Journal of Quantitative Economics, Vol. 12, No.1, January 2014

WILL THE DEVALUATION OF THE RAND IMPROVE SOUTH AFRICAN COMPETITIVENESS?: AN EMPIRICAL INVESTIGATION FOR THE SHORT-AND LONG-RUN PERIODS

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Abstract

The strength of the rand has raised fears among policymakers, labour unions, and exporters, who argue that a strong rand makes local goods relatively more expensive than foreign goods and that this negatively affects South Africa's competitiveness. This study empirically investigates the relationship between the trade balance, domestic income, foreign income and the bilateral real exchange rate by employing the Autoregressive Distributed Lag (ARDL) approach to cointegration. The results from the ARDL model suggest that the devaluation of the rand does not have a positive impact on South Africa's trade balance. Therefore the arguments put forward by policymakers, labour unions and exporters have no foundation. The recent weakening of the rand and its impacts on the economy confirm this assessment.

Keywords: Currency Depreciation (or Devaluation), J-curve, M-L condition, Real Exchange Rate, Trade Balance.

JEL Classifications: F 31, F14

1. Introduction

The devaluation of the rand is a contentious issue among policymakers, labour unions and exporters. For example the Congress of South African Trade Unions (COSATU), the Federation of Unions of South Africa (FEDUSA) and the National Council of Trade Unions (NACTU) claim that a rand/dollar exchange rate of between R9 and R10.50 would go a long way towards reviving the embattled domestic manufacturing sector (Creamer 2010). In its Accelerated and Shared Growth Initiative (ASGISA), the South African government also pointed out that exchange rate volatility caused by a strong rand is one of the major impediments to the country's economic growth (South African Government 2007).

The current study investigates the effects of the real depreciation of the rand on South Africa's trade balance. It uses the bounds testing procedure within an Autoregressive Distributed Lag framework (hereafter referred to as ARDL) pioneered by Pesaran *et al.* (1996). The study is organised under five sections. Section two provides a review of the literatureon the impact of the

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depreciation of the currency on the trade balance, while the methodology and data are presented in Section three. Section four analyses the empirical findings of the study. The conclusions are presented in Section five.

2. Research Review

Most of the models that investigate the impact of the devaluation of the currency on countries' trade balance focus on the twin concepts of the Marshall–Lerner condition (hereafter referred to as the M-L condition) and the J-Curve effect (Tang 2008). The M-L condition states that the devaluation of the currency will improve the trade balance if the sum of the demand elasticities of export and import is greater than unity; in other words if both demands are elastic, the depreciation will improve the trade balance. This condition is expressed as follows:

$$|E_{DX} + E_{Dm}| > 1 \quad \ldots (1)$$

with E_{DX} and E_{Dm} being the demand elasticity for export and import, respectively. Turning to the J-curve, the theory postulates that, due to adjustment lag, the short-run response to the devaluation is the deterioration of the trade balance; however, in the long-run the trade balance improves significantly, hence the J-curve patterns. This means that the M-L condition is not met in the short-run due to the fact that the demand for exports and imports is inelastic (Chua and Saboori 2011).The J-curve effect was first postulated by Magee (1973) who noted that when a country devaluates its currency, it is possible that the trade balance will deteriorate in the short-run before improving. Magee (1973) stressed that, in the short-run, contracts in force in specified currencies dominate the determinants of the current account. However, in the long-run new contracts begin to dominate and the pass-through of devaluation is affected in a positive way.

Empirical studies that investigate the J-curve phenomenon can be divided into two categories, earlier studies that employed aggregate trade data, and more recent ones that use bilateral trade data. The earlier studies came under strong criticism because of the aggregation bias problem in the data.

More recent literature on the J-curve includes among others, a study conducted by Bahmani-Oskooee *et al.* (2005), who used the ARDL model to detect the presence of the J-curve phenomenon on the bilateral trade balance between Australia *vis-á–vis* 23 of her trading partners. Their study failed to confirm the presence of a J-curve effect. Bahmani-Oskooee and Harvey (2008) used the ARDL model on Malaysia's disaggregated bilateral trade data between the country and her top 14 trading partners. They found that, in the long-run, the devaluation of the ringgitimproved Malaysia's trade balance in at least four cases. However, Bahmani-Oskooee and Harvey (2008) noted that short-run movements of the bilateral trade balance do not follow any clear path. The ARDL approach to cointegration was also used by Bahmani-Oskooee and Cheema (2009) who investigated which trade balances, among 13 of Pakistan's trading partners, reacted to changes in real bilateral exchange rates. Bahmani-Oskooee and Cheema's (2009) study found some evidence of the short-run effects of real exchange rates on the trade balance. However they failed to find conclusive evidence that there is a positive and significant relationship between the real exchange rate and the trade balance in almost half the trading partners.

A survey of the literature revealed that only three studies have investigated the J-curve phenomenon in South Africa. Kamoto (2006) studied the J-curve effect on the trade balance between South Africa and Malawi. Using the cointegration analysis and the vector error correction

model, he found evidence of the J-curve phenomenon in South Africa and noted that the real depreciation of the rand has a long-run positive impact on country's trade balance.

Moodley (2010) used the ARDL approach to cointegration to test the J-curve hypothesis between South Africa and other BRIC countries. He concluded that there is no clear relationship between the exchange rate and the trade balance between South Africa and its BRIC counterparts with the exception of Russia, where a long-term relationship could be identified.

Setou *et al.* (2011) used vector error correction models combined withgeneralised impulse response functions to study the effect of the devaluation of the rand on bilateral trade between South Africa and five of her major trading partners, namely the euro area, the US, the UK, Japan and Switzerland. Setou *et al.* (2011) found evidence of the J-curve in South African bilateral trade balances only with the US and UK. They established that, for bilateral trade between South Africa and the US, a speed of adjustments equal to 33.6% is achieved within a quarter, but full adjustment takes nearly three quarters. In the case of South Africa and the UK, they found that it takes about 2.75 quarters for the trade balance to return to equilibrium at a speed of 36.3% per quarter.

3. Data and Methodology

The study utilised data for South Africa and 10 of her major trading partners namely, China, the US, Japan, Germany, the UK, India, The Netherlands, Switzerland, South Korea and Belgium. South African exports to these countries represent 62.1% of the country's total exports. The variables used in the empirical model are the following: (1) the trade ratios, (2) the bilateral real exchange rates, and (3) the real GDPs (index) and price indices (CPIs) for South Africa and the above-mentioned trading partners. All variables are in natural log form. The data on GDP as well as on consumer price indices (CPIs) were sourced from the International Financial Statistics (IFS). Trade data were provided by the Statistics Division of the South African Department of Trade and Industry (dti). Finally, exchange rate data were sourced from the statistical queries link of the South African Reserve Bank website. All the countries' data with the exception of China[3] are quarterly data from 1996Q1 to 2009Q4.

The model used in the study specifies the trade balance as a function of domestic income, foreign income, and the bilateral real exchange rate. It is expressed as follows:

$$lnTB_{j,t} = a + b \ln Y_{SA,t} + c \ln Y_{j,t} + d \ln REX_{j,t} + \varepsilon_t \quad \ldots (2)$$

where $TB_{jt}$is South Africa's trade balance with trading partner *j* defined as the ratio of South African real exports to country *j* over her real imports from country *j*, $Y_{SA,t}$ is the index of South Africa's real GDP as a proxy for South African income, Y_{jt} is the index of country *J*'s real GDP as a proxy for country *J*'s income, REX_{jt} is the bilateral real exchange rate between the South African rand and *J*'s currency,[4] and ε_t is an error term. It should be noted that the trade balance is measured as a ratio of exports to imports, not only to enable the model to be expressed in log form, but also to make the trade balance measure unit-free.

[3] Due to limitations, only annual data for the period from 1988 to 2008 were obtained.

[4] Thus defined, a decrease in $REX_{jt}$is the appreciation of the rand.

It was expected that an increase in South African income $Y_{SA,t}$ will lead to an increase in her imports from partner *J;* therefore the coefficient b is expected to be negative. However, when an increase in South African income $Y_{SA,t}$ leads to a rise in the production of import-substitute goods, the coefficient b might be negative; hence the sign of coefficient b is ambiguous. Similarly, the coefficient c could also be positive or negative depending on whether an increase in partner *J*'s income Y_{jt} increases its imports from South Africa or increases the production of import substitutes. It is also expected that the real depreciation of the rand will increase exports and lower imports i.e., it will improve South Africa's trade balance. Therefore d the coefficient of real exchange rate REX_{jt}should be positive in the long-run. However, according to the J-curve hypothesis, the trade balance will worsen in the short-run before improving; this means that coefficient d is expected to be negative in the short-run.

Since equation (2) only assesses the long-run effects, it is imperative to incorporate parameters that capture the effect of the depreciation in the short-run period. To this end, the study specified equation (2) in an ARDL format as inspired by Pesaran *et al.*(2001).Equation (2) is therefore specified as follows:

$$\Delta \ln TB_{j,t} = a + \sum_{i=1}^{n} b_i \Delta \ln TB_{j,t-i} + \sum_{i=1}^{n} c_i \Delta \ln Y_{SA,t-i} + \sum_{i=1}^{n} d_i \Delta \ln Y_{j,t-i} + \sum_{i=1}^{n} e_i \Delta \ln REX_{j,t-i} + \delta_1 \ln TB_{j,t-i} + \delta_2 \ln Y_{SA,t-i}$$
$$\delta_3 \ln Y_{j-t-1} + \delta_4 REX_{j,t-1} + \mu_t \quad \text{... (3)}$$

According to Pesaran *et al.*(2001), the main advantage of the ARDL procedure is that there is no need to test for unit root, since the integrating properties of the variables are incorporated in the calculation of the critical values. Pesaran *et al.*(2001) proposed the following two steps for the estimation of equation (3). The first step consists of testing cointegration by carrying out an F-test where the null hypothesis of 'non-existence of cointegration' of $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ is tested against its alternative of $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$ or cointegration. They proposed two sets of suitable critical values to test cointegration. One set assumes that all variables are nonstationary; or I(1) and the other assumes that they are all stationary or I(0).If the calculated F-statistic lies above the upper level of the band, the null hypothesis of 'non-existence of cointegration' is rejected, indicating cointegration. In cases where the calculated F statistic falls below the lower level of the band, the null hypothesis cannot be rejected, suggesting lack of cointegration. Another scenario is when the calculated F-statistic falls within the band; in this case the result is inconclusive and the error-correction term will be a used to establish cointegration (Kremers *et al*. 1992).In the second step, a criterion is used to select the lag length in equation (3). After imposing maximum lags on each of the first differenced variables in equation (3), the AIC criterion is used to select the optimal model.

4. Results and Discussion

TheR^2 values and F-statistics estimates for all 10 trading partners are shown in Table1. The high value of $R^2$for almost all countries suggests an overall goodness of fit of the model. Equally, in all cases except China, the F-statistics results for the ARDL model are higher than the upper bound of 3.52 for a 10% level of significance suggested by Pesaran *et al.* (2001, p.300).Therefore the null hypothesis of no-cointegration is rejected, meaning that there is cointegration among the four variables of the model; hence the retention of lagged level variables.

Table 1. Some descriptive statistics (R^2 and F-test)

Country	R^2	*F-test[P-value]*
Belgium	0.626	13.39***
China	0.377	2.62*
Germany	0.667	9.25***
India	0.575	4.157**
Japan	0.550	14.14**
The Netherlands	0.706	4.609*
South Korea	0.329	5.427**
Switzerland	0.665	7.566***
United Kingdom	0.396	2.880*
United States	0.760	9.46**

***Significant at 1%, ** Significant at 5%, * Significant at 10 %

4.1 Short-run model results

The results for the short-run coefficient for bilateral real exchange rate $(e_i)$are shown in Table 2. The estimates for e_i are significantly positive in the cases of China, India, Germany, The Netherlands and Switzerland. A positive e_i suggests improvement in the trade balance in the short-run; this is in contradiction of the J-curve hypothesis. For the remaining countries, i.e., Belgium, Japan, South Korea, the UK and the US, the coefficient e_i is statistically significantly negative, suggesting a worsening of the trade balance in the short-run as a result of the depreciation of the rand; therefore, the e_i coefficient of these countries is in line with the J-curve hypothesis. For instance, the short-run coefficient for the real exchange rate between the rand and the UK pound (e_i) is -0.690; this suggests that a decrease of 1% in the bilateral real exchange rate (REX) between the rand and the English pound, that is, the appreciation of the rand, leads to a 0.690%increase in South Africa's trade balance. It is worth noting that, the results are not statistically significant for South Korea and Japan.

4.2 Long-run model results

The results for the long-run coefficient for bilateral real exchange rate δ_4 are shown in Table 3. The long-run model results follow the same pattern as the short-run results. On the one hand, in the case of China, India, Germany, The Netherlands and Switzerland, a positive δ_4 was obtained, suggesting that the depreciation of the rand improves South Africa's trade balance in the long-run. However, the results are only significant in the case of Switzerland.

On the other hand, in the case of Belgium, Japan, South Korea, the UK and the US, the coefficient δ_4 is negative, suggesting a worsening of the trade balance following a real depreciation of the rand. The results are only statistically significant in the case of Belgium, the UK and the US. For instance, the coefficient for the bilateral real exchange rate (δ_4) of -0.219 between the rand and the UK pound means that in the long-run, a decrease of 1% in the real exchange rate, that is, the appreciation of the rand, leads to a0.219%increase in South Africa's trade balance. It is worth noting that a negative δ_4 contradicts the J-curve theory that suggests that the coefficient estimate δ_4 should be positive in the long-run.

Table 2. Short-run coefficient for bilateral real exchange rate using AIC lag selection

Trading partner	*e_i coefficient(t-statistics)[Prob.]*
Belgium	-0.73(-2.34)[0.026]**
China	-0.85(-0.74)[0.527]
Germany	0.93(2.33)[0.030]**
India	0.17 (2.16)[0.039]**
Japan	-0.13 (-0.54)[0.589]
The Netherlands	2.49(2.95)[0.013]**
South Korea	-0.43(-1.63)[0.114]
Switzerland	3.05(3.34)[0.002]**
United Kingdom	-0.69(-2.015)[0.054]*
United States	-0.29(-2.43)[0.022]**

***Significant at 1%, ** Significant at 5%, * Significant at 10 %

Table 3. Long-run coefficient estimates using AIC lag selection

Trading partner	*a [Prob.]*	*δ_2[Prob.]*	*δ_3[Prob.]*	*δ_4 [Prob.]*
Belgium	-14.14[0.091]*	-6.51[0.016] **	10.23[0.002] ***	-0.54[0.016]**
China	-0.94[0.321]	0.66[0.215]	0.159[0.404]	-0.73[0.516]
Germany	-5.5[0.003]***	-0.48[0.450]	5.21[0.112]	0.71[0.183]
India	-87.78[0.780]	34.62[0.74]	-13.29[0.748]	5.22[0.74]
Japan	-17.22[0.047] **	0.74[0.348]	3.26[0.184]	-0.03[0.905]
The Netherlands	27.95[0.520]	5.02[0.118]	-10.67[0.372]	0.28[0.48]
South Korea	-1.98[0.713]	3.91[0.153]	-4.39[0.110]	-0.99[0.188]
Switzerland	-21.67[0.398]	11.15[0.055]*	-6.96[0.515]	2.56[0.014] **
United Kingdom	-6.48[0.000] ***	0.30[0.228]	1.50[0.001]***	-0.21[0.011]**
United States	-10.83[0.000] ***	-1.21[0.125]	3.90[0.006] ***	-0.22[0.025] **

***Significant at 1%, ** Significant at 5%, * Significant at 10 %

The fact that in most cases the results that are statistically significant are those where the coefficient for the bilateral real exchange rate δ_4 is negative, suggests that the depreciation of the rand worsens the trade balance more than it improves it. One explanation for this situation is that the South Africa economy is characterized by a high degree of import intensity that places limits on any export-oriented strategy. It is also worth noting that the countries with which the relationship between the real exchange rate and the trade balance was found to be significantly negative, namely, the UK,U.S and Belgium, are countries that consistently remained South Africa's major trading partners over the period of study.

Finally, from long-run coefficient estimates, an error correction term (ECM) is formed. This is obtained by replacing the linear combination of the lagged level variable in equation (3) with ECM_{t-1}.and by rerunning the model using the same optimum lags.A significantly negative coefficient is obtained for $ECM_{t-1.}$ This not only supports cointegration, but also reflects the adjustment of all variables in each model toward their long-run equilibrium (Bahmani-Oskooee and Harvey 2009).

As it can be seen in Table4, there is strong support for cointegration as well as adjustment toward the equilibrium; this is illustrated by a significantly negative$ECM_{t-1,}$with Switzerland being the only exception.

Other diagnostic tests are also shown in Table 4 including, the Lagrange Multiplier (LM) statistic which tests for serial correlation. The LM statistic has a χ^2 distribution with four degrees of

freedom (i.e., number of restriction).Given the fact that the LM statistic is less than 9.49[5] (critical value), it can be deduced that the residuals in most optimum models are not autocorrelated with China being the exception. Another diagnostic test is the Ramsey's RESET test which tests the eventuality of misspecification of the model. With a critical value of 3.84 at5% level of significance for one degree of freedom for χ^2 distribution, it is clear that the model is correctly specified, except in the case of Switzerland. Indeed, in all cases the RESET statistic is less than the critical value of 3.84. Stability for short- and long-run coefficient estimates is also tested by means of CUSUM (Cumulative Sum) and CUSUMSQ (CUMulative SUM of Square).With CUSUM, the recursive residuals are plotted against the break points, while CUSUMQ plots the squared recursive residual against breaking point. Graphical presentations of CUSUM and CUSUMQ are summarized in table 4 and can be provided by the authors on request. As can be seen in Table 4, in all cases the CUSUM results indicate stable results, while the CUSUMSQ also indicate stable results with the exception of Japan and Switzerland.

Table 4. Diagnostic tests

Trading partner	*ECMt-1[P-value]*	*LM*	*RESET*	*CUSUM*	*CUSUMSQ*
Belgium	-1.34[0.000]***	1.85	0.76	S	S
China	-5.52[0.003]***	11.107	-	S	S
Germany	-0.24[0.045]**	3.57	1.706	S	S
India	-0.18[0.736]	3.54	0.00094	S	S
Japan	-0.65[0.000]***	0.74637	0.76376	S	U
The Netherlands	1.93[0.058]*	6.38	0.625	S	S
South Korea	-0.43[0.007]***	0.512	1.995	S	S
Switzerland	0.05[0.914]	2.44	9.685	S	U
United Kingdom	-3.14[0.001]***	6.441	1.838	S	S
United States	-1.28[0.002]***	6.9105	2.044	S	S

***Significant at 1%, ** Significant at 5%, * Significant at 10 %

5. Conclusion and Policy Implications

The study employed the ARDL approach to cointegration, to examine the presence of the J-curve phenomenon between South Africa and 10 of her major trading partners. Using disaggregated data the study could not detect the J-curve phenomenonin 9 of the 10 cases that were examined. The only case where J-curve effect could be identified is for bilateral trade between South Africa and Switzerland. However, the diagnostic test revealed discrepancies in model specification as well as significant instability in the model's parameters; therefore the results are unreliable.

The results are in line with Moodley's (2010) study that found no evidence of the J-curve effect between South Africa and its BRICS counterparts. However, the results contradict Setou *et al.* (2011) who identifiedthe J-curve phenomenon in bilateral trade balances between South Africa and two of its major trading partners namely the US and UK.

[5] Because annual data were used for China, the degree of freedom is one and a critical value is 3.81.

The results of the study suggest that devaluation of the rand will not have a positive impact on South Africa's trade balance; therefore the arguments of policymakers, labour unions and exporters who advocate the devaluation of the rand have no foundation.

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