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CAUSALITY BETWEEN PUBLIC DEBT, PUBLIC DEBT SERVICE AND ECONOMIC GROWTH: EVIDENCE FROM SOUTH AFRICA

Talknice Saungweme[1] and Nicholas M. Odhiambo

Abstract

This paper explores the causality between public debt and economic growth, and between public debt service and economic growth in South Africa covering the period 1970 – 2017. The study employed the autoregressive distributed lag (ARDL) bounds testing approach to cointegration and the multivariate Granger-causality test. The empirical results indicate that there is unidirectional causality from economic growth to public debt, but only in the short run. However, the study fails to establish any causality between public debt service and economic growth, both in the short run and in the long run. In line with the empirical evidence, the study concludes that it is economic growth that drives public debt in South Africa, and that the causal relationship between public debt and economic growth is sensitive to the time frame considered. The paper recommends that South Africa should prioritise the implementation of appropriate policies and strategies that could drive economic growth in order to uphold a sustainable public debt level.

Keywords: Economic growth, Granger-causality, public debt, public debt service, South Africa, ARDL

JEL Classification : H62, H63, O47

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1. Introduction

The linkage between government debt and macroeconomic stability has remained a hotly contested issue in the literature. On the one hand, there is a rich body of theoretical literature that argues that deficit financing crowds out private sector investment and leads to waning levels of output in the long run (see, for example, Mankiw, 2000; Saint-Paul, 1992; Modigliani, 1961; Domar, 1944). There is also another branch in economic theory that purports that public debt induces economic growth by stimulating aggregate demand and overall output – through enhancing gross savings and domestic financial markets (Elmendorf and Mankiw, 1999; Chenery and Strout, 1966; Wagner, 1893). Another divergent view argues that fiscal operations have a neutral impact on economic growth (Barro, 1990; 1979). Still further, is the supposition that purports the relationship between government debt and economic growth to be nonlinear (see, for instance, Sachs, 1989). These varying theoretical views have been tested empirically, and until now, there is no general consensus on the matter.

On the other hand, the bulk of past empirical work has largely focused on the impact of public debt on economic growth, and public debt service on economic growth, with mixed results – disregarding the possibility of causality between the variables (see for instance, Huang *et al.,* 2018; Gómez-Puig and Sosvilla-Rivero; 2018; Owusu-Nantwi and Erickson, 2016; Kobayashi, 2015; Dogan and Bilgili, 2014; Kourtellos *et al.*, 2013; Balcilar, 2012). Furthermore, the existing empirical literature shows that public debt enjoyed more coverage than public debt service as evidenced by more studies on the impact of public debt on economic growth than on the impact of public debt service on economic growth. The few studies on the impact of public debt service on economic growth include Serieux and Sammy (1999), Elbadawi *et al*. (1997) and Savvides (1992). Nevertheless, it is equally essential to determine the causal relationship between public debt and economic growth, and between public debt service and economic growth for effective policy making that guarantees both sustainable economic growth and public debt sustainability.

Motivated by these developments, this paper contributes to the existing body of literature in four main ways. First, the paper simultaneously tests the direction of causality between public debt and economic growth, and between public debt service and economic growth in South Africa over the last forty-seven years to 2017. Second, the paper applies the dynamic multivariate Granger-causality model because of its many superior properties over bivariate

causality frameworks – such as minimising the omission-variable-bias, eliminating spurious correlations and also increasing the general validity of the causation test (see Ferreira, 2009; Odhiambo, 2008; Lutkepohl, 1982). The causal relationship among variables after factoring in intermittent variables can alter the direction of causality or the magnitude of variables (Odhiambo, 2009; Lin, 2008).

Third, according to Donayre and Taivan (2017), most previous studies that have focused on the causality between public debt and economic growth, and between public debt service and economic growth have neglected the testing of possible cointegrating relationships – widening the possibilities of estimating spurious correlations (see, for example, Panizza and Presbitero, 2013; Baum *et al.,* 2013; Woo and Kumar, 2015). This paper addresses this issue by accentuating the importance of cointegrating relationships using the ARDL bounds testing approach, which has been found to have many advantages when compared to other conventional cointegration techniques. For example, the ARDL approach to cointegration presents unbiased regression estimates of the long-run model, even in cases where some variables are endogenous (Odhiambo, 2009). Finally, unlike most previous studies that made causality inferences based on a panel of countries (see for, example, Ferreira, 2009; Amoateng and Amoako-Adu, 1996), this paper focuses on South Africa only; hence, the results are country-specific.

The remainder of the paper is organised as follows: Section 2 summarises the dynamics of public debt, public debt service and economic growth in South Africa. In Section 3, the paper reviews theoretical and empirical literature on the causal linkages between public debt and economic growth, and between public debt service and economic growth. Section 4 explains the empirical procedure and results; while Section 5 presents some concluding remarks on the paper.

2. Public debt, public debt service and economic performance in South Africa: An overview[2]

The evolution of public debt, public debt service and economic growth in South Africa over the period from 1970 to 2017 has been largely influenced by the political developments in this country; the government's drive to develop the economy; and also, by the structural economic

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[2] *For a detailed discussion of the evolution of public debt, public debt service and economic growth in South Africa from 1960 to 2017, see Saungweme and Odhiambo (2018a; 2018b).*

changes – including movements in domestic and foreign interest rates, exchange rates and inflation rates (National Treasury, 2018; 1995; International Monetary Fund "IMF", 2005). In the 1970s and 1980s, the inordinate rise in public debt was partly due to active participation by the government in both market processes and infrastructure development, which greatly expanded state expenditures – leading to debt financing (Faulkner and Loewald, 2008). The combined effect of: (1) exchange control regulations and stringent asset requirements; (2) international isolation; (3) high world interest rates; and (4) new government borrowing preferences, all contributed to limited access to international finance, resulting in the haste to develop a vibrant domestic debt market to fund growing budget deficits (Government of South Africa "GSA", 2014; South African Reserve Bank "SARB", 2006; Moss and Obery, 1987). As a consequence, unlike most African states, South Africa has a high proportion of its public debt denominated in local currency (Rands), with a small proportion of the country's domestic debt being held by non-residents (National Treasury, 2018).

With the demise of the apartheid regime in 1994, the new South African government inherited foreign public debt worth more than R14 billion, owed mostly to the private banks in Germany, Switzerland, the United Kingdom and the United States of America (National Treasury, 1995). Since then, the country has also embarked on the fiscal, economic and financial reforms which ultimately fashioned the current structure, composition and trends of its public debt, public debt repayment costs and economic growth process. The South African government's modest economic and financial reforms after 1994 did not only reduce the country's foreign public debt stock, but it also made the domestic government securities more attractive to both residents and non-residents (National Treasury, 2012).

Additionally, the increased issuance of government bonds from 1996 to 2017 broadened the sources of funding the fiscal financial requirements and also stimulated the growth of the country's bond market (National Treasury, 2012; 1998). The other key aim of the government in increasing domestic debt instruments and in lengthening their maturing periods was to limit and/or spread domestic public debt service costs (SARB, 2016; National Treasury, 2012). By December 2017, the aggregate public debt in South Africa amounted to R2.5 trillion (or 50.7% of gross domestic product "GDP"), while aggregate public debt repayment costs totalled R163.2 billion (or 3.5% of GDP) (National Treasury, 2018). Overall, the rise in aggregate public debt since 2000, mostly the domestic component, has been a cumulative effect of the

need to finance rising annual budget deficits and to refinance maturing government debt securities (National Treasury, 2018; 2012).

With regard to economic growth, the South African economy has grown by an average of 2.3% between 1980 and 2017 (World Bank, 2018a). In the main, South Africa experienced two explicit economic growth phases; 1980 to 1992 and 1993 to 2017. In phase one, 1980 – 1992, economic growth rates were not impressive – this was against a backdrop of the intensification of international political, economic and financial sanctions on the apartheid regime, which dried up funding for new state projects and increased political uncertainty (World Bank, 2018a; 2018b; Clark, 1994). The economic growth rates during this period, 1980 – 1992, were thus moderate, spiking around 2.1% of GDP – with swings reaching a period low of a negative 1.8% in 1983 and a period high of about 5.1% in 1984 (World Bank, 2018a).

From 1993 until 2009, economic growth rates steadily increased, whereas, from 2010, the country has had a negative economic growth trajectory up until 2017 (World Bank, 2018a). On the whole, after 1994, the South African economy made a remarkable economic rebound following the adoption of stern structural policies, which stressed on among other things, trade liberalisation, removal of discriminatory labour policies and practises, restructuring and privatisation of some state-owned businesses, sectoral deregulation and real exchange rate stabilisation (World Bank, 2018a; 2001; GSA, 2014; 1996; 1994). Figure 1 displays the public debt, public debt service and economic growth trends in South Africa for the period 1980 – 2017. Public debt (PD) and public debt service (PDS) are both expressed as a percentage of real GDP, while economic growth is measured by the annual growth rate of real GDP per capita (y).

Figure 1: Public debt, public debt service and economic growth trends in South Africa (1980-2017)
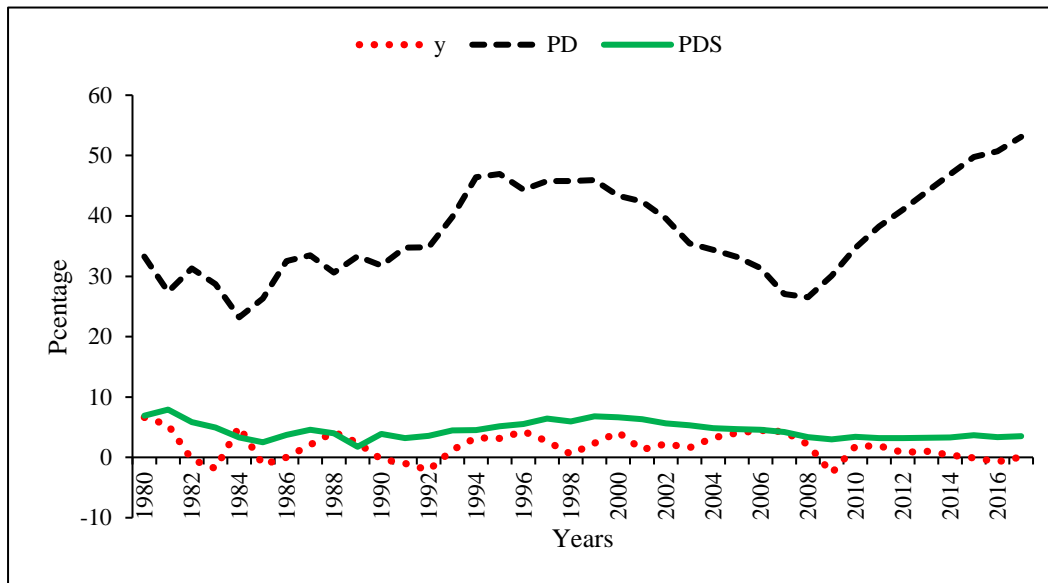
World Bank (2018a)

The evolvement of public debt in South Africa, as shown in Figure 1, can be put into three specific periods: 1980 – 1994, 1995 – 2008 and 2009 – 2017. The first period, 1980 – 1994, is defined by rising public debt levels, resulting from growing fiscal deficits, which reached a period peak of 47% of GDP in 1994 (Statistics South Africa, 2017). During this period, the country was under economic sanctions levied by the international community (Clark, 1994). Government debt service costs were, however, falling owing to rising inflation rates, which had a reducing effect on the real monetary value on the domestic public debt (World Bank, 2018a).

In the second period, 1995 – 2008, a downward trajectory in both public debt/RGDP and public debt service/RGDP ratios is evident. This period coincides with massive economic and financial reforms, which lessened the government debt repayment costs (National Treasury, 2012). Also, in this period, 1995 – 2008, there was massive industrialisation and expansion of the country's export sector. Economic growth rates steadily recovered from the 2001 bottom of 1.2% to a peak of about 4.6% in 2006 but slid back again to a negative 2.6% in 2009 (World Bank, 2018a).

In the last phase, 2009 – 2017, there is a noticeable upward trend in both the public debt/RGDP and public debt service/RGDP ratios, which can be attributed to the tail-effects of the 2008 global financial crisis and also to the introduction of new government debt instruments

(National Treasury, 2018; 2016; 2012). The corresponding economic growth rates were also not impressive during the period, portraying an overall downward trend.

3. Literature Review

In economic theory, there are two main arguments on the causal relationship between public debt and economic growth, and between public debt service and economic growth. First, is the Keynesian view, which argues that at moderate levels of public debt, fiscal policy is economic growth-enhancing (Elmendorf and Mankiw, 1999). This argument is confirmed by Barro (1979)'s view that public debt could be used to smoothen distortionary taxation and to induce economic growth by stimulating aggregate demand and output in the short run. Expansionary government policies that lead to public debt accumulation are argued to have a positive multiplier effect on both short-term and long-term economic growth – the law of increasing state activity (DeLong and Summers, 2012; Wagner, 1911). Second, is the Classical view that argues that public debt and public debt service negatively affects the productivity of public expenditures through crowding out private capital and the overall outflow of income (Teles and Mussolini, 2014; Saint-Paul, 1992; Modigliani, 1961).

Empirically, the direction of causality between public debt and economic growth, and between public debt service and economic growth has undergone a limited examination as the majority of past studies have focused more on the impact analyses between the variables. Of the few studies that explicitly focused on the direction of causality between public debt and economic growth, and between public debt service and economic growth, the results are mixed depending partly on the methodology used and a set of other heterogeneous factors. Among the countries analysed, there is evidence of unidirectional causality and bidirectional causality between public debt and real economic growth; and between public debt service and real economic growth. Furthermore, there is also empirical evidence that supports the neutrality hypothesis between the variables.

While the majority of the studies have used the time-series Granger-causality test (see, for instance, Donayre and Taivan, 2017; Gómez-Puig and Sosvilla-Rivero, 2015), a few others have employed either the panel data Granger-causality test (see, for example, Woo and Kumar, 2015; Jalles, 2011; Ferreira, 2009; Abbas and Christensen, 2007) or the instrumental variable approach (see, for example, Panizza and Presbitero, 2014; Reinhart and Rogoff, 2010). A

summary of the empirical review of studies on the causality between public debt and economic growth, and between public debt service and economic growth is given in Table 1.

Table 1: Empirical studies on the causality between public debt and economic growth, between public debt service and economic growth

Studies consistent with causality between public debt and economic growth		
Methodology	**Outcome**	**Studies**
Time-series Granger-causality	Debt → Growth	Donayre and Taivan, 2017; Gómez-Puig and Sosvilla-Rivero, 2015
	Debt ← Growth	Donayre and Taivan, 2017; Gómez-Puig and Sosvilla-Rivero, 2015; Kobayashi, 2015
	Debt ↔ Growth	Donayre and Taivan, 2017; Owusu-Nantwi and Erickson, 2016
	No causality	Donayre and Taivan, 2017; Gómez-Puig and Sosvilla-Rivero, 2015
Panel data Granger-causality	Debt ← Growth	Woo and Kumar, 2015
	Debt ↔ Growth	Ferreira, 2009; Abbas and Christensen, 2007
Instrumental variable approach	No causality	Panizza and Presbitero, 2014; Reinhart and Rogoff, 2010
Studies consistent with causality between public debt service and economic growth		
Methodology	**Outcome**	**Studies**
Time-series Granger-causality	Debt service → Growth	Karagol, 2002
Panel data Granger-causality	Debt service → Growth	Afxentiou, 1993
	Debt service ↔ Growth	Amoateng and Amoako-Adu, 1996
	No causality	Jalles, 2011

In Table 1, more studies have been conducted on the causality between public debt and economic growth than between public debt service and economic growth. Basing on the number of studies, the dominant causal flow in Table 1 is from economic growth to public debt.

However, no dominant causal flow was ascertained between public debt service and economic growth because the literature is still at a nascent stage.

4. Methodology and empirical analysis

4.1 Estimation techniques

This paper employs a multivariate Granger-causality model within an autoregressive distributed lag (ARDL) bounds testing context, with a view to investigate the causality between public debt and economic growth, and between public debt service and economic growth, along with other control variables. According to Granger (1969) and Sims (1972), one variable Granger-causes another variable, given an information set, if past information about the former can improve the prediction of the latter based solely on its own past information. In other words, information on the evolution of one time-series minimises the forecast errors of the other, implying that the latter does not evolve independently of the former (see Lin, 2008). To increase the general validity of the causation test, as well as to eliminate spurious correlations, the paper incorporated two control variables to create a multivariate Granger-causality model. The two intermittent variables are fiscal balance and savings.

Prior to the application of the afore-described ECM-based causality test, the paper utilises the ARDL approach to confirm the existence or absence of a long-run relationship among the variables. The choice of the ARDL approach to cointegration is based on its strengths over the residual-based approach by Engle and Granger (1987), and the full maximum likelihood approach by Johansen and Juselius (1990). First, the ARDL approach captures the short-run and long-run relationships simultaneously, and the t-statistics from the ARDL procedure are valid, and its long-run estimates are reliable and unbiased (see Odhiambo, 2011; Pesaran and Shin, 1999). Second, the ARDL approach to cointegration provides robust results even in cases of small or finite sample sizes (see Odhiambo, 2009; Narayan, 2005). Lastly, the ARDL approach can produce sound results even when regression variables have a mixture of order of integration not exceeding one (Makuyana and Odhiambo, 2019).

The computed F-statistic is equated to the critical values provided by Pesaran *et al.* (2001). If the computed F-statistic exceeds the upper critical value, the null hypothesis of no cointegration is rejected; while the null hypothesis of no cointegration cannot be rejected if the F-statistic

falls below the lower bounds critical value. Finally, if the F-statistic falls between the lower and upper bounds, then the cointegration result becomes inconclusive.

To determine the optimal lag structure for each variable, the paper uses the Schwartz-Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC). According to Cheung and Lai (1993), both the AIC and BIC methods perform well in finite samples provided that the true error structure has a finite and autoregressive representation. Principally, the importance of selecting the right lag length for each variable is that it lessens the bias that arises from under-parameterisation of a model, as well as the loss in efficiency resulting from its over-parameterisation (see Thornton and Batten, 1985). Table 2 gives a description of each variable included in the study.

Table 2: Variable description

Variable	Description
y	Annual growth rate of real GDP per capita (a proxy for economic growth)
PD	Public debt/RGDP ratio (a proxy for public debt)
PDS	Public debt service/RGDP ratio (a proxy for public debt service)
FB	Fiscal balance/RGDP ratio (a proxy of fiscal balance)
SAV	Gross domestic savings/RGDP ratio (a proxy for savings)

4.2 Empirical model specification and data sources

This paper applies two models, Model 1 and Model 2. In Model 1, the paper examines the causality between public debt and economic growth, whereas, in Model 2, the causality between public debt service and economic growth is considered. Two control variables, that is, fiscal balance and savings were added to each of the two models. A system of cointegration equations for Model 1 in this study is expressed as follows:

ARDL specification for Model 1 (y, PD, FB and SAV)

$$\Delta y_t = \Phi_0 + \sum_{i=1}^{n} \Phi_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \Phi_{2i} \Delta PD_{t-i} + \sum_{i=0}^{n} \Phi_{3i} \Delta FB_{t-i} + \sum_{i=0}^{n} \Phi_{4i} \Delta SAV_{t-i}$$

$$+ \Phi_5 y_{t-1} + \Phi_6 PD_{t-1} + \Phi_7 FB_{t-1} + \Phi_8 SAV_{t-1} + \varepsilon_{1t} \dots \dots \dots \dots \dots \dots \dots \dots (1.1)$$

$$\Delta PD_t = \lambda_0 + \sum_{i=0}^{n} \lambda_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \lambda_{2i} \Delta PD_{t-i} + \sum_{i=0}^{n} \lambda_{3i} \Delta FB_{t-i} + \sum_{i=0}^{n} \lambda_{4i} \Delta SAV_{t-i}$$

$$+ \lambda_5 y_{t-1} + \lambda_6 PD_{t-1} + \lambda_7 FB_{t-1} + \lambda_8 SAV_{t-1} + \varepsilon_{2t} \dots \dots \dots \dots \dots \dots \dots \dots. (1.2)$$

$$\Delta FB_t = \beta_0 + \sum_{i=0}^{n} \beta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta PD_{t-i} + \sum_{i=1}^{n} \beta_{3i} \Delta FB_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta SAV_{t-i}$$

$$+ \beta_5 y_{t-1} + \beta_6 PD_{t-1} + \beta_7 FB_{t-1} + \beta_8 SAV_{t-1} + \varepsilon_{3t} \dots \dots \dots \dots \dots \dots \dots \dots. (1.3)$$

$$\Delta SAV_t = \omega_0 + \sum_{i=0}^{n} \omega_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \omega_{2i} \Delta PD_{t-i} + \sum_{i=0}^{n} \omega_{3i} \Delta FB_{t-i} + \sum_{i=1}^{n} \omega_{4i} \Delta SAV_{t-i}$$

$$+ \omega_5 y_{t-1} + \omega_6 PD_{t-1} + \omega_7 FB_{t-1} + \omega_8 SAV_{t-1} + \varepsilon_{4t} \dots \dots \dots \dots \dots \dots \dots \dots (1.4)$$

Where Φ_0, λ_0, β_0 and ω_0 are respective constants; $\Phi_1 - \Phi_4$, $\lambda_1 - \lambda_4$, $\beta_1 - \beta_4$ and $\omega_1 - \omega_4$ are respective short-run coefficients; $\Phi_5 - \Phi_8$, $\lambda_5 - \lambda_8$, $\beta_5 - \beta_8$ and $\omega_5 - \omega_8$ are respective long-run coefficients; $\varepsilon_1 - \varepsilon_4$ are the error terms; Δ is the difference operator; n is the lag length; t is the time period; and all the other variables are as described in Table 2.

ECM-based Granger-causality for Model 1 (y, PD, FB and SAV)

Following Donayre and Taivan (2017), and based on the work of Pesaran and Shin (1999) and Pesaran *et al.* (2001), the ECM-based multivariate Granger-causality model in this study, for Model 1, is expressed as:

$$\Delta y_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i}\Delta y_{t-i} + \sum_{i=1}^{n} \phi_{2i}\Delta PD_{t-i} + \sum_{i=1}^{n} \phi_{3i}\Delta FB_{t-i} + \sum_{i=1}^{n} \phi_{4i}\Delta SAV_{t-i}$$

$$+ \phi_9 ECM_{t-1} + \mu_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1.5)$$

$$\Delta PD_t = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i}\Delta y_{t-i} + \sum_{i=1}^{n} \lambda_{2i}\Delta PD_{t-i} + \sum_{i=1}^{n} \lambda_{3i}\Delta FB_{t-i} + \sum_{i=1}^{n} \lambda_{4i}\Delta SAV_{t-i}$$

$$+ \lambda_9 ECM_{t-1} + \mu_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1.6)$$

$$\Delta FB_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta y_{t-i} + \sum_{i=1}^{n} \beta_{2i}\Delta PD_{t-i} + \sum_{i=1}^{n} \beta_{3i}\Delta FB_{t-i} + \sum_{i=1}^{n} \beta_{4i}\Delta SAV_{t-i}$$

$$+ \beta_9 ECM_{t-1} + \mu_{3t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1.7)$$

$$\Delta SAV_t = \omega_0 + \sum_{i=1}^{n} \omega_{1i}\Delta y_{t-i} + \sum_{i=1}^{n} \omega_{2i}\Delta PD_{t-i} + \sum_{i=1}^{n} \omega_{3i}\Delta FB_{t-i} + \sum_{i=1}^{n} \omega_{4i}\Delta SAV_{t-i}$$

$$+ \omega_9 ECM_{t-1} + \mu_{4t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1.8)$$

Where ϕ_9, λ_9, β_9 and ω_9 are coefficients of ECM_{t-1}; ECM_{t-1} is the error correction term lagged by one period; and all the other variables are as described in the cointegration model (Model 1).

ARDL specification for Model 2 (y, PDS, FB and SAV)

$$\Delta y_t = \psi_0 + \sum_{i=1}^{n} \psi_{1i}\Delta y_{t-i} + \sum_{i=0}^{n} \psi_{2i}\Delta PDS_{t-i} + \sum_{i=0}^{n} \psi_{3i}\Delta FB_{t-i} + \sum_{i=0}^{n} \psi_{4i}\Delta SAV_{t-i}$$

$$+ \psi_5 y_{t-1} + \psi_6 PDS_{t-1} + \psi_7 FB_{t-1} + \psi_8 SAV_{t-1} + \varepsilon_{1t} \dots\dots\dots\dots\dots\dots\dots\dots (2.1)$$

$$\Delta PDS_t = \rho_0 + \sum_{i=0}^{n} \rho_{1i}\Delta y_{t-i} + \sum_{i=1}^{n} \rho_{2i}\Delta PDS_{t-i} + \sum_{i=0}^{n} \rho_{3i}\Delta FB_{t-i} + \sum_{i=0}^{n} \rho_{4i}\Delta SAV_{t-i}$$

$$+ \rho_5 y_{t-1} + \rho_6 PDS_{t-1} + \rho_7 FB_{t-1} + \rho_8 SAV_{t-1} + \varepsilon_{2t} \dots\dots\dots\dots\dots\dots\dots\dots. (2.2)$$

$$\Delta FB_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta PDS_{t-i} + \sum_{i=1}^{n} \alpha_{3i} \Delta FB_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta SAV_{t-i}$$

$$+ \alpha_5 y_{t-1} + \alpha_6 PDS_{t-1} + \alpha_7 FB_{t-1} + \alpha_8 SAV_{t-1} + \varepsilon_{3t} \dots\dots\dots\dots\dots\dots\dots\dots. (2.3)$$

$$\Delta SAV_t = \delta_0 + \sum_{i=0}^{n} \delta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta PDS_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta FB_{t-i} + \sum_{i=1}^{n} \delta_{4i} \Delta SAV_{t-i}$$

$$+ \delta_5 y_{t-1} + \delta_6 PDS_{t-1} + \delta_7 FB_{t-1} + \delta_8 SAV_{t-1} + \varepsilon_{4t} \dots\dots\dots\dots\dots\dots\dots\dots\dots. (2.4)$$

Where ψ_0, ρ_0, α_0 and δ_0 are respective constants; $\psi_1 - \psi_4$, $\rho_1 - \rho_4$, $\alpha_1 - \alpha_4$ and $\delta_1 - \delta_4$ are respective short-run coefficients; $\psi_5 - \psi_8$, $\rho_5 - \rho_8$, $\alpha_5 - \alpha_8$ and $\delta_5 - \delta_8$ are respective long-run coefficients; $\varepsilon_1 - \varepsilon_4$ are the error terms; Δ is the difference operator; n is the lag length; t is time period; and all the other variables are as described in Table 2.

ECM-based Granger-causality for Model 2 (y, PDS, FB and SAV)

$$\Delta y_t = \psi_0 + \sum_{i=1}^{n} \psi_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \psi_{2i} \Delta PDS_{t-i} + \sum_{i=1}^{n} \psi_{3i} \Delta FB_{t-i} + \sum_{i=1}^{n} \psi_{4i} \Delta SAV_{t-i}$$

$$+ \psi_9 ECM_{t-1} + \mu_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.5)$$

$$\Delta PDS_t = \rho_0 + \sum_{i=1}^{n} \rho_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \rho_{2i} \Delta PDS_{t-i} + \sum_{i=1}^{n} \rho_{3i} \Delta FB_{t-i} + \sum_{i=1}^{n} \rho_{4i} \Delta SAV_{t-i}$$

$$+ \rho_9 ECM_{t-1} + \mu_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (2.6)$$

$$\Delta FB_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta PDS_{t-i} + \sum_{i=1}^{n} \alpha_{3i} \Delta FB_{t-i} + \sum_{i=1}^{n} \alpha_{4i} \Delta SAV_{t-i}$$

$$+ \alpha_9 ECM_{t-1} + \mu_{3t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.7)$$

$$\Delta SAV_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \delta_{2i} \Delta PDS_{t-i} + \sum_{i=1}^{n} \delta_{3i} \Delta FB_{t-i} + \sum_{i=1}^{n} \delta_{4i} \Delta SAV_{t-i}$$

$$+ \delta_9 ECM_{t-1} + \mu_{4t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (2.8)$$

Where ψ_9, ρ_9, $\propto_9$, and δ_9 are coefficients of ECM_{t-1}; ECM_{t-1} is the error correction term lagged by one period; and all the other variables are as described in the cointegration model (Model 2).

The paper utilised annual time-series data from 1970 to 2017 for all the variables in Models 1 and 2. The annual time-series data for these variables is taken from the World Bank World Development Indicators database (World Bank, 2018a). Further, the paper employed the Microfit 5.01 econometric package to run all independent regressions.

4.3 Empirical analysis

Although the ARDL bounds test procedure does not require all variables to be integrated of the same order, the approach requires that all variables be integrated of order of a maximum of one. The results of Dickey Fuller Generalised Least Square (DF-GLS) and Perron (1997) unit root test (PPURoot) are presented in Table 3.

Table 3: Unit root test results – all variables

	DF-GLS				PPURoot			
	Stationarity of all Variables in Levels		Stationarity of all Variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all Variables in First Difference	
Variable	*With Intercept*	*With Intercept and Trend*	*With Intercept*	*With Intercept and Trend*	*With Intercept*	*With Intercept and Trend*	*With Intercept*	*With Intercept and Trend*
Y	-4.928***	-4.946***	-	-	-5.578**	-5.588**	-	-
PD	-1.692*	-1.921	-	-5.444***	-2.319	-2.781	-6.072***	-6.006***
PDS	-1.336	-2.279	-5.131***	-6.500***	-3.902	-3.769	-7.688***	-7.636***
FB	-2.648***	-2.794	-	-6.537***	-3.340	-3.274	-7.596***	-7.253***
S	-1.279	-1.765	-4.932***	-5.566***	-3.310	-3.491	-7.049***	-7.508***

*Note: *, ** and *** imply the rejection of the null hypothesis of non-stationarity at 10%, 5% and 1% significance levels respectively.*

Even though the unit root test results vary from one test to the other, overall, the variables are either integrated of order zero or one, thus confirming the aptness of the ARDL bounds estimation technique. The next stage is to test for the presence or absence of long-run

equilibrium relationship among regression variables in the two models using a bounds F-statistic test. Table 4 presents the cointegration results for Model 1 and Model 2.

Table 4: Bound F-test for cointegration results – Models 1 and 2

Pane A: Model 1 – Public debt and economic growth			
Dependent Variable	**Function**	**F-statistic**	**Cointegration Status**
y	F(y| PD, FB, S)	4.538**	Cointegrated
PD	F(PD| y, FB, S)	2.407	Not cointegrated
FB	F(FB| y, PD, S)	1.537	Not cointegrated
S	F(S| y, PD, FB)	3.784*	Cointegrated
Panel B: Model 2 – Public debt service and economic growth			
Dependent Variable	**Function**	**F-statistic**	**Cointegration Status**
y	F(y| PDS, FB, S)	6.200***	Cointegrated
PDS	F(PDS| y, FB, S)	3.850*	Cointegrated
FB	F(FB| y, PDS, S)	2.335	Not cointegrated
S	F(S| y, PDS, FB)	3.112	Not cointegrated

Asymptotic critical values (unrestricted intercept and no trend)						
Pesaran *et al.* (2001: 300) Table CI(iii) Case III	**10%**		**5%**		**1%**	
	I(0)	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*
	2.72	3.77	3.23	4.35	4.29	5.61

*Note: *, ** and *** imply statistical significance at 10%, 5% and 1%, respectively.*

The cointegration results reported in Table 4 establish that cointegration exists in the economic growth and savings functions for Model 1 [Panel A], and in the economic growth and public debt service functions for Model 2 [Panel B]. The findings in Models 1 and 2 are validated by the respective F-statistics of each function vis-à-vis the Pesaran *et al.'s* (2001) asymptotic critical values. The existence of cointegration in these functions indicate the presence of causality in at least one direction (see Muyambiri and Odhiambo, 2018; Sims, 1972). Therefore, the paper proceeds to establish the direction of causality between public debt and economic growth, and between public debt service and economic growth by running an ECM-

based causality test. The empirical results of the Granger-causality test for Model 1 and Model 2 for South Africa are presented in Table 5, Panel A and Panel B, respectively.

Table 5: Granger-causality Test Results – Models 1 and 2

Panel A: Model 1 – Public debt and economic growth

Dependent Variable	F-statistics [probability]				ECT_{t-1} [t-statistics]
	Δy_t	ΔPD_t	ΔFB_t	ΔS_t	
Δy_t	-	1.739 [0.179]	2.468* [0.080]	3.143* [0.054]	-0.376*** [-4.520]
ΔPD_t	2.316* [0.051]	-	0.465 [0.632]	1.333 [0.256]	-
ΔFB_t	0.879 [0.462]	1.905 [0.148]	-	0.845 [0.479]	-
ΔS_t	2.108 [0.118]	2.802* [0.055]	1.339 [0.279]	-	-0.134* -1.727

Panel B: Model 2 – Public debt service and economic growth

Dependent Variable	F-statistics [probability]				ECT_{t-1} [t-statistics]
	Δy_t	ΔPDS_t	ΔFB_t	ΔS_t	
Δy_t	-	1.002 [0.323]	5.254** [0.027]	3.753* [0.060]	-0.369*** [-4.574]
ΔPDS_t	0.274 [0.604]	-	1.577 [0.217]	8.030*** [0.003]	-0.244** [-2.628]
ΔFB_t	1.119 [0.296]	0.004 [0.948]	-	1.579 [0.216]	-
ΔS_t	2.993* [0.091]	0.671 [0.418]	0.746 [0.393]	-	-

*Note: *, ** and *** imply statistical significance at 10%, 5% and 1% levels, respectively.*

The empirical results reported in Table 5, Panel A for Model 1, reveal that there is short-run unidirectional causality from economic growth (y) to public debt (PD). This outcome is confirmed by the corresponding F-statistic of economic growth (Δyt) in the public debt (ΔPDt) function, which is statistically significant at 10% level. The causality results for Model 1 indicate that it is economic growth that drives public debt in South Africa. This result is not unique to this study as it is consistent with the finding in Donayre and Taivan (2017).

Other results of Model 1 presented in Panel A confirm that, in South Africa, there is: (i) unidirectional causal flow from fiscal balance to economic growth, irrespective of whether the causality is estimated in the short run or in the long run; (ii) unidirectional causality between

savings and economic growth, both in the short run and in the long run; (iii) short-run and long-run causal flow from public debt to savings; and (iv) no causality between fiscal balance and public debt, and between fiscal balance and savings.

Empirical results presented in Table 5, Panel B for Model 2, where public debt service, fiscal balance, savings and economic growth are variables, indicate that in South Africa there is no short-run or long-run causality between public debt service and economic growth. This result is confirmed by the corresponding F-statistics of ΔPDS in the economic growth function (Δyt) and that of Δyt in the public debt service function (ΔPDSt), which are both statistically insignificant. This finding is in line with empirical evidence from Jalles (2011).

Other results of Model 2 reported in Panel B confirm that, in South Africa, there is: (i) distinct short-run and long-run unidirectional causality from fiscal balance to economic growth; (ii) short-run bidirectional causality from savings to economic growth; (iii) long-run unidirectional causality from savings to economic growth; (iv) distinct short-run and long-run unidirectional causality from savings to public debt service; and (v) no causality between savings and fiscal balance, and between public debt service and fiscal balance.

5. Conclusion

In this paper, the causality between public debt and economic growth, and between public debt service and economic growth is examined in South Africa for the period 1970 – 2017. The paper makes use of two models, namely, Model 1 and Model 2. Model 1 is composed of public debt, economic growth, fiscal balance and savings; whereas Model 2 is composed of public debt service, economic growth, fiscal balance and savings. Fiscal balance and savings were used as intermittent variables to overcome the limitations of bivariate causality test, such as the omission-variable-bias. The paper employed the ARDL bounds testing procedure for cointegration and the ECM-based Granger-causality test to explore the underlying relationships.

The study reveals that for South Africa, there is short-run unidirectional causal flow from economic growth to public debt. However, the study fails to establish any causality between public debt service and economic growth, both in the short run and in the long run. In line with these results, the study concludes that it is economic growth that drives public debt in South Africa, and that the causal relationship between public debt and economic growth is sensitive

to the time frame considered. The study, therefore, recommends that appropriate economic growth-enhancing policies should be intensified in South Africa in order to uphold a sustainable public debt level.

References

Abbas, A.S.M., and Christensen, J.E. (2007) *The role of domestic debt markets in economic growth: An empirical investigation for low-income countries and emerging markets.* IMF working papers no. 07/127. Washington DC. International Monetary Fund.

Afxentiou, P.C. (1993) 'GNP growth and foreign indebtedness in middle-income developing countries.' *International Economic Journal*, 7(3): 81-92.

Amoateng, K., and Amoako-Adu, B. (1996) 'Economic growth, export and external debt causality: The case of African countries.' *Applied Economics*, 28: 21-27.

Balcilar, M. (2012) 'The difficult quest for an answer to low growth dilemma in Turkey: The channel of debt and productivity.' *International Journal of Economic Perspectives*, 4: 93-111.

Barro, R.J. (1979) 'On the determination of the public debt.' *Journal of Political Economy*, 87: 940-971.

Barro, R.J. (1990) 'Government spending in a simple model of endogenous growth.' *Journal of Political Economy*, 98(5): 103-125.

Baum, A., Checherita-Westphal, C., and Rother, P. (2012) *Debt and growth: New evidence for the Euro Area*. ECB working paper no. 1450. July 2012. ECB.

Chenery, H.B., and Strout, A.M. (1966) 'Foreign assistance and economic development.' *American Economic Review*, 56(4): 679-733.

Cheung, Y.W., and Lai, K.S. (1993) 'Finite sample sizes of Johansen's Likelihood Ratio test for cointegration.' *Oxford Bulletin of Economics and Statistics*, 55: 313-328.

Clark, N. (1994) *Manufacturing Apartheid: State Corporations in South Africa*. Yale. University Press.

DeLong, B.J., and Summers, L.H. (1991) 'Equipment investment and economic growth.' *Quarterly Journal of Economics*, 106: 445-502.

Dogan, I., and F. Bilgili (2014) 'The non-linear impact of high and growing government external debt on economic growth: A Markov Regime-switching approach.' *Economic Modelling*, 39(C): 213-220.

Domar, E.D. (1944) 'The burden of the debt and the national income.' *American Economic Review*, 34: 798-827.

Donayre, L. and Taivan, A. (2017) 'Causality between public debt and real growth in the OECD: A country-by-country analysis.' *Economic Papers*, 36(2): 156-170.

Elbadawi, I., Ndulu, B., and Ndungu, N. (1997) *Debt overhang and economic growth in sub-Saharan Africa.* In *External finance or low-income countries,* Iqbal, Z and Kanbur (ed). Washington DC. International Monetary Fund.

Elmendorf, D.W., and Mankiw, G.N. (1999) *Government debt*, in *Handbook of Macroeconomics*, edited by Taylor J.B., and Woodford, M., Volume 1 of *Handbook of Macroeconomics*, Chapter 25: 1615-1669. Elsevier.

Engle, R.F., and Granger, CJ. (1987) 'Cointegration and error-correction representation, estimation and testing.' *Econometrica*, 55 (2): 251-278.

Faulkner, D., and Loewald, C. (2008) *Policy change and economic growth: A Case study of South Africa*. Policy paper no. 14. The International Bank for Reconstruction and Development /The World Bank.

Ferreira, C. (2009) *Public debt and economic growth: A Granger-causality panel data approach*. Instituto Superior de Economia e Gestão. WP24/2009/DE/UECE. Technical University of Lisbon.

Gómez-Puig, M., and Sosvilla-Rivero, S. (2015) 'The causal relationship between public debt and economic growth in EMU countries.' *Journal of Policy Modelling*, 37(6): 974-989.

Gómez-Puig, M., and Sosvilla-Rivero, S. (2018) 'Public debt and economic growth: Further evidence for the Euro area.' *Acta Oeconomica,* 68(2): 209-229.

Government of South Africa (GSA). (1994) *Reconstruction and Development Programme*. Pretoria. Government Printers.

Government of South Africa (GSA). (1996) *Growth, Employment and Redistribution*. Pretoria. Government Printers.

Government of South Africa (GSA). (2014) *Twenty-year review: South Africa: 1994-2014*. Pretoria. Government of the Republic of South Africa.

Granger, C.W.J. (1969) 'Investigating causal relations by econometric models and cross-spectral methods.' *Econometrica*, 37: 424-459.

Huang, Y., Panizza, U., and Varghese, R. (2018) *Does public debt crowd out corporate investment? International Evidence*. IHEID working papers no. 08-2018. Economics Section. The Graduate Institute of International Studies.

International Monetary Fund. (2005d) Post-apartheid South Africa: The first ten-years. Washington DC. International Monetary Fund.

Jalles, J.T. (2011) 'The impact of democracy and corruption on the debt-growth relationship in developing countries.' *Journal of Economic Development,* 36(4): 41-72.

Johansen, S., and Juselius, K. (1990) 'Maximum likelihood estimation and inference on cointegration with applications to the demand for money.' *Oxford Bulletin of Economics and Statistics*, 52:169-210.

Karagol, E. (2002) 'The causality analysis of external debt service and GNP: The case of Turkey.' *Central Bank Review,* 1 (2002): 39-64.

Kobayashi, K. (2015) 'Public debt overhang and economic growth.' Policy Research Institute, *Public Policy Review,* 11(2): 247-276.

Kourtellos, A., Stengos, T., and Tan, C.M. (2013) 'The effect of public debt on growth in multiple regimes.' *Journal of Macroeconomics*, 38: 35-43.

Lin, J.L. (2008) *Notes on testing causality*. [Online]. Available from <http://faculty.ndhu.edu.tw/~jlin/files/causality.pdf> [Accessed 19 April 2018].

Lutkepohl, H. (1982) 'Non-causality due to omitted variables.' *Journal of Econometrics*, 19: 367-378.

Makuyana, G., and Odhiambo, N.M. (2019) 'Public and private investment and economic growth in Malawi: An ARDL-bounds testing approach.' *Economic Research-Ekonomska Istraživanja*, 32(1): 673-689.

Mankiw, N.G. (2000) 'The savers-spenders theory of fiscal policy.' *American Economic Review Papers and Proceedings,* 90: 120-125.

Modigliani, F. (1961) 'Long-run implications of alternative fiscal policies and the burden of the national debt.' *Economic Journal*, 71(4): 730-755.

Moss, G., and Obery, I. (1987) *South African Review*. Johannesburg. Ravan Press.

Muyambiri, B., and Odhiambo, N.M. (2018) 'Financial development and investment dynamics in Mauritius: A trivariate Granger-causality analysis.' *Spoudai Journal of Economics and Business,* 68(2-3): 62-73.

National Treasury. (1995) *Budget review*. Pretoria. Government Printers.

National Treasury. (1998) *Macroeconomic slowdown and prospects for recovery*. National Treasury. Pretoria. The Government of the Republic of South Africa.

National Treasury. (2012) *2011/12 Debt management report*. Pretoria. The Government of the Republic of South Africa.

National Treasury. (2016) *2015/16 Debt management report*. Pretoria. The Government of Republic of South Africa.

National Treasury. (2018) *Budget review*. Pretoria. Government Printers .

Narayan, P. K. (2005) 'The savings and investment nexus from China: evidence from co-integration tests.' *Applied Economics*, 37(17): 1979-1990

Odhiambo, N.M. (2008) 'Financial depth, savings and economic growth in Kenya: A dynamic causal linkage.' *Economic Modelling*, 25: 704-713.

Odhiambo, N.M. (2009) 'Finance-growth-poverty nexus in South Africa: A dynamic causality linkage.' *Journal of Socio-Economics*, 38: 320-325.

Odhiambo, N.M. (2011) 'Financial intermediaries versus financial markets: A South African experience.' *International Business & Economics Research Journal*, 10 (2): 77-84.

Owusu-Nantwi, V., and Erickson, C. (2016) 'Public debt and economic growth in Ghana.' *African Development Review*, 28(1): 116-126.

Panizza, U., and Presbitero, A.F. (2013) 'Public debt and economic growth in advanced economies: A survey.' *Swiss Journal of Economics and Statistics,* 149(2):175-204.

Panizza, U., and Presbitero, A.F. (2014) 'Public debt and economic growth: Is there a causal effect?' *Journal of Macroeconomics*, 41: 21-41.

Pesaran, M.H., and Shin, Y. (1999) *An autoregressive distributed lag modelling approach to cointegration analysis*. In: Storm, S. (Ed.) *Econometrics and Economic Theory in the 20th Century*: Chapter 11, 1-31. The Ragnar Frisch Centennial Symposium. Cambridge University Press.

Pesaran, MH., Shin, Y., and Smith, R. (2001) 'Bound testing approaches to the analysis of level relationship.' *Journal of Applied Econometrics*, 16(3): 174-189.

Reinhart, C.M., and Rogoff, K.S. (2010) 'Growth in a time of debt.' *American Economic Review,* 100(2): 573-578.

Sachs, J.D. (1989) *The debt overhang of developing countries*. In, *Debt, stabilisation and development*, by Calvo, G.A., Findlay, R., Kouri, P., and De Macedo, J.B. (eds). Basil Blackwell, Oxford.

Saint-Paul, G. (1992) 'Fiscal policy in an endogenous growth model.' *Quarterly Journal of Economics*, 1243-1259.

Saungweme, T., and Odhiambo, N.M. (2018a) 'Public debt dynamics in emerging market economies: The experience of South Africa.' *ACTA Administratio,* 1(2018): 39-59.

Saungweme, T., and Odhiambo, N.M. (2018b) 'An exploratory review of government debt service management in South Africa.' *Journal of Accounting and Management 2018,* 8(2): 167-184.

Savvides, A. (1992) 'Investment slowdown in developing countries during the 1980s: Debt overhang or foreign capital inflows.' Kyklos, 45(3): 363-378.

Serieux, J., and Samy, Y. (2001) *The debt service burden and growth: Evidence from low-income countries.* The North-South Institute working paper. Ottawa. Canada.

Sims, C.A. (1972) 'Money, income, and causality.' *The American Economic Review*, 62(4): 540-552.

South African Reserve Bank (SARB). (2006) *Deepening capital markets: The Case of South Africa*. Address by Mr T.T. Mboweni, Governor of the South African Reserve Bank, at the seminar on "Deepening Financial Sectors in Africa: Experiences and Policy Options", co-organised and cosponsored by the IMF/AFR and DFID. Johannesburg, 7 November 2006.

South African Reserve Bank (SARB). (2016) *Annual economic report*. South African Reserve Bank.

Statistics South Africa. (2017) *Quarterly bulletin of statistics*. (Various issues). Pretoria. The Government of the Republic of South Africa.

Teles, V.K., and Mussolini, C.C. (2014) 'Public debt and the limits of fiscal policy to increase economic growth.' *European Economic Review*, 66(C): 1-15.

Thornton, D.L., and Batten, D.S. (1985) 'Lag-length selection and tests of Granger-causality between money and income.' *Journal of Money, Credit, and Banking*, 17: 164-178.

Wagner, A. (1893) *Text and Handbook of Political Economy*. 3rd edition. Winter, C.F. (ed). Leipzig. Germany.

Wagner, A. (1911) *The state in Economic Perspective* Hinsicht. In Gustav Fisher (ed) *Handwörterbuch der Staatswissenschaften* (3rd ed., pp. 743-745). Jena, Germany. Lexispp.

Woo, J., and Kumar, M.S. (2015) 'Public debt and growth.' *Economica,* 82(328): 705-739.

World Bank. (2001b) *Policies to promote growth and employment in South Africa.* 2001 annual forum. Discussion paper. The World Bank. Southern Africa Department.

World Bank. (2018a) *World development indicators.* Washington DC. World Bank. [Online]. Available from <http://databank.worldbank.org/data/databases.aspx>. [Accessed 12 October 2018].

World Bank. (2018b) *South Africa economic update: Jobs and inequality*. Washington DC. World Bank.