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Examining the Determinants of the South African Current Account Deficit and its Sustainability

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Abstract: Countries that run large current account deficits (CAD) signal negative perceptions to investors as the deficits might not be sustainable. Credit risk posed by currency weakness, credit downgrades and political uncertainties link to increased macroeconomic risks. The paper aims to find, in a first step, the determinants of South Africa's current account and, in a second step; to examine whether its current deficit is sustainable. To find the determinants of the CAD, an autoregressive distributive lag model (ARDL) is used with quarterly time series data spanning the post-apartheid era [1994-2017]. The ARDL bounds test results indicate that a long run relationship exists between the determinants of the CAD. Factors such as household savings, growth rate have positive significant impacts and net portfolio investments have a negative impact on the South African CAD. Further analyses evaluate, by using scenario analysis including feedback between the stock of debt and flows of income payments, the sustainability of the South African current account deficit. It turns out that the current deficit is not sustainable and that a further real depreciation of the rand is recommended.

Keywords: Current account deficit, Growth rate, Household savings, Income payments, Net portfolio investment

1. Introduction

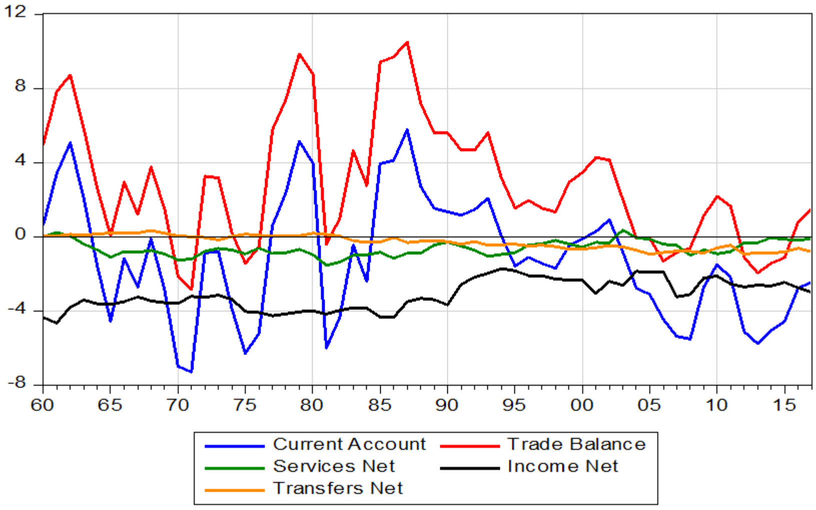
During the past two decades' current account balances and exchange rates behaviour have confounded economists and preoccupied policy makers. In South Africa, the period has been marked by, among other macroeconomic issues widely fluctuating exchange rates, persistent public debt and extraordinary current account deficits (CAD) (SARB, 2017). Countries that run large CAD signal negative perceptions to investors as the deficits might not be sustainable. Credit risk posed by currency weakness, credit downgrades and political uncertainties link to increased macroeconomic risks (Searle & Mama, 2010).

The current account in the balance of payments is a record of exports and imports of goods and services, transfers and international factor payments (Sodersten & Reed, 1994). A current account deficit is a result of payments made for imports, transfers and factors employed exceeding revenue from exports and from transfers and factor payments received. South Africa, being an open economy and also an emerging market, is vulnerable to global economic shocks, mainly those of its major trading partners (Draper, 2008). External disturbances whether positive or negative, can spill over to emerging economies like South Africa whose economic growth largely depends on export-led growth (Draper, 2008). There has been a gap in the literature about South African current account deficit determination and its sustainability (Searle & Mama, 2010; Nicita, 2013). The need for analysis is greatest on two sets of questions: Firstly, what factors have determined the size and sign of its current account balance in recent years and, secondly, is the CAD that, with the exception of 2001 and 2002, was observed since 1995 sustainable?

2. Current Account, External Debt and Rating by Agencies

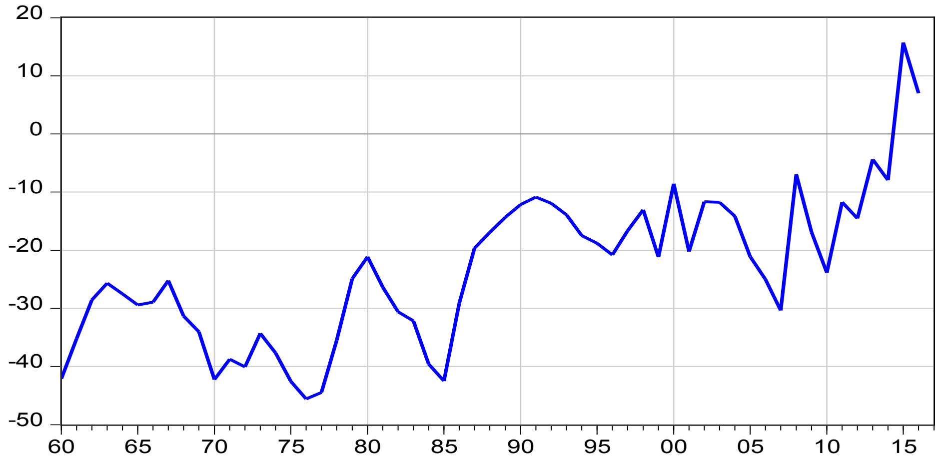
The current account of a country determines the dynamics of its external debt. The external debt increases when a country runs a CAD *vice versa*. Figure 1 on the next page shows the development of South Africa's current account along with its four components, namely the trade balance (TB), net export of services, net current income, and net transfers from 1960 to 2017. All variables are expressed in per cent of GDP. The current account (blue line) shows some cyclical pattern but since the mid-1980s the current account seems to have been on a downward trend. However, a CAD does not necessarily increase net external debt. Favourable

Figure 1: South Africa's Current Account and its Components, 1960-2017, in % of GDP



Source: Author compilation from SARB data

Figure 2: South Africa's International Investment Position, 1960-2016, in % of GDP



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price effects can lead to an improvement in the international investment position along with a CAD.

Figure 1 shows that there is a strong degree of synchronicity between the current account and the TB. Since 1960, South Africa's TB has always been more favourable, meaning that its surplus has been larger or its deficit smaller, than its current account. Indeed, South Africa has been running TB surpluses in most years since the late 1970s. The most recent episodes of TB deficits were the ones from 2004 to 2008 and from 2012 to 2015 but the deficits of 2004 and 2005 were only about 0.1 per cent to GDP. Net transfers and net exports of services tend to be negative and relatively small compared to other net items of the current account.

The fact that the balance in the current account is persistently lower than the trade balance is caused by sizable deficits in the current income account. Until recently, South Africa's International Investment Position (IIP) was negative (see Figure 2). It is no surprise that income payments are larger than income receipts when the IIP is negative but in 2015 the IIP became positive for the first time since 1960. Therefore, it can be expected that the chronic deficit in the current income account will be substantially reduced or perhaps even eliminated in the near future if and when the South African IIP remains positive.

The strong improvement in South Africa's IIP since 2012 should have signalled to international investors and markets that its external economic relations are less strained. It does not fit into this picture; however, starting in 2012, the three leading rating agencies (Moody's, S&P, and Fitch) started to downgrade South Africa's foreign currency debt.

Figure 3 plots those ratings from October 1994 to May 2018 using S&P's and Fitch's rating scale. Moody's rating uses a slightly different nomenclature but its BAA is equivalent to the BBB rating of the other two agencies and instead of using the notches plus (+), neutral and minus (-) it uses the notches 1, 2, and 3 instead. As Figure 3 illustrates, the rating of the three agencies are very similar and often the same. However, Moody's rating is relatively positive and, in fact, South Africa never dropped out of investment grade (BAA3 and BBB-, respectively) in Moody's rating. Since April 2017, South Africa's foreign currency bonds are rated as speculative grade by S&P and Fitch. Since November 2017, S&P rating of South Africa is even two notches below investment grade.

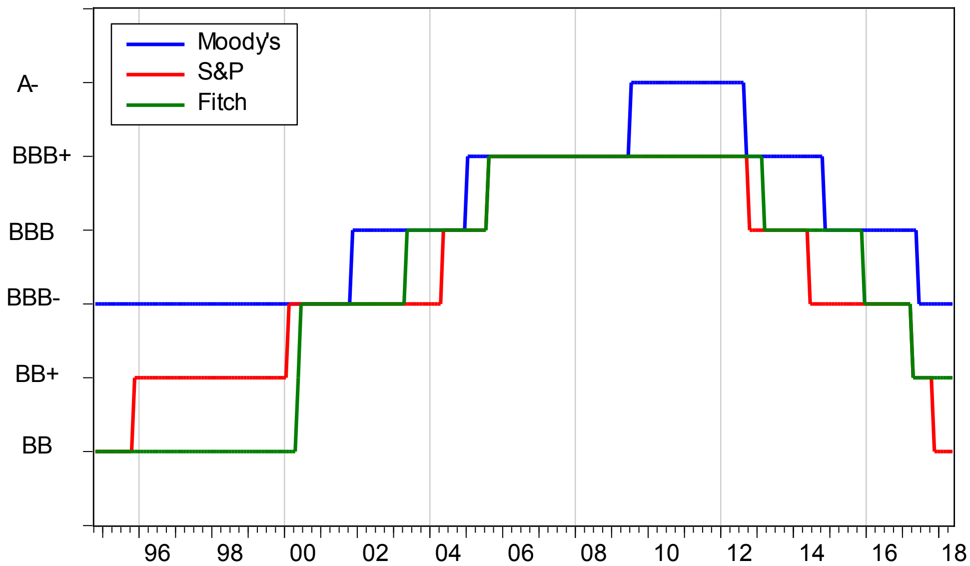
This is the paradox that motivates this paper: How can South Africa's junk bond status in the rating of S&P and Fitch be reconciled with the fact that both South Africa's TB and IIP are currently positive. The rating of a country takes into account more factors than just the TB and the IIP but it would be odd to find that a country's foreign-currency bonds are rated as junk and yet its current account is sustainable. Therefore, we focus on the modelling of South Africa's current account and on the question of whether it is sustainable.

3. Literature Review

The analysis of the determinants of South Africa's current account and, examination of whether its current deficit is sustainable, is based on two intertemporal approaches of elasticity and absorption. The elasticity approach provides an analysis of what happens to the current account balance when the country devalues its currency (Damion & Williams, 2007). It holds that an appreciation in the real exchange rate should result in higher levels of imported goods and services, and lower exports. The extent to which the exchange rate changes will depend on the relative elasticity's associated with export and import commodities. In effect, these assumptions mean that domestic and foreign prices are fixed so that changes in relative prices are caused by changes in the nominal exchange rate. Given this imports would have become cheaper while exports would have become relatively more expensive. Whereas depreciation in the real exchange rate should result in lower levels of imported goods and services and higher exports, meaning imports would have become more expensive while exports would have become relatively cheaper.

The extent to which changes in the real effective exchange rate may be realised will depend on the relative elasticity's associated with export and import commodities (Alexander, 1952; Damion & Williams, 2007). If, for example, a country relies heavily on imported intermediate inputs, that is, there are no close substitutes; depreciation in the nominal exchange rate may not stimulate changes in imports as the price elasticity of demand is low. This idea is summarised in the Marshall-Lerner condition, which

Figure 3: Rating of South Africa's Foreign Currency Debt, 1994:10 – 2018:05



Source: World Bank(2018)

states that depreciation will have a positive effect on a country's balance of payments if the sum of the elasticities of demand for its exports and imports is greater than unity. The opposite holds if it is less than unity. Furthermore, the Bickerdike, Robinson and Metzler (BRM) model provides a sufficient condition for a trade balance improvement when exchange rates depreciate (Jarita, 2007). Decreasing the foreign price of the depreciating country's export and increasing the price of imported goods would reduce import demand and finally improve trade balance. Therefore, according to the BRM theory, the effect of depreciation depends on the elasticity of exports and imports.

The absorption approach was developed by Alexander (1952), where this approach relaxes the assumption taken by elasticity approach and laid emphasizes on the income effects of devaluation. It is established on the idea that the current account is equivalent to the difference between national income and domestic absorption arising from private and public consumption and investment. Depreciation affects the current account directly through its effects on real income and absorption and indirectly on the income elasticity of absorption. Miles (1979) posits that the depreciation of a country's currency may cause the terms of trade to deteriorate, switching expenditure away from foreign goods to domestically produced ones, and thereby improving the trade balance of that country. The elasticities approach mentioned above focuses completely on the effect of changes in relative prices on imports, exports, and the current account balance. It however ignores the influence of income effects for determining these variables.

Ng *et al*. (2008) found a long run relationship between trade balance and exchange rate in Malaysia and also found determinants of trade balance as domestic income and foreign income. Also, the real exchange rate was an important variable to the trade balance, and devaluation improved trade balance in the long run, thus consistent with Marshall-Lerner condition. Sekantsi (2009) used ARCH and GARCH models to examine the effect of real exchange rate volatility on South African exports to the United States and found a significant and negative impact both in the long and short-run. Kariuki (2008) studied the determinants of current account balance in Kenya using the inter-temporal approach and found a long-run and short-run impact of the exchange rate and savings on the current account balance. Also, Osoro (2013) discovered that the balance of payment in Kenya is determined by exchange rate movements and foreign direct investments inflow.

Arouri *et al*. (2015) examined the dynamic interlinkage between India's real effective exchange rate and real current account deficit using standard VAR and structural VAR (SVAR) for the period 1975-2011. The results of the study found a positive relationship between real currency and current account deficit, thereby highlighting the occurrence of permanent shocks. A positive shock to the current account deficit leads to an appreciation in the real exchange rate. Sato *et al*. (2011) indicated that the China's renminbi exchange rate to the US dollar needs to be revalued to increase China's current account surplus. Tihomir (2004) showed that permanent depreciation of the exchange rate in Croatia improves the equilibrium trade balance.

4. Determinants of Current Account Deficit (CAD)

This section discusses the methodology adopted in order to answer the question of what determines current account deficit in South Africa. The section specifies the model, data, discuss estimation techniques employed and provide results.

4.1 Model Specification

In order to achieve the aim of finding the determinants of the current account deficit, the original specified model was:

$$CAD = f\left(REER, RSHI, NGD, LGDP, NPI\right) \quad (1)$$

Where CAD is current account deficit, REER is the real effective exchange rate, NGD is fiscal balance, RSHI is ratio of saving to household income, NPI is net portfolio investment and LGDP is economic growth. After running some tests the absorption approach is adopted, the estimated model was reduced to:

$$CAD = f\left(RSHI, NPI, LGDP\right) \quad (2)$$

4.2 Data

The study uses South African quarterly time series data from 1994 to 2016, the post-apartheid era. The data were collected from the South African Reserve Bank.

4.3 Estimation Techniques

The study applies an autoregressive distribution lag (ARDL) approach adopted from Pesaran, Shin, & Smith (2001). The ARDL captures the cointegration between a set of variables, the long run and short run simultaneously. When dealing with time series data, the first step is to perform unit root tests, in order to address issues of stationarity. In cases where the time series data are non-stationary, a simple regression model may generate spurious results (Brooks, 2008). For the purpose of the study, the Augmented Dickey-Fuller (ADF) and the Phillip-Perron test (PP) are employed to test the null hypothesis of non-stationarity (Asteriou & Hall, 2007). If data is found to contain a unit root, it will be differenced to obtain stationarity.

If variables in the series show different orders of integration meaning are integrated of different order, the ARDL is the recommended (Pesaran *et al*., 2001). ARDL is used due to its ability to incorporate small sample size data and yet generate valid results. The ARDL cointegration approach gives a lower bound critical value and the upper bound critical value. If the computed F-statistics lies above the upper critical bounds test, we reject the null hypothesis of no cointegration, indicating that cointegration exists. In case where the computed F-statistic lies in between of the two bounds test, the cointegration becomes inconclusive (Pesaran, *et al*., 2001).

To determine the long run, the short run dynamics and error correction model, Equation 2 can be transformed in to:

$$\Delta CAD_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta CAD_{t-1} + \sum_{i=1}^{p} \beta_2 \Delta RSHI_{t-1} + \sum_{i=1}^{p} \beta_3 \Delta NPI_{t-1} + \sum_{i=1}^{p} \beta_4 \Delta LGDP_{t-1} + \delta_1 CAD_{t-1} + \delta_2 RSHI_{t-1} + \delta_3 NPI_{t-1} + \delta_4 LGDP_{t-1} + \phi EC_{t-1} + \varepsilon_t \quad (3)$$

Where Δ denotes the first difference operator, β_0 represent the constant, ε_t represent the error term. The long run relationship in the model is captured by $\delta_1, \delta_2, \delta_3$ and δ_4 . The short run relationship in the model is represented by $\beta_1, \beta_2, \beta_3$ and β_4 , φ denotes the speed of adjustment to the long-run equilibrium and EC denotes the residuals obtained from estimated cointegration equation (Pesaran *et al*., 2001).

Variance decompositions were also carried out. According to Pesaran and Shin (1999), variance decomposition is conducted to measure the percentage contribution of each innovation to the one-step forecast error variance of the dependant variable. The study runs diagnostic tests to verify if the results of the model are reliable and efficient (Gujarati & Porter, 2009; Stock & Watson, 2012). The time series models have to satisfy the assumptions of classical linear regression model. The tests of serial correlation, normality and heteroscedasticity are done. The study further employs the cumulative sum of recursive residual (CUSUM) and the cumulative sum of squares of recursive residual (CUSUMsq) to test stability of the long run and the short run parameters of the model. According to Brooks (2008), the CUSUM and CUSUMsq are of paramount importance if one is not certain on when the structural change might have taken place and the methods are perfect for stationary data. Also, the inverse roots of AR characteristic polynomial indicate stability of the results (Asteriou & Hall, 2007).

4.4 Empirical Results and Discussion

Table 1 on the following page gives results of the Augmented Dickey Fuller (ADF) and Phillips Perron (PP), which reports the p-values. It has been found that the ADF and PP show different stationarity results for current account deficit (CAD), fiscal balance (NGD), ratio of saving to household income (RSHI) and net portfolio investment (NPI). For instance, the variables became stationary after first differencing in the ADF whereas they were stationary at level in the PP. Economic growth (LGDP) became stationary after first differencing and real exchange rate (REXCH) was stationary at level in both tests. It can be concluded that the variables in the study are integrated of different orders.

After finding out that there are different orders of integration as demonstrated in Table 1, the ARDL bounds test was run to find if there is cointegration. Table 2 on the next page displays the cointegration results of the bounds testing. The current account deficit model has four variables. Therefore, there are three independent variables in the model, hence k = 3.

The calculated F-statistics is 3.99, which is greater than the lower bounds critical values of 2.79 and 3.67 by Pesaran *et al*. (2001) at 5% level of significance. The calculated F-statistics is also greater than the upper critical value of 3.3 at 10% level of

Table 1: Unit Roots Test Results

Order of integration	Variables	Augmented Dickey-Fuller			Phillips-Perron		
		Intercept	Trend and intercept	None	Intercept	Trend and intercept	None
Level	CAD	0.194	0.3739	0.2243	0.0525	0.0242*	0.1508
1st diff	CAD	0.0001***	0.0000***	0.0000***	0.0001***	0.0000***	0.0000***
Level	REXCH	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Level	RSHI	0.2387	0.9428	0.0209**	0.0434**	0.0000***	0.0043***
1st diff	RSHI	0.0001***	0.0000***	0.0000***			
Level	NGD	0.3069	0.5247	0.2662	0.0000***	0.0000***	0.0000***
1st diff	NGD	0.0046***	0.0187**	0.0002***			
Level	NPI	0.0863	0.0000***	0.0566	0.0000***	0.0000***	0.0000***
1st diff	NPI	0.0000***		0.0001***			
Level	GROWTH	0.0000***	0.0002***	0.0140**	0.0001***	0.0002***	0.0046***
Level	LGDP	0.5581	0.9631	0.9999	0.4197	0.9857	1.0000
1st diff	LGDP	0.0000***	0.0002***	0.0142***	0.0001***	0.0002***	0.0046***
Note: CAD - current account deficit, REXCH - real effective exchange rate, NGD - fiscal balance, RSHI - ratio of saving to household income, NPI - net portfolio investment, LGDP - economic growth, *** stationary at 1%, ** stationary at 5%, * stationary at 10%, 1 st diff first difference.							

Source: Author compilation from SARB data

Table 2: ARDL Bounds Test

Test Statistic	Value	k	
F-statistic	3.999993	3	
Critical Value Bounds			
Significance	Lower Bound	Upper Bound	Decision
10%	2.37	3.2	Cointegration
5%	2.79	3.67	Cointegration
2.5%	3.15	4.08	None
1%	3.65	4.66	None
Note: Critical values are obtained from Pesaran, Shin, & Smith (2001)			

Source: Author compilation from SARB data

significance. Therefore, it can be concluded that there is cointegration amongst the variables in the current account deficit model, meaning in the long run the variables are co-moved and have a long run relationship.

Having found the evidence of the long run relationship through the bounds testing, the coefficients of long run are projected. Table 3 presents results of short, long run coefficients and error correction estimates that were estimated using an ARDL model, after eliminating some variables that were not significant as specified in Equation 1. The ARDL estimated Equation 2 and the results are reported in Table 3 on the next page.

Table 3 indicates that ratio of saving to income (RSHI) can significantly determine current account deficit at 1%. Also, an increase in this ratio by 1% can positively increase current account deficit by 1.97% in the long run. However, in the short run the ratio of saving to income has a negative effect after lagged once to three times. This is in line with other scholars who found a long run relationship in the current

Table 3: ARDL Short and Long Run Results Cointegrating Form

Short Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(CAD(-1))	-0.225686	0.096806	-2.331327	0.0223
D(RSHI)	0.185428	0.132026	1.404487	0.1641
D(RSHI(-1))	-0.384636	0.184776	-2.081638	0.0406
D(RSHI(-2))	-0.421687	0.154750	-2.724953	0.0079
D(RSHI(-3))	-0.259027	0.117079	-2.212417	0.0298
D(NPI)	-0.000011	0.000004	-2.686957	0.0088
D(NPI(-1))	0.000009	0.000004	2.259359	0.0266
LGDP	0.004517	0.017184	0.262875	0.7933
ECT	-0.357242	0.078446	-4.553987	0.0000
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
RSHI	1.972813	0.496570	3.972878	0.0002
NPI	-0.000050	0.000022	-2.233461	0.0283
LGDP	28.645530	11.794140	2.428794	0.0174
C	-185.346706	75.199967	-2.464718	0.0159
Note: D denote differenced variables, CAD - current account deficit, RSHI - ratio of saving to household income, NPI - net portfolio investment, LGDP - economic growth, ECT - error correction term				

Source: Author compilation from SARB & IMF data

Table 4: Diagnostic Tests

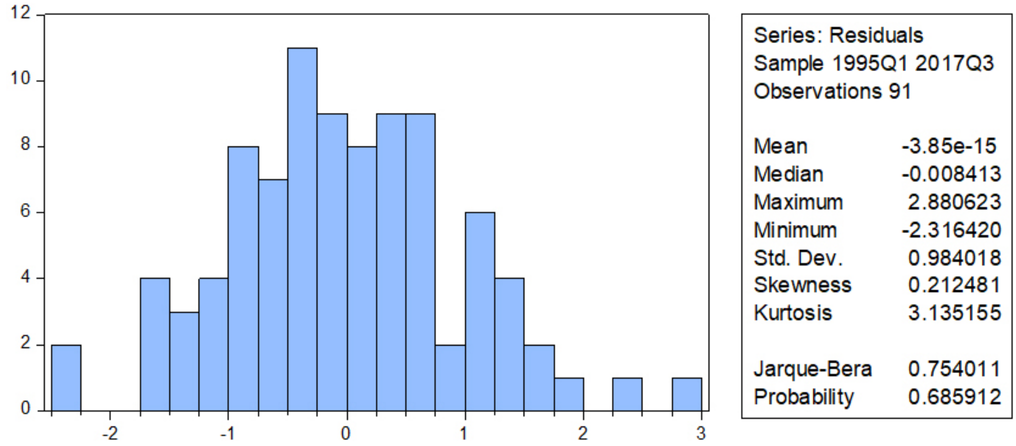
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.723466	Prob. F(11,79)	0.7128
Obs*R-squared	8.328030	Prob. Chi-Square(11)	0.6837
Scaled explained SS	6.700591	Prob. Chi-Square(11)	0.8228
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.555912	Prob. F(2,77)	0.5758
Obs*R-squared	1.295272	Prob. Chi-Square(2)	0.5233

Source: Author compilation from SARB & IMF data

account deficit modelling (Obstfeld & Rogoff, 2000; Damion & William, 2007; Ventura, 2001, Searle & Mama, 2010). There is a negative significant short and long run relationship between current account deficit and net portfolio investment (NPI) at 1% and 5% respectively. The growth of the economy (LGDP) can significantly explain current account deficit in the long run at 5% and not in the short run.

The error correction term which indicates the speed of adjustment to equilibrium is less than zero and negative at -0.36 and statistically significant at 1%. This implies that the estimated model can adjust quickly and converge towards equilibrium at a speed of 36%. Table 4 indicates diagnostic results and it can be confirmed that the ARDL model has no features of heteroscedasticity and serial correlation since the associated probability values of 0.6837 and 0.5233 respectively exceed 5%; and Figure 4 on the next page shows that the model follows a normal distribution as indicated by a kurtosis around 3 (Brooks, 2008). The stability of the series is illustrated by the CUSUM and CUSUM square test results in Figures 5 and 6 where the parameters are within the critical lines of 5% level of significance throughout the sampled period.

Figure 4: Normality Test Results



Source: Authors

Figure 5: Stability Test Results - CUSUM

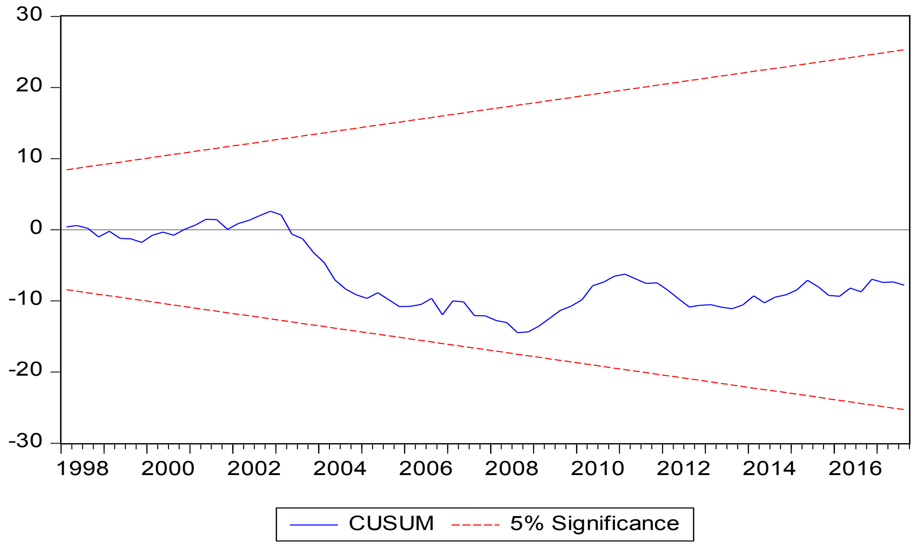


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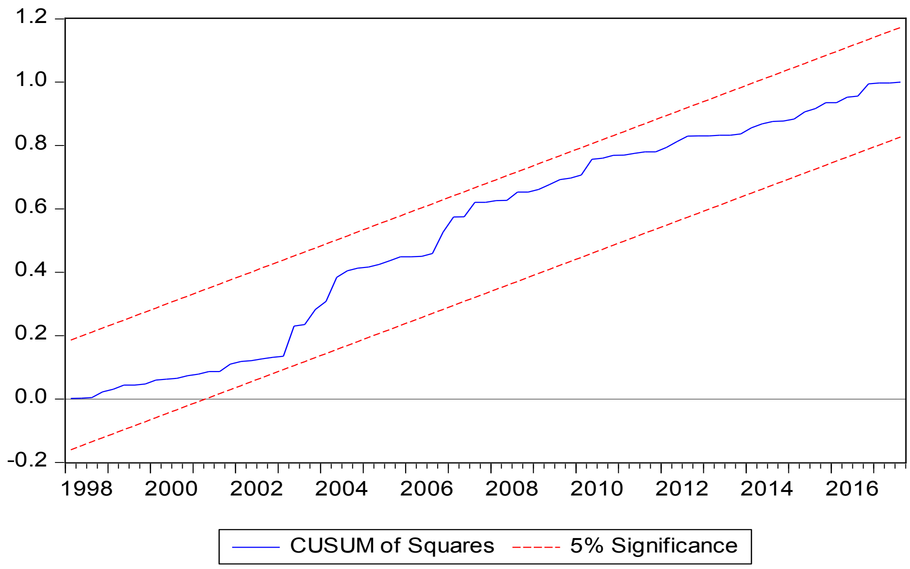
Figure 6: Stability - CUSUM Square



Source: Author compilation from SARB & IMF data

Table 5: Variance Decomposition Test Results

Period	S.E.	CAD	LGDP	NGD	RSHI	NPI
1	1.112265	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.299163	93.60921	1.156297	0.892943	3.074356	1.267193
3	1.469733	91.36113	3.315059	0.962977	2.461606	1.899223
4	1.560155	89.71453	4.925708	1.335519	2.310146	1.714093
5	1.632445	88.05822	6.345132	1.474383	2.263107	1.859160
6	1.682707	86.57788	7.465531	1.641674	2.346610	1.968303
7	1.718677	85.34086	8.380990	1.796292	2.390399	2.091455
8	1.743804	84.35250	9.101850	1.931842	2.424252	2.189553
9	1.761593	83.56415	9.668584	2.036755	2.455549	2.274967
10	1.774230	82.93659	10.11598	2.118229	2.483882	2.345320

Source: Author compilation from SARB & IMF data

A shock to a variable will affect that variable directly, but will also be transmitted to the other variables through the dynamic structure of the VAR. Table 5 presents movements of own shocks and variance decomposition of current account deficit and other variables. Variance decomposition results illustrate the relative importance of each of the determinants or variables influencing movements of the current account deficit.

Table 5 illustrates variance decomposition for 10 periods and shows how the variables have an effect towards current account deficit fluctuations in the short and the long run. This can be summarised as that throughout the whole period, current account deficit is influenced mainly by its own shocks in the short-run and in the long-run, implying a little effect that can be attributed to its determinants.

5. Is the South African CAD Sustainable?

The sustainability analysis starts with a decomposition of the current account (CA_t) into the components trade balance (TB_t), net income payments on the international investment position (IIP_t , i_t^* is the foreign interest rate) and net transfers Tr_t . To keep the analysis simple, the trade balance is assumed to have three basic driving forces: the exchange rate which is measured in the form of a nominal effective exchange-rate index (NEER) against South Africa's 20 most important competitors in international trade, domestic income (Y_t) and foreign income (Y_t^*).

$$CA_t = TB_t\left(E_t, Y_t, Y_t^*\right) + i_t^* IIP_t + Tr_t \tag{4}$$

An increase of NEER is an appreciation of the rand and should have a negative effect on the TB. An increase in domestic income will lead to more imports and will worsen *ceteris paribus* the TB whereas an increase in foreign income will stimulate exports and will improve the TB.

To analyse the question whether South Africa's CAD is sustainable we take the accounting identity of foreign debt (D_t) as the starting point:

$$D_t = \left(1 + i_t\right) D_{t-1} - TB_t - Tr_t - \left(FDI_t + FPI_t\right) \tag{5}$$

Where i_t is the interest rate or dividend rate paid on external debt, TB_t is the trade balance, Tr_t are net transfers abroad, FDI_t is the net inflow of foreign direct investment and FPI_t is the net inflow of portfolio investment. FDI_t and FPI_t appear in this equation because they are regarded as non-debt-creating capital inflows.

The payments of investment income can be subdivided into three components:

$$i_t D_{t-1} = i_{1,t} SDI_{t-1} + i_{2,t} SPI_{t-1} + i_{3,t} SGP_{t-1} \tag{6}$$

Where SDI_{t-1} denotes the stock of foreign direct investment in South Africa in $t-1$, SPI_{t-1} is the stock of portfolio investment and SGP_{t-1} is the stock of all other government and private external debt. The corresponding interest or dividend rate paid on every kind of stock of debt is denoted by $i_{j,t}$ with j from 1 to 3. All three stocks are in terms of gross debt because it can be argued that the net external liabilities of one sector will not cancel against the net assets of another sector if and when every sector can default individually.

Inserting Equation 6 into Equation 5 and normalizing South African debt by GDP (both expressed in rand) leads to the following equation:

$$d_t = \frac{1+e_t}{1+g_t}\left[d_{t-1} + i_{1,t}sdi_{t-1} + i_{2,t}spi_{t-1} + i_{3,t}sgp_{t-1}\right] - tb_t - tr_t - \left(fdi_t + fpi_t\right) \quad (7)$$

Where lower case letters denote the normalized versions of the corresponding variables, the relative change of the nominal effective exchange rate (NEER) is denoted by e_t. A positive value indicates a nominal appreciation of the rand. Nominal GDP growth is denoted by g_t.

Equations 5 to 7 are accounting identities. Economic content is added to the model by assuming, like in Equation 4, that the driving forces of the trade balance are the exchange rate, domestic income and foreign income:

$$TB_t = TB_t\left(e_t, g_t, g_t^*\right) \quad (8)$$

where g_t^* is the growth rate of foreign income. It can be shown that the partial derivatives of TB_t with respect to both e_t and g_t are negative but positive with respect to g_t^*. Equation 8 is estimated in a linear regression framework using annual data from 1970 to 2016 and gets the following point estimates:

$$TB_t = 2.435 - 0.027e_t - 0.375g_t + 0.182g_t^* \quad (9)$$

The signs of the coefficients confirm expectations: An appreciation of the rand and an increase in domestic GDP growth worsen the trade-balance ratio whereas foreign economic growth improves it via exports. Here g_t^* is measured as weighted GDP growth rates of South Africa's 20 most important competitors in international trade (with the exception of Mozambique and Poland for which long series of GDP are not available) with the weights that the SARB uses in computing its NEER and REER of the rand (Motsumi *et al*., 2014). We experimented with using other weights but the results remained robust. It is surprising that the elasticity of the trade-balance ratio with respect to the exchange rate is relatively small in absolute value. Overall the fit of model (9) is not very impressive because its R^2 is only 0.067 but at this stage our main interest is in the point estimates and not in statistical inference. The large standard errors of the point estimates (not reported here) are due to the relatively low degrees of freedom, which are only 42.

The final components of our model are the three feedback relationships between stocks and flows:

$$sfi_t = \frac{1+e_t}{1+g_t} sfi_{t-1} - \gamma_1 ca_t \quad (10a)$$

$$spi_t = \frac{1+e_t}{1+g_t} spi_{t-1} - \gamma_2 ca_t \quad (10b)$$

$$sgp_t = \frac{1+e_t}{1+g_t} sgp_{t-1} - \gamma_3 ca_t \quad (10c)$$

Where γ_j is the corresponding flow in terms of the ratio of the current account to GDP (ca_t). We apply Equations 5 to 10 to a scenario analysis to project South Africa's debt ratio d_t for the years of 2017 to 2020. In our system of equations we need to specify values of various parameters and variables. We use historical averages to calibrate the model. To check the robustness of our results, we can vary the calibrated parameters and the path of variables. Here we restrict robustness checks to exchange rate effects because the exchange rate typically has to carry the brunt of the adjustment process. The domestic growth rate g_t has two opposing effects on the ratio TB_t. There is a direct and negative effect of g_t through the denominator of the debt ratio d_t and there is an indirect and positive effect through the trade balance because an increase of g_t will stimulate imports that, *ceteris paribus*, will worsen the trade balance and increase external debt. It can be shown that the net effect will always be negative, meaning that an increase in domestic growth leads to a fall in the ratio ca_t. In general, g_t alone cannot induce a trajectory to a sustainable debt ratio. An increase in g_t^* will improve the trade balance but foreign income is exogenous.

Table 6 on the next page reports the initial values (for 2016 or 2017 depending on the value of the time subscript) of variables and parameters of the model. Note that with the exception of e_t, g_t, g_t^*, fdi_t and fpi_t, all variables change endogenously over time. The parameters β_e, β_g and β_{g*} denote the partial derivatives of the trade-balance ratio with respect to the exchange-rate changes, as measured by the NEER, and to domestic and foreign GDP growth, respectively, as reported in (9).

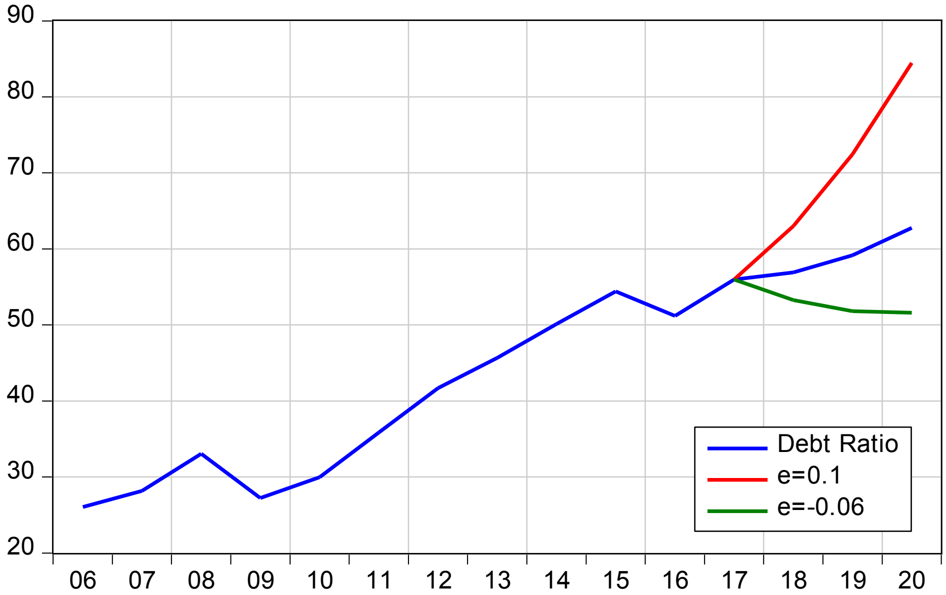
The relative exchange rate change e_t drives the dynamics of the model. For 2017 we set e_t= 0.10. The nominal effective appreciation of the rand in that year was 10.6 per cent. With such a large nominal

Table 6: Initial Values of Parameters and Variables

Endogenous Variables		Exogenous Variables and Parameters	
d_{t-1}	0.57	e_t	0.17
sfi_{t-1}	0.20	g_t	0.08
spi_{t-1}	0.20	g_t^*	
sgp_t	0.50	fdi_t	0.03
$i_{1,t}$	0.03	fpi_t	0.01
$i_{2,t}$	0.03	β_e	0.15
$i_{3,t}$	0.07	β_g	0.20
tb_t	0.07	β_{g^*}	

Source: Authors

Figure 7: Gross External Debt as a Percentage of GDP



Source: Authors

appreciation of the rand it is obvious that the current account will deteriorate considerably and that the international investment position will worsen.

Figure 7 displays the derived future path of South Africa's external debt ratio from 2017 onwards. We analyse three scenarios. The first scenario (blue line) assumes that from 2018 to 2020 the NEER will not change, under scenario 2 (red line) the 10 per cent effective appreciation of the rand will continue throughout 2018 to 2020 and in the third scenario (green line) the rand will depreciate by 6 per cent per year which is its average rate of depreciation from 2006 to 2016. It is apparent that d_t will increase very strongly to around 85 per cent in 2020 if the sharp appreciation of the rand in 2017 continues until 2020. But that is a rather unrealistic assumption. It is more realistic that the rand follows, like many other exchange rates, a random walk with an expected rate of change of zero (blue line). If that is the case, then by 2020 the debt ratio will have increased only moderately to a value of less than 63 per cent. Under scenario 3, the NEER will return to its long-run depreciation of 6 per cent per year in 2018 to 2020. This would lead to a decrease of the debt ratio to just above 50 per cent in 2020 and basically a return to its value in 2016, prior to the strong appreciation of the rand.

It follows that the answer to the question whether the South African CAD is sustainable or not very much depends on the assumption about the future path of the rand's NEER.

6. Conclusion and Recommendations

The paper aimed to find, firstly the determinants of South Africa's current account deficit (CAD) and, secondly; to examine whether it's current deficit is sustainable. To find the determinants of the CAD, an autoregressive distributive lag model (ARDL) was used with quarterly time series data spanning the post-apartheid era [1994-2017]. The ARDL bounds test results indicate that a long run relationship exists between the determinants of the CAD. Factors such as household savings, growth rate and net portfolio investments have significant impacts on the South African CAD.

Further analyses evaluate, by using scenario analysis including feedback between the stock of debt and flows of income payments, the sustainability of the South African current account deficit. The claim that South Africa's current account is not sustainable and that its foreign currency debt deserves a down-grading to speculative grade is related to the assumption that the strong appreciation of the rand will continue in the future. Under more realistic assumptions about the rand's future path it is less than clear that South Africa's CAD is not sustainable. However, sustainability of the South African CAD could be attributed to further real depreciation of the rand.

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