Is the Co-Movement Between Budget Deficit and Current Account Deficit Applicable to South Africa?

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ABSTRACT: The idea of the fiscal balance to have a statistically significant impact on the current account is known as the Twin deficits hypothesis, which this study seeks to investigate. We make use of annual macroeconomic data spanning from 1990 – 2017. Additionally, we utilise novel time-series cointegration techniques such as the ARDL Bounds and Granger causality analysis. From empirical tests, we find that a long-run relationship exists between budget deficit and current account deficit. Moreover, the real effective exchange rate, real interest rate and GDP are found to have a negative and statistically significant impact on the current account whereas the budget deficit, on the contrary, is found to have a positive and statistically significant impact on the current account deficit, at least in the short-run. Granger causality test indicates uni-directional causation from budget deficit to current account deficit, lagged one period. Given these findings, we fail to reject the Twin Deficits Hypothesis within the context of South Africa. The policy implication is for the government to fix its fiscus so as to improve the current account stance. This can be achieved through extended fiscal adjustments to bring expenditure in line with revenue, thereby stabilising debt.

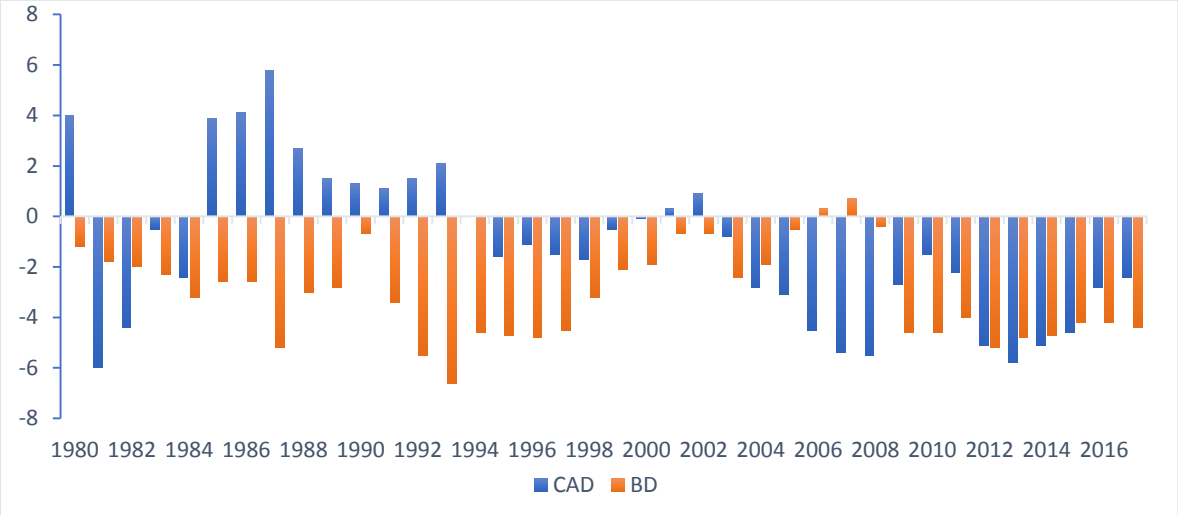
Key words: Twin deficits, Ricardian equivalence, ARDL Bounds test, Granger causality
JEL Codes: E62, F32, H62, O16, F41, C33

1. INTRODUCTION

The recent 2008 Global Financial turmoil has somewhat created room for researchers in the field of social sciences to revisit the Twin Deficit Hypothesis (TDH). This is because, ever since the financial turmoil, nations have been faced with sustained budget deficits and current account deficits, which to this end, remain the primary causes of major ills in economies

(Aqeel and Nishat, 2000 and Mukhtar et al., 2007). Based on the TDH, a budget deficit exacerbates the current account deficit by placing upward pressure on domestic interest rates, triggering capital inflows and exchange rate appreciation, which then translates into cheaper imports and relatively less competitive exports (Epaphra, 2017). As exports experience a decline in international competitiveness, imports on the other hand gain momentum, thus outweighing the value of exports, consequently a trade shortfall. This hypothesis is strongly supported by researchers such as (Fleming, 1962: Mundell, 1963: Kim and Roubini, 2008) to name a few. Although this makes economic sense, certain academics, Barro (1989) to be specific, challenged the TDH by stating that a rational agent would see current tax cuts and increases in government spending as future tax burdens, thus increasing savings more than consumption to offset future tax increases (Amaghionyeodiwe, 2015). This idea is known as the Ricardian Equivalence, which remains contested simultaneous with the TDH. South Africa has been incurring sustained budget deficits and current account deficits post the fall of the Lehman Brothers in 2008. The historical data is provided in figure 1 below.

Figure 1: Trends in fiscal balance and current account balance



Source: South African Reserve Bank Database (2018)

As can be seen in figure 1, South Africa's budget deficit ranged between 0.7% and -6.6% as a ratio of the Gross Domestic Product (GDP) over the period 1980 – 2017 (Budget Review, 2018). The current account deficit ranged between 5.8% and -6.0% as a ratio of GDP during the same period (South African Reserve Bank Database, 2018). Furthermore, the fiscal balance gained momentum in 2007, amounting to 0.7% as a ratio of GDP, before hitting a

record low of -5.2% as a ratio of GDP in 2012. The current account balance on the other hand, performed fairly well between the years 1985 to 1994, recording positive balances before hitting a record low of -5.8% as a ratio of GDP in 2013. According to SARB Quarterly Bulleting (2018), South Africa's trade surplus narrowed from R38 billion in the second quarter of 2018 to R14 billion in the third quarter of 2018. Notwithstanding, the services, income and current transfers account accelerated in the third quarter of 2018, albeit this was not sufficient to offset the trade shortfall. It is worth noting however, that the government has taken several necessary measures to narrow the budget shortfall, consisting of a mixture of tax increases and expenditure ceilings to narrow the budget shortfall and stabilise debt (Budget Review, 2018). Interestingly, the budget deficit is projected to narrow down to -3.8% in 2018/19 due to renewed focus (Fin24, 2018).

Against this backdrop, this study aims to revisit the Twin Deficit Hypothesis within the context of South Africa. The reasoning is that, South Africa is currently experiencing massive budget shortfalls and current account deficits, placing upward pressure on borrowing requirements. As the nation continues to implement fiscal adjustments to bring expenditure in line with revenue, it becomes necessary to investigate if reductions in the budget shortfall will improve the current account position. This will be achieved by estimating if whether the fiscal balance exhibits a positive or negative effect on the current account and the direction of causality thereof, if any exists. The rest of the study is organised as follows: Section 2 provides a review of literature on TDH. Section 3 delves into the empirical strategy while Section 4 presents findings of the study. Section 5 is a conclusion of the study as well as policy implications.

2. LITERATURE REVIEW

2.1. THEORETICAL LITERATURE

Following Mukhtar et al (2007) and Epaphra (2017), we begin the theoretical framework with simplified national income dynamics. Assume two measures of GDP, the income and expenditure method, expressed as follows:

$$Y = C + I + G + (X - Z) \qquad (1)$$

Where:

Y is national income measured in terms of GDP

C is private final consumption expenditure

I is the gross private investment

G is final expenditure by central government

$(X - Z)$ is exports less imports, yielding the trade balance

Furthermore, the income method on the one hand, can be expressed as:

$$Y = C + S + T + N_{TP} \qquad (2)$$

Where

S is gross national savings

T is tax revenue

N_{TP} is net transfer payments

By equating equations (1) and (2), assuming negligible transfers for simplicity' sake, we are able to derive the resource gap:

$$(X - Z) = (S - I) + (G - T) \qquad (3)$$

comprising of the current account $(X - Z)$, the savings-investment gap $(S - I)$ and fiscal balance $(G - T)$. Theoretically, an increase in the budget deficit would exacerbate the current account deficit (Salvatore, 2006: Epaphra, 2017). This is because, an increase in budget deficit induces upward pressure on domestic interest rates: triggering capital inflows and exchange rate appreciation and translating into cheaper imports and less competitive exports prices. Notably, the national savings equation can be written mathematically as:

$$S = Y - C \qquad (4)$$

Equation (4) implies that national savings is the difference between national income and consumption expenditure. Additionally, national savings can be broken into two components (Mukhtar, 2007), that part which is financed by households and firms known as private savings S_P and that which is financed by the government known as government savings S_G, expressed as:

$$S = S_P + S_G \qquad (5)$$

in which case private savings is the remainder of household income adjusted for taxes and consumption, expressed as:

$$S_P = Y_d - C = (Y - T) - C \qquad (6)$$

Government savings is the positive difference between government revenue and expenditure, which can be expressed mathematically as:

$$S_G = T - (G + G_{TR}) = T - G - G_{TR} \qquad (7)$$

where G is government spending on goods and services, G_{TR} is government transfers and T is government revenue in taxes. Given this, equation (3) can be rewritten as:

$$CA = (S_P - I) + BD \qquad (8)$$

This implies that, under stable savings conditions, variations in budget deficit will affect the current account stance, deeming the twin deficit hypothesis valid (Suresh and Vikas, 2015).

2.2. EMPIRICAL LITERATURE

Epaphra (2017) employed the Johansen Cointegration technique and Vector Error Correction Model (VECM) to test the validity of the twin deficit hypothesis in Tanzania. The empirical tests indicate that the twin deficit hypothesis is present in the Tanzanian economy, implying that budget deficits worsen current account deficits. Amaghionyeodiwe and Akinyemi (2015) revisited the twin deficit hypothesis in an oil-dependent-economy like Nigeria. The cointegration results confirmed the existence of a long-run relationship between fiscal balance and current account deficit whereas the causality tests indicated a uni-directional causation from current account to budget deficit.

Mukhtar et al., (2007) tested the validity of the twin deficit hypothesis in Pakistan using quarterly time-series data spanning from 1975 - 2005. Their findings revealed a long-run relationship between budget deficit and current account deficit. Even more, they find a bi-directional causation from budget deficit to current account deficit and from current account deficit to budget deficit. Mandishekwa et al., (2014) investigated the applicability of the twin deficit hypothesis in the context of Zimbabwe. Having utilised the Johansen cointegration test and Granger causality test, they found that the twin deficit hypothesis holds in Zimbabwe. They conclude by accentuating that public expenditure overruns should be a thing of the past. Akbaş and Lebe (2016) investigated an extreme case known as the triple deficit hypothesis in G7 countries and found it valid as causality runs from savings gap to current account deficit, from budget deficit to current account deficit and from budget deficit to savings gap.

Kalaj and Mema (2015) made an inquiry into the twin deficit hypothesis within the context of Albania using macroeconomic data ranging from 1992 – 2014. Using an extended set of control variables, they find evidence of a causal link between the twin deficits. El-Baz (2014) analysed the relationship between the current account deficit and budget deficit in Egypt using annual time-series data spanning from 1990 – 2012. Surprisingly, the empirical tests failed to accept the validity of the twin deficit hypothesis, as granger causality tests revealed a reverse causal relationship running from the current account deficit to the budget deficit.

Sakyi and Opoku (2016) conducted a study on the twin deficit hypothesis in Ghana using annual time-series data covering 1960 – 2012. They made use of novel cointegration techniques while controlling for structural breaks and found the existence of the twin divergence hypothesis. In other words, they found that the budget deficit improves the current account deficit. Suresh and Vikas (2015) conducted a similar analysis within the context of India. Based on empirical cointegration tests, no long-run relationship exists between budget deficit and current account deficit in India. However, the granger causality test revealed a bi-directional causation between budget deficit and current account deficit.

3. EMPIRICAL STRATEGY

3.1. DATA

The study made use of annual macroeconomic data spanning from 1990 – 2017. The frequency and range of the data was chosen based on data availability. The data was collected from the South African Reserve Bank (SARB)and World Development Indicators (WDI).

3.2. MODEL SPECIFICATION AND ESTIMATION TECHNIQUES

The model is expressed as follows:

$$Y_t = \Psi + \theta L\Upsilon + \varepsilon_t \qquad (9)$$

Where Y_t is the regressand (current account deficit), Ψ is a constant, θ represents parameters to be estimated, L is the lag operator (e.g. $Y_{t-1} = LY$) and ε_t is the gaussian white noise term with usual properties $N{\sim}(0, \sigma)$. Υ is a vector of regressors consisting of:

$$\Upsilon = (BD, LnGDP, RIR, EXR) \qquad (10)$$

where BD is the budget deficit as a ratio of GDP, $LnGDP$ is GDP at market prices used as a proxy for domestic incomes, RIR is the real interest rate and EXR[1] is the real effective exchange rate. Only GDP is linearized as other variables contain non-zero values, hence we fail to linearize them. The estimated coefficient for GDP will thus be significantly higher. Nonetheless, variables were tested for unit root by means of the Augmented-Dickey-Fuller-GLS (ADF-GLS) unit root test (Elliot, Rothenberg and Stock, 1996), which is a modification of the conventional ADF (Fuller, 1976) unit root test. The ADF-GLS test is known to dominate existing unit root tests in terms of power. However, there is no uniformly better unit root test. Following this, we employ the Autoregressive Distributed Lag (ARDL) approach to cointegration by Pesaran (1997) and Pesaran et al., (2001) to test for long-run relationship

[1] EXR is measured in terms of the average weighted real effective exchange rate of South Africa's 20 major trading partners.

amongst the variables. In the ARDL estimation, equation (9) can be reparameterized as such to obtain long run coefficients:

$$CAD_t = \Psi + \theta_1 CAD_{t-1} + \theta_2 BD_{t-1} + \theta_3 LnGDP_{t-1} + \theta_4 RIR_{t-1} + \theta_5 EXR_{t-1} + \sum_{i=0}^{p} \beta_1 \Delta CAD_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta BD_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta LnGDP_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta RIR_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta EXR_{t-i} + \varepsilon_t \quad (11)$$

The selected ARDL model for estimating short run coefficients and the Error Correction term (ECt) is expressed as:

$$\Delta CAD_t = \Psi + \sum_{i=1}^{p} \beta_1 \Delta CAD_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta BD_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta LnGDP_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta RIR_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta EXR_{t-i} + \lambda(\Sigma_{t-1}) + \varepsilon_t \quad (12)$$

where λ measures the speed of adjustment to equilibrium, also known as the ECt. The increment Δ denotes the short run coefficient. $\lambda < 0$ implies deviation from steady state whereas $\lambda = 0$ implies steady state, for which $\lambda \ncong 1$. Notably, we make use of Granger causality technique (Granger, 1969, 1980) to test for causality between CAD and BD. The traditional equation (12) in granger causality form can thus be written as:

$$CAD_t = \sum_{j=1}^{p} \beta_{11,j} \Delta CAD_{t-j} + \sum_{j=1}^{p} \beta_{12,j} \Delta BD_{t-j} + \sum_{j=1}^{p} \beta_{13,j} \Delta \Omega_{t-j} + \mu_{1t} \quad (13)$$

$$BD_t = \sum_{j=1}^{p} \beta_{21,j} \Delta CAD_{t-j} + \sum_{j=1}^{p} \beta_{22,j} \Delta BD_{t-j} + \sum_{j=1}^{p} \beta_{23,j} \Delta \Omega_{t-j} + \mu_{2t} \quad (14)$$

$$RIR_t = \sum_{j=1}^{p} \beta_{31,j} \Delta CAD_{t-j} + \sum_{j=1}^{p} \beta_{32,j} \Delta RIR_{t-j} + \sum_{j=1}^{p} \beta_{33,j} \Delta \Omega_{t-j} + \mu_{3t} \quad (15)$$

$$EXR_t = \sum_{j=1}^{p} \beta_{41,j} \Delta CAD_{t-j} + \sum_{j=1}^{p} \beta_{42,j} \Delta EXR_{t-j} + \sum_{j=1}^{p} \beta_{43,j} \Delta \Omega_{t-j} + \mu_{4t} \quad (16)$$

$$LnGDP_t = \sum_{j=1}^{p} \beta_{51,j} \Delta CAD_{t-j} + \sum_{j=1}^{p} \beta_{52,j} \Delta LnGDP_{t-j} + \sum_{j=1}^{p} \beta_{53,j} \Delta \Omega_{t-j} + \mu_{5t} \quad (17)$$

where Ω is a vector of control variables: p indicates the number of lagged variables and μ is the innovation term. Lastly, we performed residual diagnostics tests to ensure that the residuals and coefficients are not biased as a result of serial correlation, heteroskedasticity, multicollinearity or any other econometric threat. For serial correlation, we made use of the Breusch-Pagan-Godfrey LM Serial correlation test (Breusch and Godfrey, 1978) while for heteroskedasticity we employed the White heteroskedasticity test (White, 1980). Variance Inflation Factors (VIF) test is also utilised to detect multicollinearity.

3.3. JUSTIFICATION OF VARIABLES

The choice of variables was guided by TDH and earlier studies (i.e. Epaphra, 2017: Suresh and Vikas, 2015). Through this hypothesis, the impact of budget deficit on current account works through numerous channels namely: interest rates, exchange rates, capital inflows and to a certain extent, domestic incomes. An appreciation of the exchange rate worsens the current

account as imports become cheaper while exports experience a decline in international competitiveness. Thus, exchange rates are expected to have a negative sign. Domestic interest rates on the other hand, have a negative impact on the current account and are thus expected to have a negative sign. Furthermore, domestic incomes adversely affect the current account as higher incomes result in increased imports. The budget deficit on the contrary, is expected to have a positive sign since improvements in the budget deficits are expected to improve the current account deficit.

4. EMPIRICAL RESULTS AND DISCUSSIONS

This section details all the empirical tests conducted as well as findings. We begin by analysing the characteristics of the data in table 1, in terms of mean, median, standard deviation and normal distribution. It can be noted from table 1 that the corresponding p-values for Jarque-Bera (JB) normality test are above 5%, implying that the data for all variables is normally distributed. Furthermore, the budget deficit and domestic income have standard deviations of 1.82 and 0.33, respectively, insinuating that the data points are close to the mean. On the contrary, real effective exchange rate and real interest rate have relatively high values of standard deviation, amounting to 12.9 and 4.31, respectively, implying that the data points are spread out.

Table 1: Descriptive statistics

	CAD	BD	LNGDP	REX	RIR
Mean	-1.42	-3.28	14.40	98.33	13.84
Median	-1.50	-3.30	14.31	98.53	12.83
Maximum	5.80	0.70	14.95	136.78	22.33
Minimum	-7.30	-6.60	13.82	72.50	7.96
Std. Dev.	3.35	1.82	0.33	12.88	4.31
Skewness	0.20	0.33	0.20	0.55	0.44
Kurtosis	2.28	2.17	1.96	3.78	1.95
Jarque-Bera	1.38	2.24	2.50	3.68	3.77
Probability	0.50	0.33	0.29	0.16	0.15
Observations	48	48	48	48	48

Source: author's computations

The real effective exchange rate, followed by domestic incomes and real interest rate, have the highest average, amounting to 98.3, 14.4 and 13.8, respectively. The total number of

observations is 48 for all variables. Table 2 details findings from the correlation matrix and it can be observed that the budget deficit, real effective exchange rate and real interest rate are positively yet weakly correlated with current account deficit, amounting to 0.01, 0.09 and 0.34, respectively.

Table 2: Correlation matrix

	CAD	BD	LNGDP	REX	RIR
CAD	1.00	0.00	-0.25	0.09	0.34
BD	0.01	1.00	0.13	-0.06	0.13
LNGDP	-0.25	0.13	1.00	-0.5	-0.15
REX	0.09	-0.06	-0.5	1.00	0.28
RIR	0.34	0.13	-0.15	0.2	1.00

Source: author's computations

Domestic incomes on the contrary, are negatively correlated with the current account deficit. It is clearly apparent that there is no strong correlation amongst the regressors. This implies that multicollinearity is less likely to be present in the model, however, to formally confirm this, the VIF test was conducted.

The non-stationarity test was performed since the macroeconomic data is known to be non-stationary. We utilised the ADF-GLS unit root test and the results are provided in table 3.

Table 3: Unit root test results

	Dickey-Fuller-GLS		Outcome
	Level	1st difference	
CAD	-2.31**	-6.34*	|(0)
BD	-3.14*	-4.62*	|(0)
LNGDP	0.97	-4.42*	|(1)
REX	-2.10**	-5.93*	|(0)
RIR	-1.74***	-6.05*	|(0)

Asterisks (*, **, ***) denote significance at the 1%, 5% and 10%, respectively

It can be seen in table 3 that current account deficit, budget deficit, real effective exchange rate and real interest rate are stationary at level whereas domestic incomes are stationary after first differencing. Given that the variables are integrated in different orders, we confidently employed the ARDL Bounds test to cointegration given that it is robust when variables are integrated in different orders. Prior to that, the optimal lag-length for our specified ARDL model was estimated and the output is provided in table 4.

Table 4: Optimal lag-length test results

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-489.15	NA	3914.27	22.4	22.66	22.53
1	-273.01	373.34	0.67	13.78	14.99*	14.22*
2	-244.21	43.20*	0.59	13.60	15.83	14.42
3	-217.14	34.46	0.60	13.51	16.75	14.71
4	-182.26	36.47	0.49*	13.06*	17.31	14.64

Asterisks (*, **, ***) denote significance at the 1%, 5% and 10%, respectively

The commonly used information criterions include Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hann-Quin (HQ). For our study, we choose SIC over AIC since AIC is known to suggest more lags than necessary, resulting in loss of degrees of freedom and model overfitting. As can be seen in table 4, SIC recommends one lag, supported by HQ. AIC on the other hand, recommends four lags.

The next step was to estimate the long-run relationship between current account deficit and regressors in question, the budget deficit being the main variable of interest. The output is provided in table 5.

Table 5: ARDL Bounds Cointegration

Test Statistic	Value	k
F-statistic	4.44**	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Asterisks (*, **, ***) denote significance at the 1%, 5% and 10%, respectively

The ARDL bounds test confirms existence of long-run relationship between the variables in question. This is because, the F-statistic of 4.44 is greater than the lower (2.86) and upper (4.01) bounds at least at the 5% significance level. The null hypothesis of no cointegration $H_0 = 0$ is thus rejected for the alternative hypothesis of cointegration $H_0 \neq 0$. These findings are consistent with Hassan et al., (2015) and Ahmad and Aworinde (2015) who utilised the

ARDL cointegration technique. Given the existence of long-run relationship, we estimated the speed of adjustment to equilibrium and the results are presented in table 6.

Table 6: Long-run and short run coefficients

Dependent variable: CAD				
Short run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BD)	0.42**	0.20	2.06	0.04
D(LNGDP)	-51.17*	17.31	-2.96	0.00
D(REX)	-0.05***	0.03	-1.80	0.08
D(RIR)	-0.28**	0.12	-2.37	0.02
ECt	-0.37*	0.09	-3.94	0.00
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
BD	-0.17	0.46	-0.37	0.71
LNGDP	-7.72**	3.24	-2.38	0.02
REX	-0.12	0.08	-1.56	0.12
RIR	0.19	0.22	0.86	0.39
C	122.23	54.05	2.26	0.03

Asterisks (*, **, ***) denote significance at the 1%, 5% and 10%, respectively

Based on findings presented in table 6, the speed of adjustment to equilibrium is 37%. This implies that 37% of past disequilibria are corrected in the today. Even more, the value is negative and statistically significant. It can also be observed that all short-run coefficients are statistically significant, indicating that the variables are important in explaining short-run variations in current account deficit. Domestic incomes, real effective exchange rate and real interest rates are found to have a negative and statistically significant impact on the current account deficit whereas the budget deficit is found to have a positive and statistically significant impact on the current account deficit, at least in the short run. These findings are consistent with Amaghionyeodiwe and Akinyem (2015), Hassan et al., (2015), Sakyi and Opoku (2016) and Epaphra (2017). The short-run coefficients meet the priori expectation, however in the long run, only domestic incomes are found to be statistically significant in explaining changes in current account deficit. Even worse, the budget deficit is found to exhibit a negative impact on the current account deficit. Ahmad and Aworinde (2015) also

found similar results in the long-run. Nonetheless, we perform the VIF test for multicollinearity and the results are provided in table 7.

Table 7: Variance inflation factors analysis

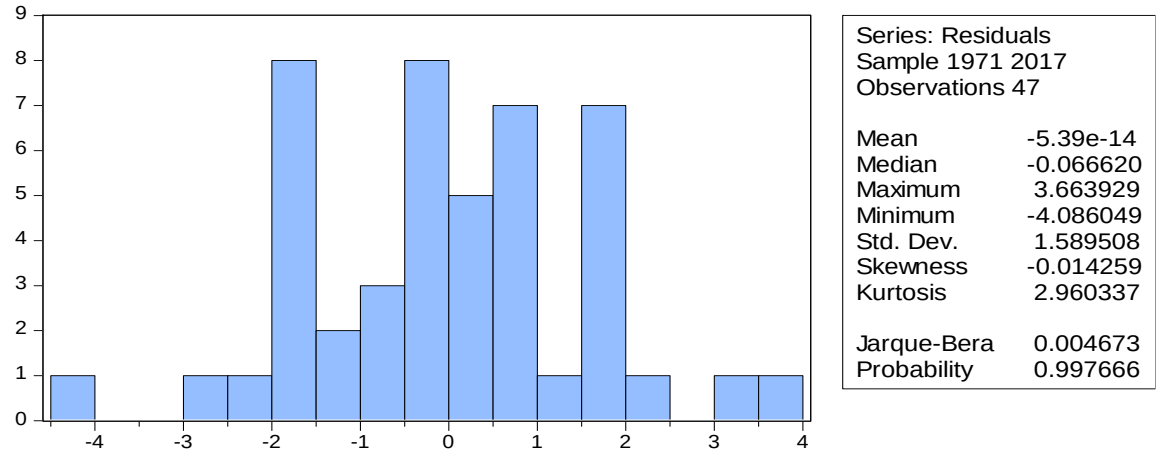
	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
CAD(-1)	0.008885	1.793566	1.525937
BD	0.041601	9.016044	2.116760
BD(-1)	0.035986	7.691658	1.816117
LNGDP	299.6366	956962.3	469.4610
LNGDP(-1)	296.1392	942641.1	466.4321
REX	0.000647	97.61701	1.644660
RIR	0.013619	44.57070	3.743342
RIR(-1)	0.016665	54.31652	4.693052

Source: author's computations

From the results provided in table 7, we can see that only the current and lagged value of GDP are inflated by factors of 469 and 466, respectively. Only these values are above the recommended bound of 10. All other variables are found to be free from variance inflation. Given these findings, we can conclude that multicollinearity is minimal and thus not a problem in our estimated model.

Performing residual diagnostic tests has become a formal condition in econometric analysis. Several tests have been performed and the results are provided in figure 2 and table 8 below.

Figure 2: Normality test



It is apparent in figure 2 that the data is normally distributed given that the JB corresponding p-value is above 5%, also given that the kurtosis value of 2.96 is approaching the recommend value of 3.7. The data though, is found to be slightly skewed to the left, given the skewness value of -0.01. In table 8, we present further residual diagnostic tests of serial correlation and heteroskedasticity.

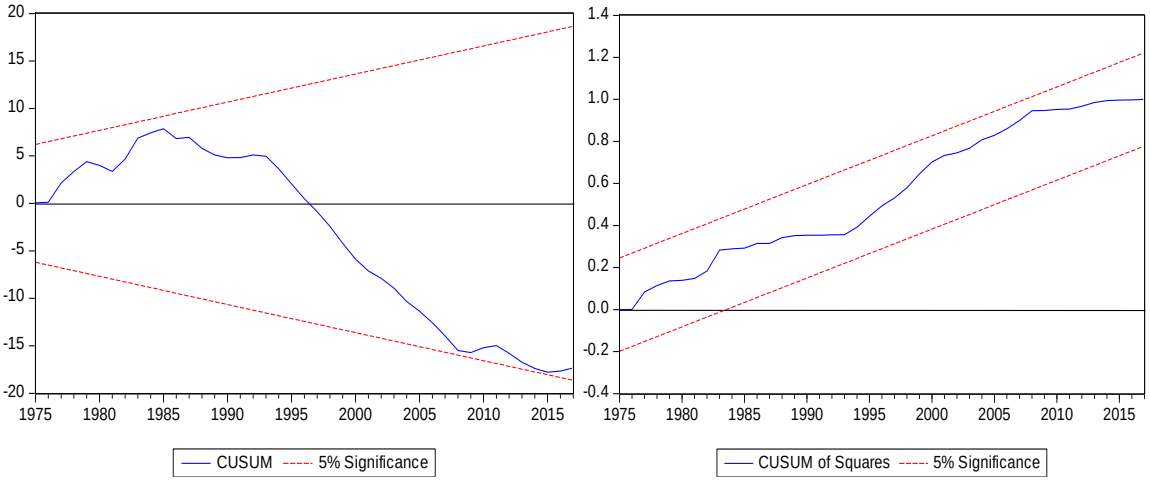
Table 8: Residual diagnostics

	Obs*R-squared	Prob. Chi-Square(1)
Breusch-Godfrey Serial Correlation LM Test:	0.00	0.98
Heteroskedasticity Test: Breusch-Pagan-Godfrey	14.86	0.06
Heteroskedasticity Test: White	8.84	0.36

Source: author's computations

Based on findings presented in table 8, the estimated model does not suffer from serial correlation nor heteroskedasticity. This is because, the corresponding p-values of 98% for the LM-Serial correlation test and 36% for the White-Heteroskedasticity test are way above the 5% significance level. To validate this even further, the residual stability tests were conducted by running Ordinary Least-Squares (OLS). The results are provided in figure 3 below.

Figure 3: Residual Stability test



As can be seen in figure 3, the residuals have been fairly stable over the entire period in both the Cusum and Cusum of squares approaches to stability. Finally, the Granger causality analysis was used to determine the direction of causation, if any exists. The results are provided in table 9.

Table 9: Granger causality

Null Hypothesis:	Obs.	F-Statistic	Prob.	Outcome
BD does not Granger Cause CAD	47	3.41	0.07***	Reject
CAD does not Granger Cause BD		1.73	0.20	Accept
LNGDP does not Granger Cause CAD	47	2.09	0.16	Accept
CAD does not Granger Cause LNGDP		1.99	0.16	Accept
REX does not Granger Cause CAD	47	0.00	0.99	Accept
CAD does not Granger Cause REX		3.69	0.06***	Reject
RIR does not Granger Cause CAD	47	9.5	0.00*	Reject
CAD does not Granger Cause RIR		0.01	0.91	Accept

Asterisks (*, **, ***) denote significance at the 1%, 5% and 10%, respectively

We find uni-directional causation from budget deficit to current account deficit, given that the f-statistic of 3.41 is statistically significant at the 10% significance level. Thus, we reject the null hypothesis of no granger-causality against the alternative hypothesis of granger-causality. These findings are in line with earlier studies i.e. Egwaikhide et al., (2002), Mandishekwa et al., (2014). Furthermore, we find uni-directional causality from real interest rate to current account deficit and from current account deficit to real effective exchange rate albeit our variable of interest is the current account.

5. CONCLUSION AND RECOMMENDATIONS

This study was aimed at testing the validity of the twin deficits hypothesis within the context of South Africa. We made use of novel time-series techniques such as the ARDL Bounds test and the empirical tests indicated that a long-run relationship exists between budget deficit and current account deficit. Moreover, the real effective exchange rate, real interest rate and GDP were found to have a negative and statistically significant impact on the current account whereas the budget deficit, on the contrary, was found to have a positive and statistically significant impact on the current account deficit, at least in the short-run. Granger causality test revealed uni-directional causation from budget deficit to current account deficit, lagged one period. Given these findings, we fail to reject the Twin Deficits Hypothesis and conclude that it holds within the context of SA. The policy implication is for the government to fix its fiscal stance so as to improve the current account stance. This can be achieved through extended fiscal adjustments to bring expenditure in line with revenue, thereby stabilising debt in the long run.

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