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

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ABSTRACT

With the South African Rand (ZAR) recording record lows against most major currencies throughout 2014 coupled with a persistent trade deficit in the BOP, 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 South African economy. The bounds test and Johansen cointegration test results show that there is a long run equilibrium relationship between the trade balance, real effective exchange rate, domestic GDP, money supply, terms of trade and foreign reserves. The results show that a depreciation of the ZAR improves the trade balance in the long run, thus confirming the Marshal-Lerner condition. In the short run, a ZAR depreciation leads to a deterioration of the trade balance, thus confirming the J-curve effect for the RSA economy.

Keywords

Trade Balance; Foreign Exchange; Depreciation; Auto Regressive Distributed Lag model (ARDL); Commercial Policy, J-curve, Marshall–Lerner condition

JEL codes: C32, F13, F31

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. These trade-associated problems 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 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 since the world financial crisis of 2007-2010. This means that these emerging markets have to use both commercial and exchange rate devaluation policies to manage trade deficits and ensure some degree of good balance in their economies.

The nexus between the trade balance 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 using the elasticities approach, the absorption approach and the monetary approach. Theoretically, it is expected that a depreciation of the currency will induce an increase in exports and a decrease in imports, thus, improving the trade balance, whereas an appreciation of the local currency will have the opposite effect.

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 and part of it being 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, the Rand has taken a beating against most major currencies throughout 2014. 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). It also hit a near seven-year low against the pound sterling, trading at R17.70 on the same day (Pells, 2014). From December 2013 to December 2014, the Rand lost about 9.5% of

its value against the dollar. According to Mittner (2014), there are fears that the Rand may stay weak for at least the next five years (2014-2018)

Against this background, it is clear that in South Africa, the trade balance (deficit) and the exchange rate seem to be moving together. Thus, this study aims to determine to what extent the movements in the Real Effective Exchange Rate impact on South Africa's trade balance as well as determining whether the J-curve phenomenon and the Marshal-Lerner condition can be confirmed in the RSA economy.

A multilateral exchange rate or nominal effective exchange rate (NEER) is defined by Dornbusch and Fischer (2005) 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 as the explanatory variable.

2. LITERATURE REVIEW

2.1. Theoretical Framework

The elasticities approach determining the trade balance-exchange rate relationship states that, following a currency depreciation or devaluation, 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, (Wang, 2009).

The J-Curve effect

The J-curve effect describes the time lag with which a currency depreciation or devaluation leads to an improvement in 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: 1-1). 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 balance-of-payments. According to this theory, a currency devaluation or depreciation is expected to improve the trade balance by changing the relative prices of domestic goods and foreign goods, (Reinert and Rajan, 2009).
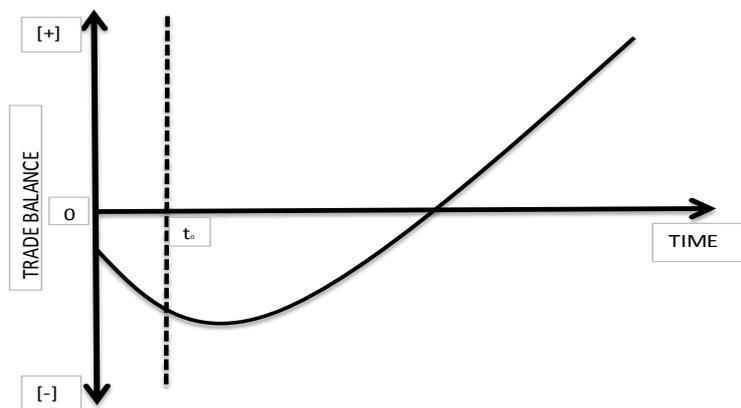
Source: Author, adapted from Lindert and Pugel (2000)

Figure 1-1: The J-Curve

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 lead to an improvement of 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 helped nor worsened if the sum of

the demand elasticities is equal to 1.0. The Marshall-Lerner condition may be stated in terms of the currency of either the nation undergoing depreciation or its trading partner.

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 a devaluation or depreciation) is bound to lead to an increase in imports and hence, deterioration in the trade balance, (Bouchet, Clark and Groslambert, 2003).

Lastly, the monetary approach states that, 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, the excess supply of money is eliminated by outflows of money to other countries, worsening the trade balance, (Appleyard and Field, 2014).

2.2. Empirical Literature

Gupta-Kapoor and Ramakrishnan (1999) have employed the Johansen cointergration procedure using quarterly data from 1975 through 1996 and found a long run cointegrating relationship between trade balance, exchange rate, foreign and domestic GDP, showing that depreciation leads to trade balance improvement in the Japanese economy. The study went further to estimate the error correction model (ECM) and the estimates suggest that in the first five quarters, trade balance deteriorates, and subsequently improves reaching a new equilibrium value in the following 13 quarters. A previous study of the Japanese economy by Noland (1989) for the period 1970 through 1985, also supports the results obtained by Gupta-Kapoor and Ramakrishnan (1999), namely that long-run price elasticities fulfil the Marshall-Lerner condition hence implying that currency depreciation improves trade balance in the long run. A J-curve effect is also confirmed indicating that it takes seven quarters from depreciation for the trade balance to start improving, and that it achieves a new equilibrium after 16 quarters

A study on the Thailand economy using quarterly data from 1973 to 1997 and ARDL cointegration by Bahmani-Oskooee and Kantipong (2001) has found that, versus its

five major trading partners, namely Germany, Singapore, Japan, UK and USA, there is evidence of the J-curve in bilateral trade only with the USA and Japan and none for the rest of the countries in the study. This means that Thailand's trade balance worsened initially before showing improvement, thus depicting the J-curve phenomenon.

An extensive study of predominantly Eastern European countries including Bulgaria, Croatia, Cyprus, Czech Republic, Hungary, Poland, Romania, Russia, Slovakia, Turkey and Ukraine has been done by Bahmani-Oskooee and Kutan (2007). The study has 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 there was a short run deterioration combined with long-run improvement in the trade balance. 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 percent 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 real effective exchange rate by 10 percent would result in about 8.3 percent 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.

Stučka (2003) showed the existence of the J-curve in Croatia while employing the ARDL cointegration approach with quarterly data. The study showed long run cointegrating relations that one percent depreciation improves trade balance on average by 0.9% to 1.3% in Croatia.

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. Rose and Yellen (1989) have undertaken a study covering the period between 1960 and 1985 at the bilateral level

between the USA and its six largest trading partners. The study did not find the J-curve pattern or long-run relationship between bilateral exchange rates and trade flows. Marwah and Lawrence (1996) have also investigated the influence of the real bilateral exchange rate on bilateral trade balance in both the US and Canada with their respective five largest trading partners. Quarterly data covering the period between 1977 and 1992 has been used. 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.

3. METHODOLOGY

3.1. Data analysis

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

3.1.1. 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) will be employed to check the non-stationary assumption as well as to ensure that spurious results as well as problems of autocorrelation and heteroscedastricity are avoided.

3.1.2. 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 a maximum likelihood method that determines the number of cointegrating vectors in a non-stationary time series Vector Auto Regression (VAR) with restrictions imposed. Johansen and Juselius (1990)

3.1.3. Model Specification:

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:

$$LnTB_t = \beta_0 + \beta_1 LnREER_t + \beta_2 LnGDP_t + \beta_3 LnMS_t + \beta_4 LnTOT_t + \beta_5 LnFR_t + \varepsilon_t \qquad (1)$$

Where,

$[LnTB_t]$ = 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.

$[LnREER_t]$ = 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. 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 (2014) 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.

$[LnGDP_t]$ = 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_1 can assume either a positive or negative sign.

$[LnMS_t]$ = 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 IMF IFS. According to Appleyard and Field (2014), under the monetary approach to the BOP, the presence of excess cash balances means that individuals will spend more money on goods and services. This pushes up the prices of goods and services. Furthermore, if the economy is not at full employment, the level of real income rises. Additionally, if part of any new real income is saved, then the level of real wealth in the economy increases. A rise in the price level will lead to increased imports as home goods become relatively more expensive compared to foreign goods. The rise in the price level will also make it more difficult to export to other countries. 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, the excess supply of money generates pressures leading to a current account deficit. Therefore β_3 is expected to be negative as an increase in money supply is expected to worsen the trade balance.

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

$[LnTOT_t]$ = the log of South Africa's Terms of Trade, computed as the ratio between the relative price of exports to the price of imports.

[ε] = the Error term

3.1.4. 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 and 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. This approach is applicable irrespective of the order of integration whether the variables under consideration are purely 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 uses the ARDL method to estimate the long and short run parameters of the models.

ARDL specification for the Trade Balance model

$$\Delta LnTB_t = \beta_0 + \beta_1 LnTB + \beta_2 LnREER_{t-1} + \beta_3 LnGDP_{t-1} + \beta_4 LnMS_{t-1} + \beta_5 LnTOT + \beta_6 LnFR_{t-1} + \sum_{i=1}^{p} \beta_7 i \Delta LnTB_{t-i}$$

$$+ \sum_{i=1}^{q} \beta_8 i \Delta LnREER_{t-i} + \sum_{i=1}^{r} \beta_9 i \Delta LnGDP_{t-i} + \sum_{i=1}^{s} \beta_{10} i \Delta LnMS_{t-i} + \sum_{i=1}^{t} \beta_{11} i \Delta LnTOT_{t-i} + \sum_{i=1}^{u} \beta_{12} i \Delta LnFR_{t-i} + \varepsilon_t$$

$$(2)$$

Where,

Δ denotes the first difference operator [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 2 is denoted the trade balance, with $(\beta_1 - \beta_6)$ on the right hand side representing the long-run relationship and the coefficients thereof. The remaining parameters $(\beta_7 - \beta_{12})$ in equation 2 denote the short-run relationship between the variables in the model as well as the coefficients of the model in the short run.

3.1.5. ARDL Cointegration Test

The ARDL bound test for cointegration is based on the Wald-test (F-statistic). Two critical values are given by Pesaran et al. (2001) for the cointegration test. The lower critical bound assumes all the variables are I(0) meaning that there is no cointegration relationship between the examined variables. The upper bound 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 inconclusive, 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 equations 4, 5 and 6 are shown in following table.

Model	Null Hypothesis [H_0]	Alt Hypothesis [H_1]	Function
Equation 2	$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$	$H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$	F_{LnTB} (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.

3.1.6. 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 3 below

The error correction version of the ARDL model relating to the variables in equation 1 is as follows (where, λ explains the speed of adjustment and **ECT** is the Error Correction Term, and is derived from the residuals obtained in equations 2):

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

$$(3)$$

4. Analysis of Results

4.1. Unit root tests

Table 1-1 summarises the results of the unit root tests from the Augmented Dickey–Fuller (ADF) test.

Table 1-1: Unit root test (Augmented Dickey–Fuller Test)

VARIABLE	INTERCEPT	INTERCEPT & TREND	ORDER OF INTERGRATION
LNTB	-2.282 (0.1791)	-2.609(0.2768)	I(1)
ΔLTB	-18.804(0.0000)***	-18.735(0.0000)***	I(1)
LNGDP	1.125(0.9976)	-1.627(0.7770)	I(1)
ΔLNGDP	-6.324(0.0000)***	-6.547(0.0000)***	I(1)
LNREER	-2.822(0.0578)*	-3.569(0.0364)**	I(1)
ΔLNREER	-5.818(0.0000)***	-5.793(0.0000)***	I(1)
LNMS	-3.220(0.0209)**	-1.113(0.9222)	I(1)
ΔLNMS	-3.650 (0.0060)***	-9.303 (0.0000)***	I(1)
LNFR	-0.230(0.9304)	-3.447(0.0494)**	I(1)
ΔLNFR	-13.213(0.0000)***	-13.176(0.0000)***	I(1)

Source: Author's calculations

* 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 1-1 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 test is 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.

4.2. Johansen test of cointegration

The Augmented Dickey–Fuller (ADF) test employed in section 4.1 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.

Table 1-2: 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 1-3: 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 1-3 and 1-4 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 the 5% level of significance respectively. Thus, there is evidence of a long run relationship between the variables in the model.

4.3. ARDL Cointegration test

Table 1-4: 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 1-5: 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 1-5 and table 1-6 present results of the bounds testing approach. 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 provided sufficient evidence of a long run relationship between the variables in the model, the paper then proceeds to estimate the long run cointegrating equation and the coefficients of the model specified.

Table 1-6: 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 1-6 summarise the results of the long run ARDL model for trade balance equation. 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% increase or appreciation of the ZAR will lead to 3.77% deterioration in the trade balance and 10% depreciation or decrease 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. This result further confirms the Marshal-Lerner condition. According to Yusoff (2009) and Andersson (2010), the coefficient of the exchange rate provides evidence of the Marshal-Lerner condition if the exchange rate depreciation improves the trade balance in the long run.

LNGDP with an elasticity of -2.731 suggests that there is a negative long run relationship between real income or GDP and the trade balance.

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 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.

Table 1-7: 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 1-7 presents the short run parameters of the trade balance model. 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% deterioration 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 economic theory, more specifically, the monetary approach to the balance of payments. According to Appleyard and Field (2014), under the monetary approach to the BOP, the presence of excess cash balances means that individuals will spend more money on goods and services. This pushes up the prices of goods and services. Furthermore, if the economy is not at full employment, the level of real income rises. Additionally, if part of any new real income is saved, then the level of real wealth in the economy increases. A rise in the price level will lead to increased imports as home goods become relatively more expensive compared to foreign goods. The rise in the price level will also make it more difficult to export to other countries. 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, the excess supply of money generates pressures leading to a current account deficit.

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 6th 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 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, and this indicates a low speed of adjustment in the model

5. CONCLUSION AND RECOMMENDATIONS

The paper investigated the impact of the real effective exchange rate depreciation on the trade balance in the South African economy. The results showed 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 to the deterioration of the trade balance, thus confirming the J-curve effect in the RSA economy. GDP is 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 model is corrected in each quarter.

The results 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, a policy aimed at depreciating the ZAR to improve the trade balance can be recommended. 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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