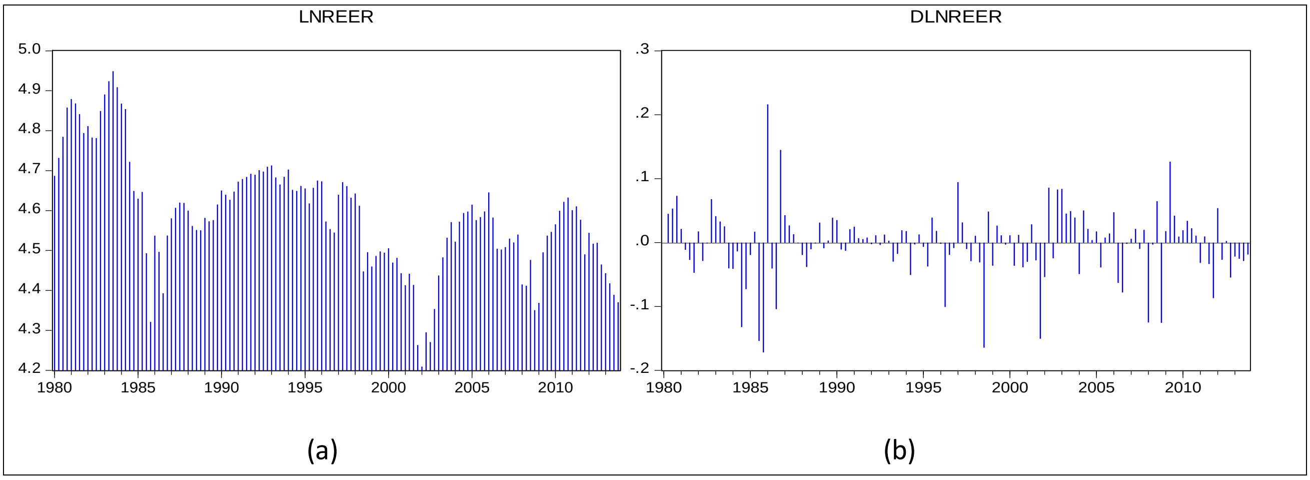
Figure 5-1: Trade Balance variable.



Source: Author

Figure 5-1 (a) and (b) show both the log of Trade Balance in level form and the log of the Trade Balance in 1st difference (DLNTB). Panel (a) indicates that for most of the sample period, LNTB is not oscillating around the mean but is rather below zero. The conclusion is that the figure on the log of the trade balance is not stationary, but has to be differenced once in order to be stationary. Panel (b) shows that the log of trade balance oscillates around the mean of zero after 1st difference. This means that the variable (LNTB) is integrated of the 1st order. i.e. it is stationary after 1st difference. This result will be confirmed by the ADF and Phillips – Perron unit root tests in section 5.2.2

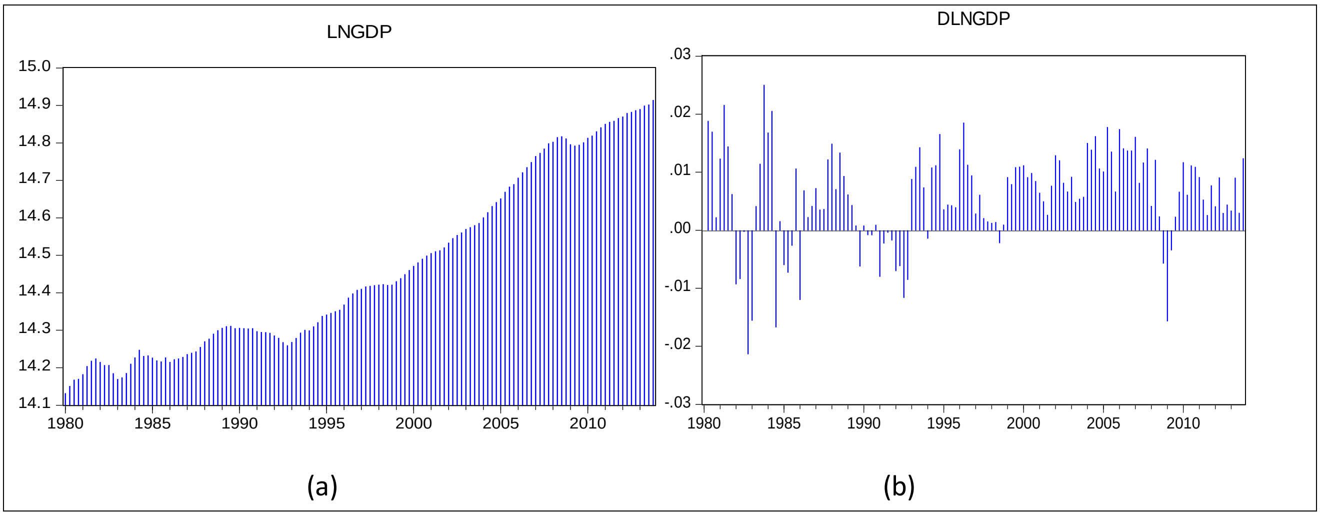
Figure 5-2: Real effective exchange rate variable.



Source: Author

Panels (a) and (b) in figure 5-2, show both the log of the Real Effective Exchange Rate (LNREER) at level form and the log of the Real Effective Exchange Rate at 1st difference (DLNREER). The pattern of the data on the figure depicts the volatility of the exchange rate; hence the panel (a) shows the level (both appreciation and depreciation) of the Rand throughout the sample period under consideration. To allow for proper analysis of the data, the variable in panel (a) has to oscillate around the mean to be stationary and it does oscillate after being differenced once as seen in panel (b). Thus, the variable (LNREER) is integrated of the 1st order. i.e. it is an I(1) variable as it becomes stationary after 1st difference, hence applicable for the analysis as it violates none of the assumptions of the ARDL bounds test. This result will be confirmed by the ADF and Phillips – Perron unit root tests 5.2.2

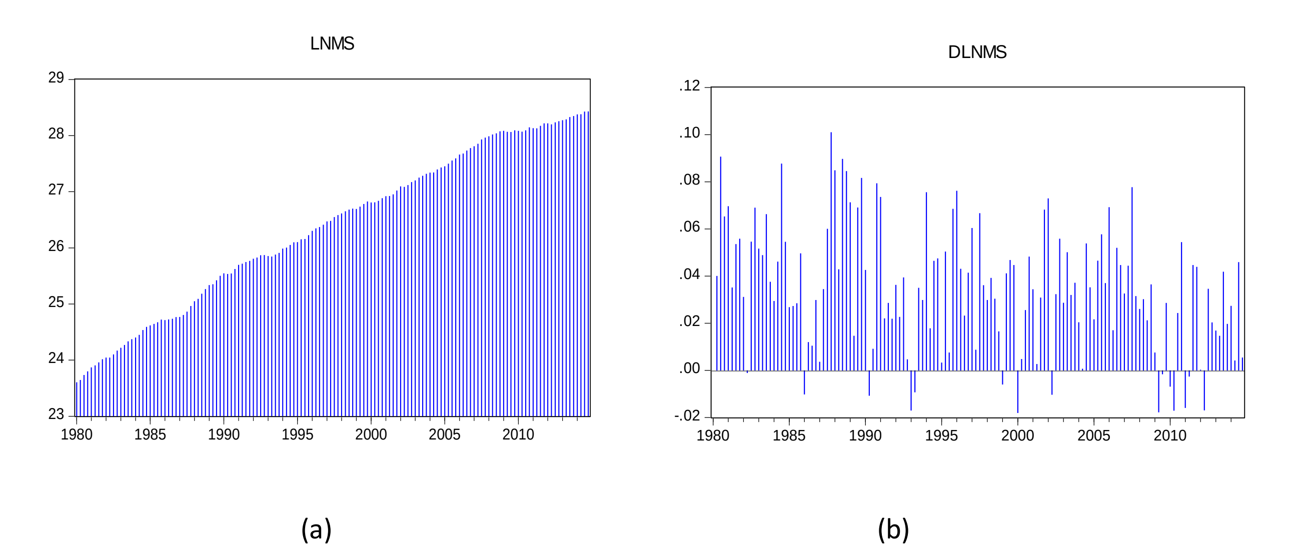
Figure 5-3: Real gross domestic product variable.



Source: Author.

Panel (a) shows the log of the Real GDP (LNGDP) in level form and panel (b) the log of Real GDP at 1st difference (DLNGDP). The pattern on the figures through time show the trending nature of the data and that Real GDP has been generally increasing. The variable is supposed to be stationary, and hence fluctuate around the mean. Panel (b) in figure 5-3 shows the 1st difference of the variable in panel (a), and it appears to be stationary though not conclusive. Hence, the result will be verified by the ADF and Phillips – Perron unit root tests in section 5.2.2.

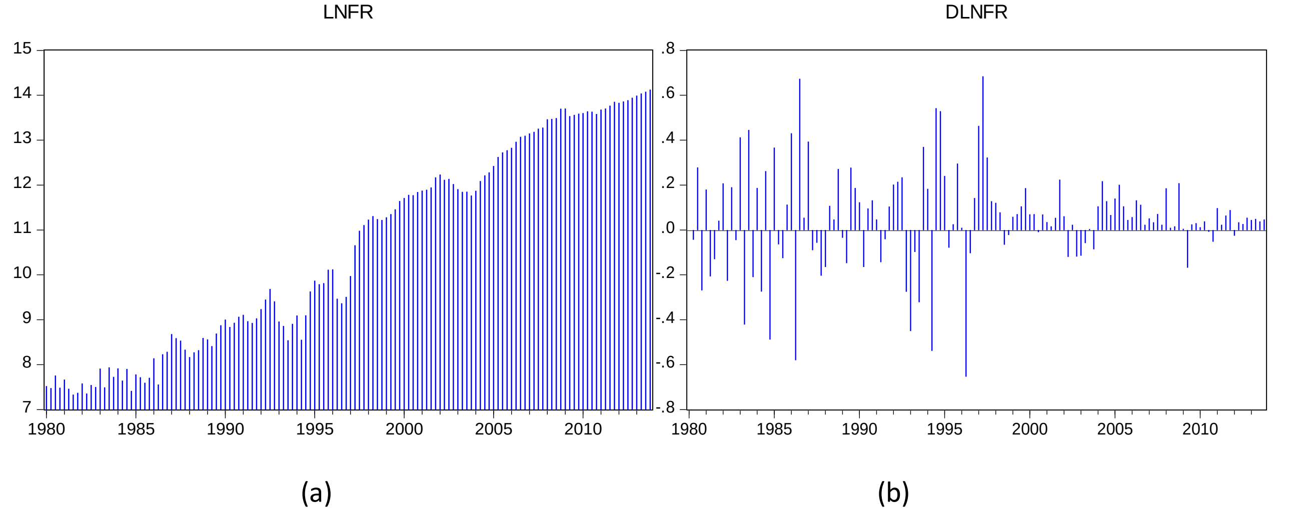
Figure 5-4: Real money supply variable.



Source: Author

Figure 5-4 (a) shows the log of the Real Money Supply (LNMS) at level form, and 5-4 (b), shows the log of Real Money Supply at 1st difference (DLNMS). Panel (a) shows that money supply is not fluctuating around the mean of zero. Panel (b) shows the 1[st] difference of the money supply variable and it looks to be stationary. Thus, the variable (LNMS) is integrated of the first order. i.e. it becomes stationary after 1[st] difference. This result will be confirmed by the ADF and Phillips – Perron unit root tests in section 5.2.2

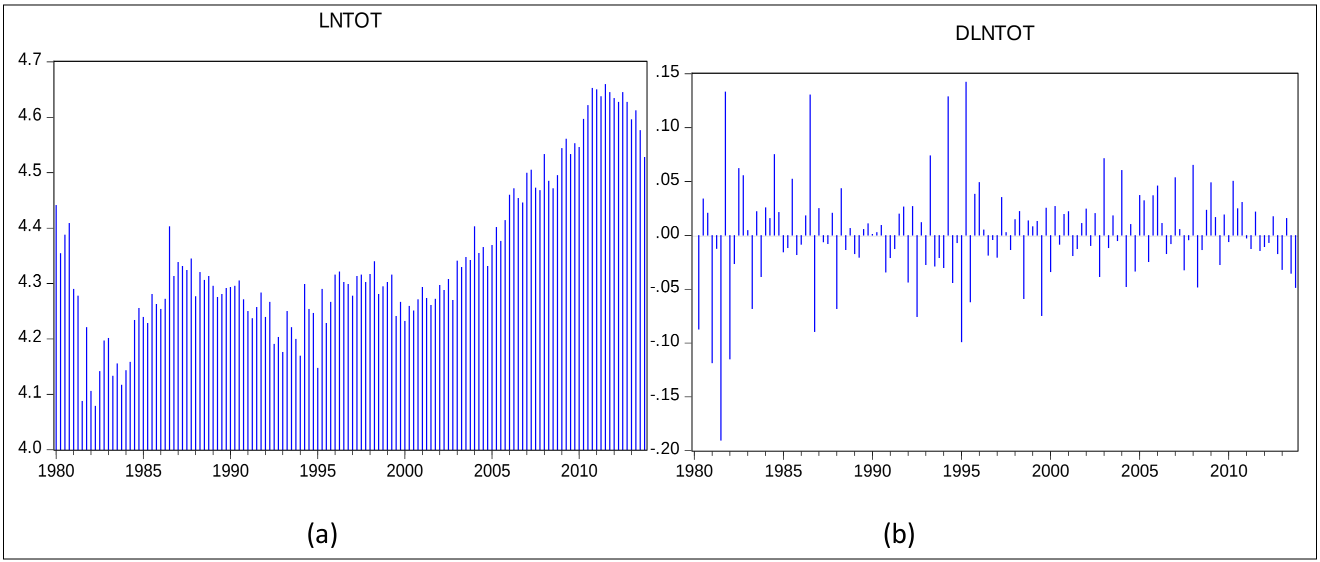
Figure 5-5: Real foreign reserves variable.



Source: Author

Panel (a) in figure 5-5 shows the log of the Real Foreign Reserves (LNRF) at level form and panel (b), the log of Real Foreign Reserves at 1st difference (DLNFR). Panel (a) shows that the data has trending characteristics and is not stationary at level form. Panel (b) shows that after 1st difference, the variable appears to be stationary. Thus, the variable is integrated of the 1st order. i.e. it is an I(1) variable as it becomes stationary after 1st difference. The result will also be verified by the ADF and Phillips – Perron unit root tests in section 5.2.2

Figure 5-6: Terms of trade.



Source: Author

Panel (a) in figure 5-6 shows the log of the Terms of Trade (LNTOT) at level form and panel (b), the log of the Terms of Trade at 1st difference (DLNTOT). Panel (a) indicates that for the entire sample period, LNTOT is not oscillating around the mean, but rather shows improvements and sometimes deteriorations as well as the volatility of export prices relative to import prices in the terms of trade. The conclusion is that the figure on the log of the Terms of Trade is not stationary but rather has to be differenced at least once in order to oscillate around the mean of zero. Panel (b) shows that the log of the Terms of Trade does oscillate around the mean of zero after being differenced once. This means that the variable (LNTOT) is integrated of the 1st order. The result will be verified by the ADF and Phillips – Perron unit root tests in section 5.2.2

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5.2.2. Unit root tests

Table 5-1 summarise the results of the unit root tests from the Augmented Dickey–Fuller (ADF) test and the Phillips – Perron test. Detailed results for both unit root tests are presented in appendix A.

Table 5-1: Unit root tests.

VARIABLE	INTERCEPT		INTERCEPT & TREND	
	Augmented Dickey–Fuller	Phillips – Perron	Augmented Dickey–Fuller	Phillips – Perron
LNTB	-2.182 (0.214)	-4.075 (0.002)***	-2.994 (0.138)	-5.102 (0.000)***
ΔLNTB	-16.529(0.000)***	-16.529 (0.000)***	-16.449 (0.000)***	-16.529 (0.000)***
LNGDP	0.958 (0.997)	0.893 (0.995)	-1.758 (0.720)	-1.348 (0.871)
ΔLNGDP	-6.537 (0.000)***	-6.449 (0.000)***	-6.707 (0.000)***	-6.750 (0.000)***
LNREER	-2.428 (0.136)	-1.750 (0.404)	-3.679 (0.027)**	-3.038 (0.126)
ΔLNREER	-5.582 (0.000)***	-10.644 (0.000)***	-5.571 (0.000)***	-10.605 (0.000)***
LNMS	-3.220 (0.021)**	-3.310 (0.016)**	-1.113 (0.922)	-1.214 (0.903)
ΔLNMS	-3.650 (0.006)***	-8.861 (0.000)***	-9.303 (0.000)***	-9.399 (0.000)***
LNFR	0.419 (0.983)	0.730 (0.992)	-2.855 (0.181)	-2.802 (0.199)
ΔLNFR	-8.558 (0.000)***	-8.601 (0.000)***	-8.640 (0.000)***	-8.685 (0.000)***
LNTOT	-0.759 (0.827)	-1.281 (0.637)	-3.045 (0.124)	-4.014 (0.010)**
ΔLNTOT	-17.774 (0.000)***	-17.845 (0.000)***	-17.856 (0.000)***	18.083 (0.000)***

Source: Author

* denotes the rejection of the null hypothesis at 10%

** denotes the rejection of the null hypothesis at 5%

*** denotes the rejection of the null hypothesis at 1%.

Probability values are in parentheses.

As can be seen from table 5-1, all the variables exhibit non stationary properties; hence the null hypothesis of non-stationarity cannot be rejected at level form. When the Augmented Dickey–Fuller and Phillips – Perron tests are applied to the 1st differences of the variables, they all become stationary. Thus, it is concluded that all the variables in the trade balance model are integrated of the 1st order.

5.2.3. Johansen test of cointegration

The Augmented Dickey–Fuller (ADF) and Phillips – Perron tests employed in section 5.2.2 showed that the variables in the model are integrated of the same order. i.e. they are all I(1), therefore, the Johansen test of cointegration can then be employed to test for the long run relationship between the variables. Detailed results for the Johansen test of cointegration are presented in appendix B.

Table 5-2: Trace test.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value @5%	Prob.**
None *	**0.300011**	**117.4335**	**95.75366**	**0.0007**
At most 1	0.207103	68.56679	69.81889	0.0626
At most 2	0.105138	36.77430	47.85613	0.3583
At most 3	0.082304	21.55562	29.79707	0.3239
At most 4	0.056315	9.788795	15.49471	0.2973

Source: Author's calculations

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Table 5-3: Max-Eigen test.

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value @5%	Prob.**
None *	**0.300011**	**48.86668**	**40.07757**	**0.0040**
At most 1	0.207103	31.79248	33.87687	0.0869
At most 2	0.105138	15.21868	27.58434	0.7307
At most 3	0.082304	11.76682	21.13162	0.5708
At most 4	0.056315	7.940873	14.26460	0.3847

Source: Author's calculations

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Table 5-2 and 5-3 present the results of the Johansen cointegration test. From the results, the null hypothesis of no cointegration between the variables can be rejected as both the Trace Statistic at 117.43 and the Max-Eigen Statistic at 48.87 are greater than their respective critical values at 95.75 and 40.08 at both the 5% and 1% levels of significance respectively. Thus, there is evidence of a long run relationship between the variables in the trade balance model.

5.2.4. ARDL Bounds test of Cointegration

Table 5-4: Bounds Test.

Equation	F-statistic	Lower Bound I0 At 1%	Upper Bound I1 At 1%	Outcome
Trade Balance	**6.04**	3.41	4.68	**COINTERGRATED**

Source: Author's calculations

Table 5-5: Critical Value Bounds.

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Source: Pesaran *et al*. (2001)

Table 5-4 and table 5-5 present results of the bounds testing approach. Detailed results for the Bounds test are presented in appendix C. The number of independent variables in the model is 5, hence k=5. All the lower bound and upper bound critical values are obtained from Pesaran et al (2001). The calculated F-statistic = 6.04 and is greater than the lower bound critical value of 3.41 and the upper bound critical value of 4.68 at the 1% level of significance, therefore the variables are cointegrated.

Since the bounds testing approach and the Johansen test of cointegration have both provided sufficient evidence of a long run relationship between the variables in the trade balance model, the paper then proceeds to estimate the long run cointegrating equation and the coefficients of the model specified.

5.2.5. ARDL long run Trade Balance model

Table 5-6: ARDL long run Trade Balance model.

Variable	Coefficient
LNREER	-0.376751
LNGDP	-2.731271
LNMS	-0.334903
LNTOT	1.346248
LNFR	0.428804
C	40.010133

Source: Author's calculations

Table 5-6 summarises the results of the long run ARDL model for the trade balance equation. Detailed results for the ARDL long run model are presented in appendix D. All the variables in the model, bar the foreign reserves variable, exert significant long term influences on the trade balance. LNREER with a coefficient of -0.377 indicates a negative long run relationship between the REER and trade balance. This suggests that a 10% appreciation of the ZAR will lead to 3.77% deterioration in the trade balance and 10% depreciation of the ZAR will lead to a 3.77% improvement in the trade balance.

This result is also consistent with economic theory, more specifically, the elasticities approach to a Balance of Payments adjustment, which states that, following currency depreciation, import prices would rise, leading to decreased demand and a decline in the volume of imports, ultimately leading to an improvement in the trade balance on the import front due to the price effect of imports. On the other hand, when the ZAR appreciates, foreign goods (imports) become cheaper; hence the volume of imports is likely to rise, thus worsening the trade balance. Wang (2009) also states that following currency depreciation, exports become cheaper from the foreign country's viewpoint of consumption, leading to a higher demand for exports. Consequently, the volume of exports increases, so does the value of exports in terms of the domestic currency, improving the trade balance on the export front due to the price effect of exports.

LNGDP with an elasticity of -2.731 suggests that there is a significant long run relationship between real income or GDP and the trade balance. The result shows that a 1% increase in GDP will lead to 2.73% deterioration in the level of the trade balance. This means that the more that the domestic income level increases in the long run, the more domestic consumers will increase their consumption of imported goods.

The money supply elasticity stands at -0.334, suggesting a negative relationship between LNMS and LNTB in the long run. A 10% increase in money supply will lead to 3.34% deterioration in the level of the trade balance. The result is also consistent with economic theory and more specifically, the monetary approach to the balance of payments which states that excess supply of money always generates pressures in the economy and leads to a current account deficit (Appleyard and Field, 2014).

The terms of trade elasticity of 1.346 shows that a 1% improvement in the terms of trade will lead to a 1.35% improvement in the trade balance. According to the Harberger-Laursen-Metzler effect (HLME) as proposed by Laursen and Metzler (1950) and Harberger (1950), an improvement in the terms of trade will cause an increase in the level income when the marginal propensity to consume is less than one. Private savings would increase and ultimately lead to an improvement in the trade balance. However, this will only apply when there is a temporal shock in the terms of trade than a permanent one (Sachs, 1981).

5.2.6. ARDL Error Correction Model

Table 5-7: ARDL Error Correction Model.

Variable	Coefficient	t-statistic	Probability Value
$\Delta LnTB_{t-1}$	-0.510942	-4.686016	0.0000
$\Delta LnREER_{t-1}$	0.391126	2.665506	0.0093
$\Delta LnGDP_{t-9}$	-2.618821	-2.919100	0.0045
$\Delta LnMS_{t-9}$	-0.717966	-1.936239	0.0563
$\Delta LnFR_{t-6}$	-0.251511	-2.740204	0.0076
$\Delta LnTOT_{t-1}$	0.374178	2.280241	0.0252
ΔECT_{t-1}	-0.255196	-2.444502	0.0167

Source: Author's calculations

*denotes significance at 10%,

** denotes significance at 5% and

***denote significance at 1% level.

Table 5-7 presents the short run parameters of the trade balance model. The appropriate lags were automatically selected by the Eviews 9 statistical estimation package (IHS Global, 2015). Detailed results for the ARDL short run model are presented in appendix D. It is clear from the model that all the elasticities are statistically significant. The results show that the trade balance is positively related to a one quarter lag of REER and TOT while being negatively related to a ninth quarter lag of GDP, ninth quarter lag of money supply and a sixth quarter lag of foreign reserves in the short run. The one quarter lag of the trade balance variable is highly significant at 1% and suggests that the current quarter level in the trade balance is directly influenced by last quarter's trade balance value.

The exchange rate elasticity of trade balance is 0.391, meaning that, *ceteris paribus,* a 10% depreciation in the REER index will lead to an approximately 3.91% deterioration of the trade balance in the short run and this depreciation of the ZAR takes one period (quarter) to filter through. This result also confirms the J-Curve effect in South Africa's economy. Reinert and Rajan (2009) state that although the trade balance may improve in the long run following a currency depreciation, it may actually worsen in the short run such that it follows the pattern of a tilted J-Curve to the right. Salvatore (2007) argues that this deterioration may be as a result of import prices rising faster than export prices soon after currency depreciation, while quantities change only by a small margin.

The income elasticity of the trade balance stands at -2.62, suggesting a negative relationship between GDP and TB. The result shows that a 1% increase in GDP, hence in domestic income levels, will lead to 2.62% decrease in the level of the trade balance, *ceteris paribus*. This means that the more that the domestic income level increases, then the more domestic consumers will increase their consumption of imported goods.

The money supply elasticity stands at -0.718, suggesting a negative relationship between money supply and trade balance in the short run. A 10% increase in money supply will lead to 7.18% deterioration in the level of the trade balance, *ceteris paribus* and this effect will take nine quarters to filter through. The result is also consistent with the monetary approach to the balance of payments which states that excess supply of money always generates pressures in the economy and leads to a current account deficit (Appleyard and Field, 2014).

The foreign reserves variable has a coefficient of -0.252, suggesting a negative relationship between the variables. *Ceteris paribus*, a 10% increase in the level of foreign reserves will lead to a 2.52% deterioration of the trade balance by the 6^{th} quarter.

The terms of trade elasticity of 0.374 shows that a 10% improvement in the terms of trade will lead to a 3.74% improvement in the trade balance. According to the Harberger-Laursen-Metzler effect (HLME) as proposed by Laursen and Metzler (1950) and Harberger (1950), an improvement in the terms of trade will cause an increase in the level of income when the marginal propensity to consume is less than one, private savings would increase and ultimately lead to an improvement in the trade balance. However, Sachs (1981) contends that this will only apply when there is a temporal shock in the terms of trade than a permanent one.

The error correction term which measures the speed at which variables converge to equilibrium has a magnitude of -0.255, and is negative as expected and significant at 5%.

This result shows that about 25.5% of the disequilibrium in the current period will be corrected in the next quarter.

5.2.7. Stability diagnostic checks on the Error Correction Model

Table 5-8: Stability diagnostic checks on the Error Correction Model.

Test	Null Hypothesis	Test Statistic	P-Value	Conclusions
Jarque-Bera	Residuals are normally distributed	5.269917	0.071722	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore the residuals of the model are normally distributed
Ljung-Box Q	No Autocorrelation	35.703	0.483	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore the model does not suffer from autocorrelation.
Lagrange Multiplier Test	No Serial correlation	5.485599	0.0644	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore, therefore there is no serial correlation in the model
Breusch-Pagan-Godfrey	No Heteroskedasticity	52.83471	0.2928	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore there is no Heteroskedasticity in the model.
Harvey	No Heteroskedasticity	42.87171	0.6825	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore there is no Heteroscedastricity in the model.
Glejser	No Heteroskedasticity	50.83108	0.3627	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore there is no Heteroskedasticity in the model.

Arch	No Arch Heteroskedasticity	0.649838	0.4202	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore there is no Heteroskedasticity in the model.
White	No Heteroskedasticity	55.96644	0.2007	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore there is no Heteroskedasticity in the model.

Source: Author's calculations

Table 5-8 reports the residual diagnostics of the trade balance model. Detailed results for all the stability and diagnostic tests are presented in appendix E. The residuals are normally distributed in the model as evidenced by the non-rejection of the null hypothesis using the Jarque-Bera test. The Ljung-Box Q statistic also reports that there is no auto correlation in the model, thus not rejecting the null hypothesis. The Lagrange Multiplier serial correlation test also confirms that there is no serial correlation in the model, therefore not rejecting the null hypothesis. The null hypothesis of no heteroscedastricity is not rejected as the p-values are greater than the respective levels of significance at 5% for the Breusch-Pagan-Godfrey, Harvey, Glejser, Arch and White tests.

5.2.8. Ramsey RESET test

Table 5-9: Ramsey RESET test.

Test	**Ho**	**Test Statistic**	**P-Value**	**Conclusion**
Ramsey RESET	The model is correctly specified	1.312589	0.1931	Do not reject Ho because the P-Value is greater than the level of significance at 5%

Source: Author's calculations

Table 5-9 present the result from the Ramsey Reset test. Detailed results for the Ramsey RESET test are presented in appendix F. The null hypothesis states that the model is correctly specified. Since the p-value is greater than the 5% level of significance, the null hypothesis is not rejected. Therefore, the model is correctly specified.

5.3. Conclusion

This chapter presented the results of the study based on the methodology discussed in chapter 4. The time series characteristics of the data were discussed first to visually check if the variables are stationary before proceeding with the ADF and Phillips - Perron unit root tests. Both the ARDL Bounds test and the Johansen method were employed for cointegration. The ARDL method was also employed for the long run as well as the short run trade balance model. Stability tests round up the chapter.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

This dissertation has analysed the impact of the real effective exchange rate on aggregate trade data but has not ascertained which sectors in the economy are impacted the most by the currency fluctuations. This is indeed a limitation of the study. As a recommendation, perhaps another approach could be used to analyse the impact of the REER on certain importing and exporting industries.

The primary aim of this dissertation was to investigate the impact of the real effective exchange rate depreciation on the trade balance both in the long run and the short run in the South African economy. The secondary aims/objectives included the analysis of South Africa's trade patterns with the rest of the world, determining if the J-Curve phenomenon exists as well as determining if the Marshal – Lerner condition holds in the RSA economy.

The analysis of trade patterns between RSA and the rest of the world for the period 2010 - 2014 confirmed China as South Africa's main trading partner with 9.6% of total exports going to that country and 17.6% of all imported merchandise sourced from the country. Regionally, 33% of all merchandise exports to Asia and 38.8% of all the imports sourced from that continent originated from China. Germany was shown to be RSA's 2nd largest trading partner in aggregate terms and the largest trading partner in Europe, with 6.5% of South Africa's total exports going to the country and 11.5% of all total imports coming from there. The United States underlined its position as South Africa's second largest export destination in the world, with 7.6% of South Africa's exports going to the country and 7.1% of total imports sourced from there. Regionally, 77.9% of all exports to the Americas went to the USA, with 65.2% of imports from that region also coming from the country by the end of 2014. From an African perspective, Botswana was shown to be South Africa's largest trading partner on the African continent, accounting for 5.1% of all total exports to the rest of the world as well as 0.5% of all total imports from the rest of the world. Regionally, 17.8% of total exports to Africa went to Botswana and 5.1% of imports came from that country as at the end of 2014. From a BRICS perspective, only China and India appear in the top 10 export destinations and import sources, with 13.7% of all exports going to both countries and 22.8% of all imports from the rest of the world coming from the two countries. The growth analysis in chapter 2 also highlighted the importance of using real data instead of nominal data as rising inflation in the reporting economy has a tendency of exaggerating and seriously distorting growth values.

To achieve the stated objectives, this dissertation was anchored on the Keynesian (elasticities and absorption approaches) and monetary theories of balance of payments adjustment. The elasticities approach states that, following currency depreciation, the demand for imports falls and so does the volume of imports, which leads to the improvement in the trade balance on the import front due to the price effect of imports. Exports also become cheaper from the foreign country's viewpoint of consumption, leading to a higher demand for exports. Consequently, the volume of exports increases, so does the value of exports in terms of the domestic currency, improving the trade balance on the export front due to the price effect of exports. From the elasticities approach rises the J-Curve phenomenon and the Marshal – Lerner condition. The J-Curve phenomenon describes the time lag within which currency depreciation may improve the trade balance. It states that even though the trade balance may improve in the long run, it may worsen initially in the short run such that it follows the pattern of a tilted J-curve to the right. The Marshal – Lerner condition on the other hand looks at the demand elasticities for both imports and exports. It states that depreciation will lead to an improvement of the trade balance if the sum of the demand elasticities is greater than 1.0. If the sum of the demand elasticities is less than 1.0, depreciation will worsen the trade balance. The trade balance will neither be helped nor worsened if the sum of the demand elasticities is equal to 1.0. This means that the Marshal – Lerner condition analyses the long run impact of the currency depreciation on the trade balance.

The absorption approach on the other hand, argues that the net effect of the devaluation (depreciation) on the balance of payment would depend not only on elasticities but also on the change in income and absorption which will have repercussions on the balance of payments. Any increase in income due to an improvement in the balance of payment (which is brought about by depreciation) is bound to lead to an increase in imports and hence, deterioration in the trade balance.

The monetary approach states that, if people demand more money than is being supplied by the central bank, then the excess demand for money would be satisfied by inflows of money from abroad. In this case, the trade balance will improve. On the other hand, if the central bank is supplying more money than is demanded, then the excess supply of money is eliminated by outflows of money to other countries and this will worsen the trade balance.

The study is quantitative in nature and has employed quarterly data covering the period 1980Q1 – 2014Q4. The Johansen cointegration and the ARDL bounds testing techniques were employed to test for the long run cointegration/relationship between the variables in the trade balance model. The Autoregressive Distributed Lag Approach was adopted to test for the impact of the real effective exchange rate on the trade balance both in the short run and the long run and to also test for the J-Curve phenomenon and the Marshal – Lerner condition.

The results from the Johansen cointegration test and the ARDL bounds test showed that there exists a long run cointegrating relationship between the variables in the trade balance model. In estimating the ARDL long run equation, it was shown that a depreciation of the ZAR improves the trade balance in the long run, thus confirming the Marshal-Lerner condition. In the short run, the depreciation of the ZAR leads was shown to lead to the deterioration of the trade balance, thus confirming the J-curve phenomenon in the RSA economy. GDP was found to be a major determinant as well, with a significant negative impact on the trade balance both in the long and short run. Money supply and foreign reserves were also found to have a negative impact on the trade balance in the short run, with money supply also affecting the TB in the long run. The terms of trade effect was reported positive for both the long run and short run models, confirming the Harberger-Laursen-Metzler effect (HLME). The error correction model revealed that 26% of the disequilibrium in the trade balance model is corrected in each quarter.

The results from this study have certain implications for policy discussions. Since the results show that a depreciation of the currency can have a positive impact on the trade balance in the long run, a policy aimed at depreciating the ZAR to improve the trade balance can be recommended. This recommendation to depreciate the ZAR should however not be too excessive so as to impact negatively on the importation of certain capital goods critical to the growth and development of the South African economy. From the monetary side, the results showed that an increase in money supply worsens the trade balance. Thus, monetary authorities may adopt a contractionary monetary policy in the form of a reduction in money supply to improve the trade balance.

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APPENDICES

APPENDIX A - UNIT ROOT TESTS

TRADE BALANCE (ADF)

Null Hypothesis: LNTB has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.182139	0.2138
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNTB has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.994079	0.1377
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTB) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.52873	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTB) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.44944	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

TRADE BALANCE (PHILLIPS PERRON)

Null Hypothesis: LNTB has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.075038	0.0015
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNTB has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.101540	0.0002
Test critical values:	1% level	-4.025426	
	5% level	-3.442474	
	10% level	-3.145882	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTB) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-16.52873	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTB) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-16.44944	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

REAL EFFECTIVE EXCHANGE RATE (ADF)

Null Hypothesis: LNREER has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.427848	0.1360
Test critical values:	1% level	-3.478911	
	5% level	-2.882748	
	10% level	-2.578158	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.678846	0.0271
Test critical values:	1% level	-4.026942	
	5% level	-3.443201	
	10% level	-3.146309	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNREER) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.582521	0.0000
Test critical values:	1% level	-3.478911	
	5% level	-2.882748	
	10% level	-2.578158	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNREER) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.571052	0.0000
Test critical values:	1% level	-4.026942	
	5% level	-3.443201	
	10% level	-3.146309	

*MacKinnon (1996) one-sided p-values.

REAL EFFECTIVE EXCHANGE RATE (PHILLIPS PERRON)

Null Hypothesis: LNREER has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.750242	0.4039
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNREER has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.038107	0.1258
Test critical values:	1% level	-4.025426	
	5% level	-3.442474	
	10% level	-3.145882	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNREER) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.64399	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNREER) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.60545	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

REAL GDP (ADF)

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.957877	0.9960
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.757935	0.7198
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.536510	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.707266	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*

Phillips-Perron test statistic		0.893437	0.9952
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.348405	0.8714
Test critical values:	1% level	-4.025426	
	5% level	-3.442474	
	10% level	-3.145882	

*MacKinnon (1996) one-sided p-values.

REAL GDP (PHILLIPS PERRON)

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.449029	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.750319	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

MONEY SUPPLY (ADF)

Null Hypothesis: LNMS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.220418	0.0209
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNMS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.113448	0.9222
Test critical values:	1% level	-4.027463	
	5% level	-3.443450	
	10% level	-3.146455	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.650273	0.0060
Test critical values:	1% level	-3.479281	
	5% level	-2.882910	
	10% level	-2.578244	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.303133	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

MONEY SUPPLY (PHILLIPS PERRON)

Null Hypothesis: LNMS has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.310376	0.0162
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNMS has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.213589	0.9034
Test critical values:	1% level	-4.025426	
	5% level	-3.442474	
	10% level	-3.145882	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.860915	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.399826	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

FOREIGN RESERVES (ADF)

Null Hypothesis: LNFR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.418643	0.9831
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNFR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.855141	0.1806
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.557510	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.639608	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

FOREIGN RESERVES (PHILLIPS PERRON)

Null Hypothesis: LNFR has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.730259	0.9924
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNFR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.802032	0.1991
Test critical values:	1% level	-4.025426	
	5% level	-3.442474	
	10% level	-3.145882	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFR) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.601097	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.684717	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

TERMS OF TRADE (ADF)

Null Hypothesis: LNTOT has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.758715	0.8270
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNTOT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.044868	0.1241
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.77402	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTOT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.85574	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

TERMS OF TRADE (PHILLIPS PERRON)

Null Hypothesis: LNTOT has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.281322	0.6372
Test critical values:	1% level	-3.477835	
	5% level	-2.882279	
	10% level	-2.577908	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNTOT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.013789	0.0104
Test critical values:	1% level	-4.025426	
	5% level	-3.442474	
	10% level	-3.145882	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTOT) has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-17.84463	0.0000
Test critical values:	1% level	-3.478189	
	5% level	-2.882433	
	10% level	-2.577990	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNTOT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-18.08292	0.0000
Test critical values:	1% level	-4.025924	
	5% level	-3.442712	
	10% level	-3.146022	

*MacKinnon (1996) one-sided p-values.

APPENDIX B – JOHANSEN COINTEGRATION TEST

Date: 08/16/15 Time: 20:06
Sample (adjusted): 1980Q4 2014Q4
Included observations: 137 after adjustments
Trend assumption: Linear deterministic trend
Series: LNTB LNREER LNGDP LNMS LNTOT LNFR
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.300011	117.4335	95.75366	0.0007
At most 1	0.207103	68.56679	69.81889	0.0626
At most 2	0.105138	36.77430	47.85613	0.3583
At most 3	0.082304	21.55562	29.79707	0.3239
At most 4	0.056315	9.788795	15.49471	0.2973
At most 5	0.013398	1.847922	3.841466	0.1740

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.300011	48.86668	40.07757	0.0040
At most 1	0.207103	31.79248	33.87687	0.0869
At most 2	0.105138	15.21868	27.58434	0.7307
At most 3	0.082304	11.76682	21.13162	0.5708
At most 4	0.056315	7.940873	14.26460	0.3847
At most 5	0.013398	1.847922	3.841466	0.1740

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
3.816370	4.330227	-23.69355	0.919592	6.764282	3.079450
8.076282	3.001838	16.82542	0.758831	-14.30030	-0.786003
9.303449	2.421652	14.75291	-1.281972	-9.806496	0.015234
-0.038420	2.773932	2.192756	-1.340529	-13.02590	1.992892
0.397838	8.414341	2.053606	1.730672	1.139314	-0.989420
2.841309	0.046204	19.78011	-1.882543	-1.315263	-0.746817

Unrestricted Adjustment Coefficients (alpha):

D(LNTB)	-0.023443	-0.007092	-0.007599	0.011957	-0.001429	-0.001061
D(LNREER)	-0.003046	-0.004044	-0.003384	-0.007362	-0.010899	0.000243
D(LNGDP)	0.001865	0.000705	-0.000362	0.000412	-0.000135	-0.000563
D(LNMS)	-0.003498	-0.004263	0.005357	-8.51E-05	0.000677	-0.001386
D(LNTOT)	-0.009109	0.013496	0.003454	0.004623	-0.001764	3.94E-05
D(LNFR)	-0.027818	0.009504	-0.007685	-0.013271	0.011495	-0.002223

1 Cointegrating Equation(s):		Log likelihood	1616.468		

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
1.000000	1.134645	-6.208401	0.240960	1.772439	0.806906
	(0.33596)	(1.21498)	(0.12039)	(0.65144)	(0.14235)

Adjustment coefficients (standard error in parentheses)

D(LNTB)	-0.089466
	(0.02158)
D(LNREER)	-0.011626
	(0.01879)
D(LNGDP)	0.007116
	(0.00212)
D(LNMS)	-0.013351
	(0.00800)
D(LNTOT)	-0.034763
	(0.01333)
D(LNFR)	-0.106164
	(0.03011)

2 Cointegrating Equation(s):		Log likelihood	1632.364		

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
1.000000	0.000000	6.122728	0.022344	-3.496716	-0.537829
		(1.19854)	(0.10428)	(0.66634)	(0.14300)
0.000000	1.000000	-10.86783	0.192673	4.643878	1.185158
		(1.79401)	(0.15609)	(0.99739)	(0.21404)

Adjustment coefficients (standard error in parentheses)

D(LNTB)	-0.146746	-0.122802
	(0.05018)	(0.02960)
D(LNREER)	-0.044284	-0.025330
	(0.04386)	(0.02587)
D(LNGDP)	0.012814	0.010192
	(0.00492)	(0.00290)
D(LNMS)	-0.047777	-0.027944
	(0.01841)	(0.01086)
D(LNTOT)	0.074236	0.001070
	(0.02926)	(0.01726)
D(LNFR)	-0.029408	-0.091930
	(0.07007)	(0.04133)

3 Cointegrating Equation(s):		Log likelihood	1639.974		

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
1.000000	0.000000	0.000000	-0.731439	0.926020	0.290090
			(0.29714)	(1.71004)	(0.29208)
0.000000	1.000000	0.000000	1.530637	-3.206467	-0.284395
			(0.56860)	(3.27232)	(0.55891)
0.000000	0.000000	1.000000	0.123112	-0.722347	-0.135221
			(0.05698)	(0.32793)	(0.05601)

Adjustment coefficients (standard error in parentheses)

D(LNTB)	-0.217440	-0.141203	0.324002
	(0.07191)	(0.03233)	(0.18171)

D(LNREER)	-0.075767	-0.033525	-0.045784			
	(0.06320)	(0.02842)	(0.15971)			
D(LNGDP)	0.009449	0.009316	-0.037645			
	(0.00709)	(0.00319)	(0.01791)			
D(LNMS)	0.002063	-0.014971	0.090201			
	(0.02585)	(0.01162)	(0.06531)			
D(LNTOT)	0.106370	0.009434	0.493855			
	(0.04205)	(0.01891)	(0.10626)			
D(LNFR)	-0.100908	-0.110541	0.705636			
	(0.10078)	(0.04531)	(0.25465)			

4 Cointegrating Equation(s): Log likelihood 1645.857

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
1.000000	0.000000	0.000000	0.000000	1.238245	-0.093927
				(0.73776)	(0.06481)
0.000000	1.000000	0.000000	0.000000	-3.859840	0.519212
				(1.31579)	(0.11559)
0.000000	0.000000	1.000000	0.000000	-0.774900	-0.070585
				(0.15765)	(0.01385)
0.000000	0.000000	0.000000	1.000000	0.426864	-0.525015
				(1.78299)	(0.15663)

Adjustment coefficients (standard error in parentheses)

D(LNTB)	-0.217900	-0.108036	0.350220	-0.033227
	(0.07055)	(0.03516)	(0.17868)	(0.01206)
D(LNREER)	-0.075484	-0.053946	-0.061927	0.008337
	(0.06262)	(0.03121)	(0.15860)	(0.01071)
D(LNGDP)	0.009433	0.010458	-0.036742	0.002162
	(0.00707)	(0.00352)	(0.01791)	(0.00121)
D(LNMS)	0.002067	-0.015207	0.090014	-0.013205
	(0.02585)	(0.01288)	(0.06546)	(0.00442)
D(LNTOT)	0.106193	0.022260	0.503994	-0.008761
	(0.04171)	(0.02079)	(0.10563)	(0.00713)
D(LNFR)	-0.100398	-0.147353	0.676537	0.009273
	(0.09959)	(0.04963)	(0.25221)	(0.01703)

5 Cointegrating Equation(s): Log likelihood 1649.828

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
1.000000	0.000000	0.000000	0.000000	0.000000	0.061588
					(0.01964)
0.000000	1.000000	0.000000	0.000000	0.000000	0.034444
					(0.03367)
0.000000	0.000000	1.000000	0.000000	0.000000	-0.167906
					(0.00920)
0.000000	0.000000	0.000000	1.000000	0.000000	-0.471404
					(0.08936)
0.000000	0.000000	0.000000	0.000000	1.000000	-0.125593
					(0.01852)

Adjustment coefficients (standard error in parentheses)

D(LNTB)	-0.218468	-0.120059	0.347286	-0.035699	-0.140006
	(0.07057)	(0.05791)	(0.17898)	(0.01533)	(0.12439)
D(LNREER)	-0.079820	-0.145652	-0.084309	-0.010525	0.153882
	(0.06136)	(0.05035)	(0.15562)	(0.01333)	(0.10816)
D(LNGDP)	0.009379	0.009321	-0.037020	0.001928	0.000556
	(0.00707)	(0.00580)	(0.01794)	(0.00154)	(0.01247)

D(LNMS)	0.002336	-0.009510	0.091405	-0.012034	-0.013363
	(0.02585)	(0.02121)	(0.06556)	(0.00561)	(0.04556)
D(LNTOT)	0.105491	0.007417	0.500371	-0.011814	-0.350720
	(0.04168)	(0.03420)	(0.10571)	(0.00905)	(0.07347)
D(LNFR)	-0.095825	-0.050627	0.700144	0.029167	-0.062751
	(0.09873)	(0.08102)	(0.25042)	(0.02145)	(0.17404)

Date: 08/16/15 Time: 20:06
Sample (adjusted): 1980Q4 2014Q4
Included observations: 137 after adjustments
Trend assumption: Linear deterministic trend
Series: LNTB LNREER LNGDP LNMS LNTOT LNFR
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.300011	117.4335	95.75366	0.0007
At most 1	0.207103	68.56679	69.81889	0.0626
At most 2	0.105138	36.77430	47.85613	0.3583
At most 3	0.082304	21.55562	29.79707	0.3239
At most 4	0.056315	9.788795	15.49471	0.2973
At most 5	0.013398	1.847922	3.841466	0.1740

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.300011	48.86668	40.07757	0.0040
At most 1	0.207103	31.79248	33.87687	0.0869
At most 2	0.105138	15.21868	27.58434	0.7307
At most 3	0.082304	11.76682	21.13162	0.5708
At most 4	0.056315	7.940873	14.26460	0.3847
At most 5	0.013398	1.847922	3.841466	0.1740

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
3.816370	4.330227	-23.69355	0.919592	6.764282	3.079450
8.076282	3.001838	16.82542	0.758831	-14.30030	-0.786003
9.303449	2.421652	14.75291	-1.281972	-9.806496	0.015234
-0.038420	2.773932	2.192756	-1.340529	-13.02590	1.992892
0.397838	8.414341	2.053606	1.730672	1.139314	-0.989420
2.841309	0.046204	19.78011	-1.882543	-1.315263	-0.746817

Unrestricted Adjustment Coefficients (alpha):

D(LNTB)	-0.023443	-0.007092	-0.007599	0.011957	-0.001429	-0.001061

D(LNREER)	-0.003046	-0.004044	-0.003384	-0.007362	-0.010899	0.000243
D(LNGDP)	0.001865	0.000705	-0.000362	0.000412	-0.000135	-0.000563
D(LNMS)	-0.003498	-0.004263	0.005357	-8.51E-05	0.000677	-0.001386
D(LNTOT)	-0.009109	0.013496	0.003454	0.004623	-0.001764	3.94E-05
D(LNFR)	-0.027818	0.009504	-0.007685	-0.013271	0.011495	-0.002223

1 Cointegrating Equation(s): Log likelihood 1616.468

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LNREER	LNGDP	LNMS	LNTOT	LNFR
1.000000	1.134645	-6.208401	0.240960	1.772439	0.806906
	(0.33596)	(1.21498)	(0.12039)	(0.65144)	(0.14235)

Adjustment coefficients (standard error in parentheses)

D(LNTB)	-0.089466
	(0.02158)
D(LNREER)	-0.011626
	(0.01879)
D(LNGDP)	0.007116
	(0.00212)
D(LNMS)	-0.013351
	(0.00800)
D(LNTOT)	-0.034763
	(0.01333)
D(LNFR)	-0.106164
	(0.03011)

APPENDIX C – ARDL BOUNDS TEST

ARDL Bounds Test
Date: 08/16/15 Time: 19:02
Sample: 1982Q3 2014Q4
Included observations: 130
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.042816	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

APPENDIX D – ARDL SHORT/LONG RUN MODEL

ARDL Cointegrating And Long Run Form
Dependent Variable: LNTB
Selected Model: ARDL(10, 3, 10, 10, 8, 2)
Date: 08/16/15 Time: 16:21
Sample: 1980Q1 2014Q4
Included observations: 130

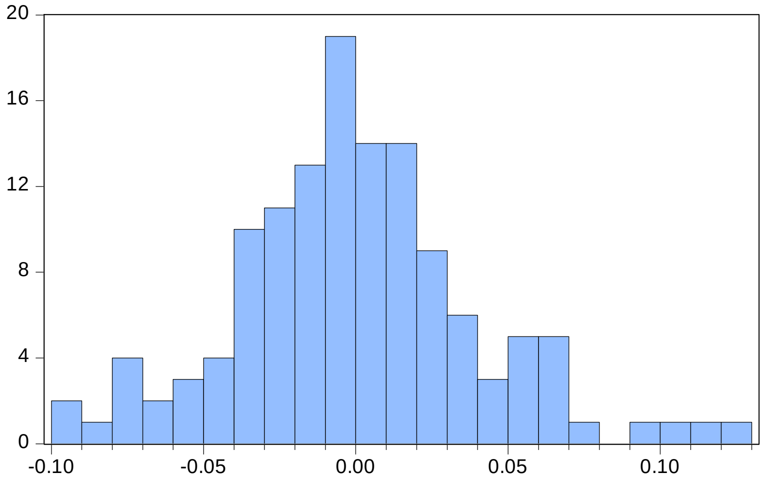
Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTB(-1))	-0.510942	0.109035	-4.686016	0.0000
D(LNTB(-2))	-0.205659	0.097102	-2.117973	0.0372
D(LNTB(-3))	-0.175910	0.096775	-1.817717	0.0728
D(LNTB(-4))	-0.007818	0.092457	-0.084558	0.9328
D(LNTB(-5))	-0.191036	0.088089	-2.168672	0.0330
D(LNTB(-6))	-0.438128	0.090320	-4.850819	0.0000
D(LNTB(-7))	-0.170350	0.092182	-1.847987	0.0683
D(LNTB(-8))	-0.208322	0.093232	-2.234437	0.0282
D(LNTB(-9))	-0.132086	0.075476	-1.750050	0.0839
D(LNREER)	0.093762	0.098935	0.947713	0.3461
D(LNREER(-1))	0.391126	0.146736	2.665506	0.0093
D(LNREER(-2))	-0.306679	0.107736	-2.846581	0.0056
D(LNMS)	-0.162186	0.250387	-0.647739	0.5190
D(LNMS(-1))	-0.129285	0.375341	-0.344447	0.7314
D(LNMS(-2))	-0.375835	0.374334	-1.004010	0.3184
D(LNMS(-3))	0.275205	0.375509	0.732886	0.4657
D(LNMS(-4))	-0.622213	0.372332	-1.671123	0.0986
D(LNMS(-5))	0.668285	0.363254	1.839716	0.0695
D(LNMS(-6))	-0.717966	0.370804	-1.936239	0.0563
D(LNMS(-7))	0.063683	0.389555	0.163475	0.8706
D(LNMS(-8))	-0.396272	0.376239	-1.053244	0.2954
D(LNMS(-9))	0.765390	0.243492	3.143391	0.0023
D(LNGDP)	-0.164025	0.930977	-0.176186	0.8606
D(LNGDP(-1))	-1.548442	1.586446	-0.976045	0.3319
D(LNGDP(-2))	-1.698676	1.563375	-1.086544	0.2805
D(LNGDP(-3))	3.140069	1.597005	1.966224	0.0527
D(LNGDP(-4))	0.061282	1.608925	0.038089	0.9697
D(LNGDP(-5))	-1.682030	1.594729	-1.054743	0.2947
D(LNGDP(-6))	0.458937	1.549606	0.296164	0.7679
D(LNGDP(-7))	0.028395	1.563278	0.018163	0.9856
D(LNGDP(-8))	2.684148	1.543618	1.738869	0.0859
D(LNGDP(-9))	-2.618821	0.897133	-2.919100	0.0045
D(LNFR)	0.166746	0.071712	2.325213	0.0226
D(LNFR(-1))	-0.195798	0.114199	-1.714525	0.0903
D(LNFR(-2))	0.128784	0.104046	1.237756	0.2194
D(LNFR(-3))	-0.042675	0.095408	-0.447286	0.6559
D(LNFR(-4))	-0.069973	0.096523	-0.724932	0.4706
D(LNFR(-5))	0.152396	0.096667	1.576513	0.1188
D(LNFR(-6))	-0.251511	0.091785	-2.740204	0.0076
D(LNFR(-7))	0.141450	0.058896	2.401690	0.0186
D(LNTOT)	0.372645	0.162589	2.291941	0.0245
D(LNTOT(-1))	0.374178	0.164096	2.280241	0.0252
CointEq(-1)	-0.255196	0.104396	-2.444502	0.0167

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREER	-0.376751	0.205732	-1.831270	0.0707
LNMS	-0.334903	0.163152	-2.052709	0.0433
LNGDP	-2.731271	1.589762	-1.718038	0.0896
LNFR	0.428804	0.259067	1.655186	0.1018
LNTOT	1.346248	0.619756	2.172224	0.0328
C	40.010133	19.484764	2.053406	0.0433

APPENDIX E - STABILITY DIAGNOSTIC CHECKS ON THE ARDL MODEL

Jarque-Bera Residuals test:



Series: Residuals
Sample 1982Q3 2014Q4
Observations 130

Mean	-6.96e-15
Median	-0.001712
Maximum	0.126494
Minimum	-0.098022
Std. Dev.	0.040605
Skewness	0.310533
Kurtosis	3.766280
Jarque-Bera	5.269917
Probability	0.071722

Breusch-Godfrey Serial Correlation LM Test:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.740210	Prob. F(2,79)	0.1821
Obs*R-squared	5.485599	Prob. Chi-Square(2)	0.0644

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.155423	Prob. F(48,81)	0.2797
Obs*R-squared	52.83471	Prob. Chi-Square(48)	0.2928
Scaled explained SS	28.37062	Prob. Chi-Square(48)	0.9892

Heteroskedasticity Test: Harvey

Heteroskedasticity Test: Harvey

F-statistic	0.830339	Prob. F(48,81)	0.7551
Obs*R-squared	42.87171	Prob. Chi-Square(48)	0.6825
Scaled explained SS	54.05522	Prob. Chi-Square(48)	0.2542

Heteroskedasticity Test: Glejser

Heteroskedasticity Test: Glejser

F-statistic	1.083474	Prob. F(48,81)	0.3696
Obs*R-squared	50.83108	Prob. Chi-Square(48)	0.3627
Scaled explained SS	38.07673	Prob. Chi-Square(48)	0.8469

Heteroskedasticity Test: ARCH

Heteroskedasticity Test: ARCH

F-statistic	0.643002	Prob. F(1,127)	0.4241
Obs*R-squared	0.649838	Prob. Chi-Square(1)	0.4202

Heteroskedasticity Test: White

Heteroskedasticity Test: White

F-statistic	1.275683	Prob. F(48,81)	0.1655
Obs*R-squared	55.96644	Prob. Chi-Square(48)	0.2007
Scaled explained SS	30.05226	Prob. Chi-Square(48)	0.9802

Ljung-Box Q: Autocorrelation

Date: 01/26/16 Time: 11:56
Sample: 1980Q1 2014Q4
Included observations: 130
Q-statistic probabilities adjusted for 10 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
*|. |	*|. |	1	-0.117	-0.117	1.8078	0.179
.|. |	.|. |	2	-0.035	-0.049	1.9680	0.374
.|. |	.|. |	3	-0.019	-0.030	2.0182	0.569
.|. |	.|. |	4	-0.033	-0.041	2.1649	0.705
.|. |	.|. |	5	-0.004	-0.016	2.1672	0.826
.|. |	.|. |	6	-0.009	-0.015	2.1774	0.903
.|. |	*|. |	7	-0.061	-0.068	2.6899	0.912
*|. |	*|. |	8	-0.073	-0.094	3.4376	0.904
.|. |	.|. |	9	-0.022	-0.053	3.5083	0.941
*|. |	*|. |	10	-0.112	-0.140	5.3133	0.869
*|. |	*|. |	11	-0.106	-0.165	6.9406	0.804
.|. |	.|. |	12	0.057	-0.013	7.4051	0.830
.|. |	.|. |	13	0.021	-0.010	7.4702	0.876
.|. |	*|. |	14	-0.035	-0.069	7.6469	0.907
.|. |	.|. |	15	0.039	-0.008	7.8722	0.929

*|. |	*|. |	16	-0.099	-0.135	9.3531	0.898
.|* |	.|* |	17	0.211	0.152	16.137	0.514
.|. |	.|. |	18	0.044	0.039	16.431	0.563
*|. |	*|. |	19	-0.138	-0.163	19.371	0.433
.|. |	*|. |	20	-0.028	-0.097	19.498	0.490
.|* |	.|. |	21	0.090	0.043	20.767	0.473
.|* |	.|* |	22	0.122	0.136	23.145	0.394
.|. |	.|. |	23	-0.046	-0.022	23.480	0.433
*|. |	*|. |	24	-0.130	-0.170	26.211	0.343
.|* |	.|* |	25	0.085	0.090	27.400	0.336
*|. |	*|. |	26	-0.097	-0.082	28.966	0.313
.|. |	*|. |	27	-0.061	-0.118	29.586	0.333
*|. |	*|. |	28	-0.088	-0.113	30.890	0.322
.|* |	.|. |	29	0.094	0.055	32.402	0.303
.|. |	*|. |	30	-0.045	-0.097	32.756	0.333
.|. |	.|. |	31	-0.008	-0.050	32.766	0.380
*|. |	*|. |	32	-0.086	-0.129	34.064	0.369
.|. |	.|. |	33	0.038	0.051	34.314	0.405
.|. |	*|. |	34	0.009	-0.128	34.330	0.452
.|. |	*|. |	35	0.036	-0.127	34.563	0.489
.|* |	.|* |	36	0.079	0.099	35.703	0.483

*Probabilities may not be valid for this equation specification.

APPENDIX F

Ramsey RESET test

Ramsey RESET Test
Equation: ARDL
Specification: LNTB LNTB(-1) LNTB(-2) LNTB(-3) LNTB(-4) LNTB(-5) LNTB(-6) LNTB(-7) LNTB(-8) LNTB(-9) LNTB(-10) LNREER LNREER(-1) LNREER(-2) LNREER(-3) LNGDP LNGDP(-1) LNGDP(-2) LNGDP(-3) LNGDP(-4) LNGDP(-5) LNGDP(-6) LNGDP(-7) LNGDP(-8) LNGDP(-9) LNGDP(-10) LNMS LNMS(-1) LNMS(-2) LNMS(-3) LNMS(-4) LNMS(-5) LNMS(-6) LNMS(-7) LNMS(-8) LNMS(-9) LNMS(-10) LNTOT LNTOT(-1) LNTOT(-2) LNFR LNFR(-1) LNFR(-2) LNFR(-3) LNFR(-4) LNFR(-5) LNFR(-6) LNFR(-7) LNFR(-8) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.312589	80	0.1931
F-statistic	1.722889	(1, 80)	0.1931

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.004484	1	0.004484
Restricted SSR	0.212686	81	0.002626
Unrestricted SSR	0.208202	80	0.002603

*Note: p-values and any subsequent tests do not account for model selection