



Savings and growth nexus in the context of Southern African Customs Union countries



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Orientation: The primary goal of Southern African Customs Union (SACU) is to promote economic development through regional coordination. Consequently, SACU members have set economic growth targets through various medium- and long-term policies.

Research purpose: The article investigates the savings-growth nexus among SACU countries.

Motivation for the study: This study is motivated by low economic growth among SACU countries and the gap in the saving-growth literature. Specifically, previous studies assumed linear relationship, thereby ignoring the fact that savings may be related to economic growth in a nonlinear fashion.

Research approach/design and method: The study utilised several panel estimation techniques with data over 1990–2021 for the SACU countries.

Main findings: Firstly, there is a strong evidence of long run relationship between saving and economic growth in SACU countries. Secondly, domestic saving exhibits a positive and statistically significant effect on economic growth both in the short-and long-term. Thirdly, there is evidence of non-linear relationship between domestic saving and economic growth. Lastly, it is shown that 16% threshold level of domestic savings to gross domestic product (GDP) ratio is consistent with 6% GDP growth target aspired by SACU union.

Practical/managerial implications: The findings of this article suggest that domestic saving is a prerequisite for economic growth provided the funds are channelled to productive investments. Consequently, there is a need to design appropriate policies that can help to promote and mobilise savings.

Contribution/value-add: This article contributes to the ongoing debate on saving-growth in the context of developing countries. In addition, it addressed the linearity assumption of the previous studies by incorporating nonlinear assumption.

Keywords: savings; economic growth; Southern African Customs Union countries; fully modified ordinary least square; dynamic ordinary least square; pool mean group.

Introduction

Southern African Customs Union (SACU) is a common customs territory of five member states, namely Botswana, Eswatini, Lesotho, Namibia and South Africa. It is one of the oldest customs union arrangements in the world and dates to 1889 Customs Union Convention, which was later extended in 1910 to include the Union of South Africa and the three High Commission Territories of Bechuanaland (Botswana), Basutoland (Lesotho) and Swaziland (SACU 2013). The 1969 agreement replaced the 1910 and following the negotiations, a new SACU agreement was adopted in 2002 which was later amended in 2013. The amendments over the years were not only because of new political developments in the region including among others, the independence of Namibia in 1990 and the formation of a democratic government in South Africa in 1994, but also to meet the needs of the 21st century and international developments (SACU 2022a).

One of the key missions of SACU is to promote sustainable economic growth and development for employment creation and poverty reduction (SACU 2013). Within this context, SACU members have individually set economic growth targets, ranging between 2.5% and 6.2%, through the various member's medium and long-term policy frameworks namely, the Eswatini's National Development Strategy (Vision 2022), Namibia's Fifth National Development Plan (NDP5), Botswana's Vision 2016, and South Africa's NDP (Vision 2030). However, the region has experienced slow economic growth following the 2008/2009 global financial crisis with average annual growth rate of 1.9% over the period of 2010–2019 compared to average of 4.2% during the

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period of 2000–2008. The current economic growth trajectory is well below the growth targets set by the members and the disruption caused by the coronavirus disease 2019 (COVID-19) pandemic has worsen the growth performance.

Moreover, to address several developmental challenges facing the region (including among others high rate of poverty, unemployment and income inequalities), SACU countries have emphasised the need for stronger economic performance (SACU 2022b). To this end, there is a need to understand the fundamental factors that drive economic growth. Nevertheless, the complexity surrounding the drivers of economic growth has led to several theoretical propositions from the classical models to neoclassical models, and down to the new growth theories. In particular, the role of domestic savings in promoting economic growth has been widely acknowledged by a number of these theories (Domar 1946; Harrod 1939; Lewis 1955; Lucas 1988; Romer 1986; Solow 1956). Importantly, all these theories have postulated a positive relationship between savings and economic growth.

However, the applications of these theories in the context of developing countries (like SACU countries) have been questioned given the poor economic performance in many developing countries (Agu & Omolade 2021). It is argued that the dominant concepts relating to these theories are mostly based on the context of developed countries (Keita 2016). Sujianto et al. (2020) argued that low domestic savings is a common feature of developing countries because of the poor economic performance, inadequate financial sector, meagre wages, high unemployment and poverty levels. In addition, structural constraints not only prevent developing countries from channelling savings to productive investments but also prevent them from attracting higher levels of investment (Pettinger 2019). Such structural constraints could lead to capital flight and leakages which could potentially aggravate the poor economic growth in developing countries. For these reasons, examination of the savings-growth nexus in SACU countries provides a good environment to test the proposition of these theories. Therefore, the goal of this article is to investigate the savings-growth nexus among SACU countries.

Although saving-growth nexus has been investigated by several studies, available evidence on the impact of savings on growth remains inconclusive. In this regard, this article contributes to the literature in three ways. Firstly, the article contributes to the debate on saving-growth nexus in the developing countries by focussing on the SACU countries. The focus on SACU countries is motivated by the fact that they share common colonial history, institutions (such as the Common Monetary Area), cultural and greater regional trade. Also, the revenue from the customs union (SACU) constitutes a significant source revenue for some of the member countries. Secondly, most of the existing studies have focussed on linear relationship between domestic saving and economic growth, thereby ignoring the fact that both variables may be related in a nonlinear fashion. That is,

changes in savings may not necessarily be directly proportional to changes in economic growth. Additionally, economic growth may not be feasible at all possible level of savings, implying that there could be a threshold level of saving and above which economic growth turns negative. Therefore, the current article addresses this weakness by analysing both linear and nonlinear relationship between saving and economic growth. Thirdly, the article examines the threshold level of domestic savings to gross domestic product (GDP) required to achieve the SACU growth targets.

The rest of this article is structured as follows: Section 2 provides a brief overview of savings and economic growth in SACU countries. Section 3 presents literature review. Section 4 describes the data and methodology while empirical results are discussed in Section 5. Lastly, Section 6 presents conclusion and recommendation.

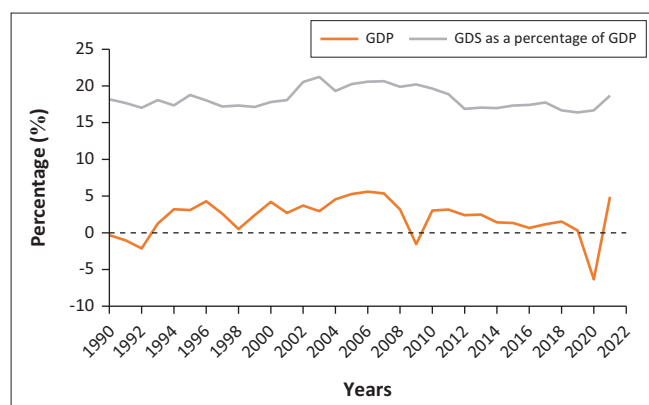
Overview of savings and economic growth in Southern African Customs Union countries

This section provides a brief analysis of trends in savings and economic growth among SACU members and various policy initiatives to stimulate savings and growth.

South Africa

South Africa plays a dominant role in the Southern Africa region both on the political and economic front. Economically, South Africa accounts for approximately 50% of the region's output (African Development Bank [AfDB] 2018b). Since the onset of the democratic dispensation in 1994 following the collapse of apartheid regime, the developmental policies and programmes, from the Reconstruction and Development Programme (RDP) to the current NDP (Vision 2030), have focussed on improving economic growth and alleviation of poverty and inequalities (Sulla & Zikhali 2018). However, achieving such goals has become difficult given the low rate of economic growth over the last 10 years.

The country has recorded the slowest rate of growth since the end of 2007/2008 global financial crisis compared to the decades before the crisis. For instance, between 1994–2000 and 2001–2008, South African economy expanded by an average of 2.9% and 4.2%, respectively. By contrast, the average growth expanded by 1.7% over the period of 2010–2019. The sluggish economic growth over these periods can be attributed to several economic events such as global financial crisis, Eurozone debt crisis, commodity market crash and Brexit. As shown in Figure 1, South Africa has experienced several periods of negative economic growth, particularly during the early 1990s, 2009 and 2020. The economy was in a recession from 1990 to 1992, largely in response to the effect of international sanctions on the apartheid regime (The Presidency 2014; World Bank 2020). The periods 2009 and 2020 coincided with the global financial crisis and COVID-19 pandemic. In a nutshell, South Africa's



Note: World Development Indicators.

GDP, gross domestic product; GDS, gross domestic saving.

FIGURE 1: Gross domestic product and gross domestic saving (% of gross domestic product) for South Africa.

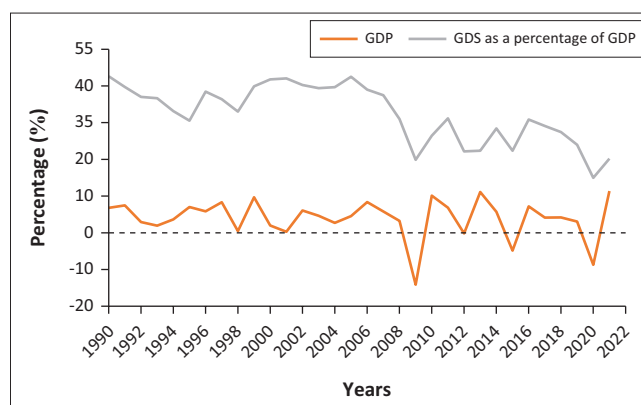
economic growth has been consistently below the 6.1% target of the Growth Employment and Redistribution (GEAR) strategy introduced in 1996.

Bonga-Bonga and Guma (2017) argue that savings are crucial for economic growth in South Africa. Unfortunately, South Africa has experienced a decline in the domestic savings over the 1990–2019 period. For instance, the average gross domestic saving (GDS) grew from 11.8% between 1994 and 2000 to 13.9% over the period 2001–2008, before declining to 5.1% during the period 2010–2019. This rate of domestic saving is less than the target rate of 16%–25% set in the NDP (South African Government 2012). As a result, a study by the National Treasury (2019) conceded that South Africa's low domestic savings are likely to constrain the growth of the economy. As a proportion of GDP, the GDS accounts for approximately 17.7% and 20.1% of the GDP over the period 1994–2000 and 2001–2008, respectively. From 2010 to 2019, the share of GDS declined to approximately 17.5%.

Botswana

Since its independence in 1966, Botswana has experienced rapid economic development owing to its diverse mineral wealth, prudent economic management and good governance (World Bank 2022). While Botswana has historically experienced one of the highest economic growth rates in world, the rate has slowed in recent years (International Trade Administration [ITA] 2022). For instance, from 1990 to 1999, the economy expanded by an average of 5.4% compared to average growth of 4.2% over the 2000–2008. After experiencing a negative growth of -14.1% during the global financial crisis in 2009, the economy expanded by 10.1% in 2010. However, the average growth rate of 4.7% over the period of 2010–2019 was lower compared to the period 1990–1999.

The high dependence on diamond export which accounts for over 80% of total export, and public sector-driven model make the economy vulnerable to external shocks (World Bank 2022). In addition, diamond export revenue and custom revenue from SACU account for about two-third of the total



Note: World Development Indicators.

GDP, gross domestic product; GDS, gross domestic saving.

FIGURE 2: Gross domestic product and gross domestic saving (% of gross domestic product) for Botswana.

revenue, implying a large share of the country's revenue falls outside its control (ITA 2022). As a result, the negative economic growth experienced over the period of 2012, 2015 and 2020 indicates the exposure of the economy to external shocks. Moreover, these periods were associated with different external economic events (including the Eurozone sovereign debt crisis, commodity market collapse and COVID-19 pandemic) that affected commodity export.

Given the vulnerability of the country to external shocks, policy makers would be under pressure to plan conservatively, and savings is seen as one of the policy measures to mitigate this problem. While Botswana has maintained a higher domestic saving compared to other SACU members over the years, the growth rate of savings has remained relatively stable over the periods of 1990–1999, 2000–2008 and 2010–2019, averaging 16.0%, 9.8% and 16.1%, respectively. As a percentage of the GDP, the average rate of growth increased from 36.7% during the period of 1990–1999 to 39.2% between 2000 and 2008, before declining to 26.4% over the period of 2010–2019 (see Figure 2).

Lesotho economy

The Kingdom of Lesotho is a small country surrounded by the Republic of South Africa, and is classified as a low-income developing country (World Bank 2020). It is an open economy, with imports accounting for over 90% of GDP, of which around 80% originate from South Africa (Ministry of Finance and Development Planning 2016). The government of Lesotho depends on external sources of revenue, such as receipts from the customs union (SACU), as well as royalties from transfers of water resources to South Africa. Additionally, households rely heavily on remittances from family members working in South African mines, farms and domestic workers (AfDB 2018b). The country's ability to sustain strong economic growth is closely linked to the economic and political dynamics in South Africa and other members of Southern African Development Community as well as weather conditions (United Nations Conference on Trade and Development [UNCTAD] 2013).

In recent decades, Lesotho has experienced declining economic performance from average growth of 4.4% over the period of 1990–1999 to 3.5% during the period of 2000–2008 and further to 2.4% during the period of 2010–2019. The declining economic performance towards the early 2000s has been attributed to drop in Lesotho Highland Water Project investment, weak growth in agriculture and manufacturing as well as declining migrant workers remittance from South Africa (World Bank 2002). The weak economic performance over the period 2010–2019 has been attributed to weak growth in South Africa, lower global economic prospects and effect of drought (UNCTAD 2013). The fact that Lesotho economic growth path is linked to external environment, the role of domestic savings will be critical in ensuring stable economic growth. Although the proportion of domestic savings as a percentage of GDP was negative over the period 1990–2019, it has progressively improved from -66.3% in 1990 to -16.0% in 2019. The fluctuations experienced in the economic performance and savings over the period of 1990–2021 are presented in Figure 3.

Namibia economy

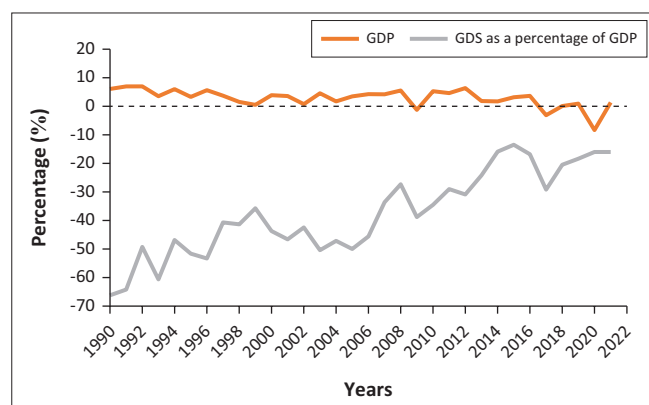
Namibia is a small open economy, sharing borders with Angola, Botswana, South Africa and Zambia (AfDB 2018a). The economy is closely linked to South African economy through several institutional relationships including membership of SACU and Common Monetary Area (CMA) as well as through trade, investment and common monetary policies (International Monetary Fund [IMF] 1997). Since independence in 1990, the major goal of the government is to reduce the legacy of apartheid regime through sustained economic growth, employment creation, reducing inequality and poverty. These socio-economic challenges are addressed through various 5-year national development planning strategies which consist of both medium- and long-term development perspectives (National Planning Commission 2004). The adoption of various National Development Plans (NDP 1–5) together with the implementation of Namibia Vision 2030 have assisted in addressing some of these issues.

However, the economic performance in Namibia has continued to be subject to external shocks and erratic growth

since the independence. The real GDP grew at an average rate of 3.5% annually over the period of 1990–1999. This period was marked with the implementation of the First National Development Plan (NDP1). Thereafter, the economy expanded by an average of 4.8% annually during the period of 2000–2008 following the implementation of the NDP2, before contracting to 3.1% during the 2010–2019 period. While Namibia weathered the effect of the global financial crisis compared to most SACU countries, the economy contracted to -1.0% in 2017 and -8.0% in 2020 because of uncertainties around Brexit and COVID-19 pandemic. In terms of domestic savings as a proportion of GDP, the share of saving increased from 16.0% over the period 1990–1999, to 17.8% during the 2001–2008 period, and declined to 6.5% during the period of 2010–2019. Figure 4 presents the trends in the economic growth and domestic savings in Namibia over the period.

Eswatini (Swaziland) economy

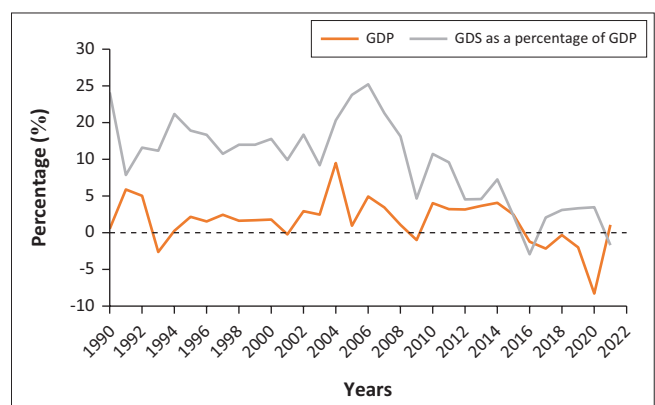
The Kingdom of Eswatini formerly known as Swaziland gained its independence in 1968. The country is classified as a lower middle-income country according to the World Bank (2020). It is a small open economy with close economic ties to South Africa, which receives 60% of its exports and from which it receives over 80% of its imports (AfDB 2020). In addition, it is a member of CMA with South Africa, Lesotho and Namibia, and its domestic currency is pegged to the South African rand. Furthermore, the economy is dependent on workers remittances and customs union revenue from SACU (Moody's Analytics 2023). The overarching development goal of the government is to maintain a sustainable and inclusive economic growth that is resilient to shocks through structural transformation (Central Bank of Eswatini 2020). The major policy framework adopted by the government to address the socio-economic challenges facing the country is the National Development Strategy (NDS, 1997–2022). The implementation of NDS is carried out through the medium-term programmes such as the Economic Social Reform Agenda (ESRA), the Millennium Action Programme (MAP), the Smart Programme for Economic Development (SPEED), and the Poverty Reduction Strategy



Note: World Development Indicators.

GDP, gross domestic product; GDS, gross domestic saving.

FIGURE 3: Gross domestic product and gross domestic saving (% of gross domestic product) for Lesotho.



Note: World Development Indicators.

GDP, gross domestic product; GDS, gross domestic saving.

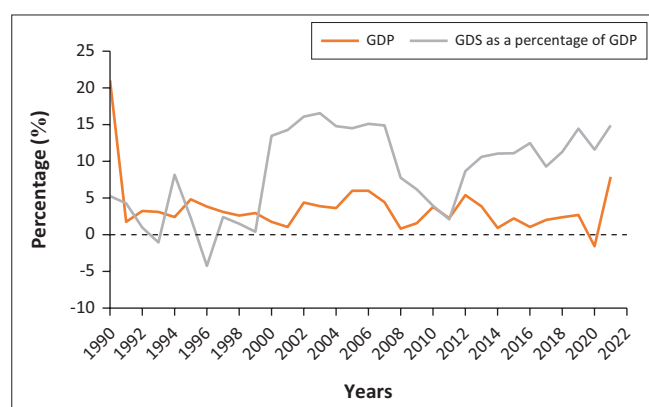
FIGURE 4: Gross domestic product and gross domestic saving (% of gross domestic product) for Namibia.

and Action Plan (PRSP) (Ministry of Economic Planning and Development [MEPD] 2006).

Although there has been a shift in the economic structure of the country from primary to secondary production, the manufacturing sector particularly the sugar and soft drink concentrate are the leading export industries (Moody's Analytics 2023). However, the rate of economic growth has declined over the years. From 1990 to 1999, the economy expanded at an average of 4.9% per annum but contracted to 3.8% during the period of 2001–2008, and further to 2.7% during the period of 2010–2019. The recent poor economic performance is partly attributed to low agricultural productivity, a slowdown in manufacturing output, declining foreign direct investment inflows and drought (MEPD 2019). The domestic savings rate is very low, averaging about 2.0% of the GDP from 1990 to 1999 before rising to 14.1% during 2000–2008, and falling to 9.5% during 2010–2019. Figure 5 shows the growth and savings trend over the period 1990–2021.

Literature review

Many economic theories have acknowledged the significance of savings to economic growth. Early efforts to understand the role of savings in the economy can be found in the classical model by Lewis (1955) who argued that saving is a necessary and sufficient condition for investment, which in turn leads to economic growth. Similar view was expressed by Harrod-Domar model. Harrod (1939) and Domar (1946) stressed the importance of savings rate and investment to long-term economic growth and suggested that through investment, savings contribute to economic growth. Within the neoclassical growth theory popularised by Solow (1956), savings is argued to improve economic growth in the short-run while long-run growth is because of technological progress. In addition, the endogenous growth model developed by Romer (1986) envisages that a rise in savings rate results in an increase in economic growth through its impact on investment and capital accumulation. Lucas (1988) also affirms the view that output grows at a rate of net investment, which is a function of savings.



Note: World Development Indicators.

GDP, gross domestic product; GDS, gross domestic saving.

FIGURE 5: Gross domestic product and gross domestic saving (% of gross domestic product) for Eswatini.

Empirically, several studies have attempted to address the saving-growth nexus across different countries with diverse economic conditions. Given the objective of this study, the analysis of empirical literature focusses on studies in developing countries with a particular interest in Africa. While previous studies have presented diverse evidence on this issue of savings-growth nexus, the existing literature can be divided into three strands which cannot be isolated from one another.

The first group of studies are those that have documented evidence of positive long-run relationship between savings and economic growth across different developing countries (El-Seoud 2016; Khandelwal & Joshy 2017; Kok & Munir 2021; Najarzadeh, Reed & Tasan 2014; Nguyen & Nguyen 2017; Ribaj & Mexhuani 2021; Soyulu 2019; Tang & Tan 2014). In African context, Gidigbi and Donga (2020) focussed on 30 African countries using panel techniques and found evidence of positive long-run relationship between domestic savings and economic growth. Studies by Sellami, Bentafat and Rahmane (2020) and Mohanty (2018) applied the autoregressive distributed lag (ARDL) model and found a positive significant short-run and long-run effects of savings on economic growth in Algeria and Ethiopia, respectively. In Ghana, Siaw, Enning & Pickson (2017) show evidence of positive effects of savings on economic growth. Similar study in Botswana by Jagadeesh (2015) found that savings is positively related to economic growth both in the short- and long-term. Related study in South Africa by Van Wyk and Kapingura (2021) found evidence of positive effects of saving on economic growth only in the short run.

By contrast, the second group are studies that found evidence of negative impact of saving on economic growth (Rahman & Ferdaus 2021; Sabra & Eltalla 2016; Sujianto et al. 2020). Among these studies, Agu and Omolade (2021) found that savings have significant negative impact on economic growth in Nigeria both in the short run and the long run. In a related study, Gatsi and Appiah (2020) found that savings have significant negative effect on economic growth in Ghana. Study by Sere and Tchereni (2020) applied the Johansen cointegration technique to disaggregated savings and found that all the components of saving had a negative impact on economic growth in South Africa in the long run, while corporate savings had significant positive effect in the short run.

The third group of studies consists of those that found insignificant or mixed results regarding the effect of savings on growth (Joshi, Pradhan & Bist 2019; Miah & Majumder 2020; Patra et al. 2017; Yadav, Goyani & Mishra 2018). Among this group of studies, Bolarinwa and Obembe (2017) focussed on six African countries and found that saving had negative impact on growth in Burkina Faso and Niger, but positive impact for Nigeria. Gashe (2017) investigated the interplay between savings, inflation and economic growth for the economy of Ethiopia. The results show an insignificant relationship between domestic savings and economic

growth. Also, study by Mohanty (2017) revealed that savings have no effect on economic growth in Ethiopia. Similar study in Lesotho by Sekantsi and Kalebe (2015) found that the effect of savings on growth is insignificant in short-term. Amusa (2014) followed a disaggregated approach to analyse saving-growth nexus in South Africa and found that while household saving had negative effect on growth, government and corporate savings had positive effect over the short run. In the long run, only corporate saving was found to have positive effect on growth.

While most of the empirical literature provides evidence of strong long-term relationship between savings and economic growth, there is inconclusive evidence regarding the effect of saving on economic growth. However, a major weakness in the existing literature is that they all assumed a linear relationship between savings and economic growth. This article addressed this weakness in the existing literature by assuming both linear and nonlinear relationship between savings and economic growth.

Data and methodology

Data

This article utilised a balanced panel data over the period 1990–2021 to investigate the savings-growth nexus among five SACU member countries (South Africa, Botswana, Lesotho, Namibia and Eswatini). The data were obtained from the World Bank Development Indicators, African Development Bank Socioeconomic database and African statistical yearbooks. The key variables of interest are GDP which is used as a proxy for economic growth and GDS as a percentage of GDP. Following previous studies, the control variables included in the analysis are: the gross fixed capital formation (GFCF) to GDP a proxy for investment; the Consumer Price Index (CPI) as a proxy for inflation; and Trade openness (TRADE), which is the ratio of total exports plus imports of goods and services to GDP (Joshi et al. 2019; Mohanty 2018; Nguyen & Nguyen 2017; Rahman & Ferdaus 2021; Sujianto et al. 2020). It is important to highlight that panel data were transformed to natural logarithm to allow the estimates to be analysed as elasticity coefficients.

Table 1 provides both the descriptive statistical properties (Panel A) and correlation analysis (Panel B). The data in Panel A show that the average economic growth in SACU countries is about 3.2%, while the ratio of domestic savings to GDP is approximately 7.6% over the period. This finding shows that the current economic growth is well-below the target rate of 6% GDP growth. The rate of investment in SACU as proxied by the GFCF to GDP, indicates that investment accounts on average about 21.0% of GDP. Looking at the skewness coefficients, it is shown that all the variables are positively skewed except domestic saving. These findings suggest that domestic savings have declined or that there is a high level of dissaving in SACU countries over the period.

TABLE 1: Summary statistics.

Variable	Mean	Standard deviation	Skewness	Kurtosis
Panel A: Descriptive statistics				
GDP	0.0322	0.0353	0.2976	7.8248
GDS	0.0755	0.2567	-1.1346	3.5568
GFCF	0.2100	0.0650	0.7629	2.7363
TRADE	1.0400	0.3986	0.5473	2.6111
CPI	0.8683	0.3995	0.1680	1.9957
Panel B: Correlation analysis				
	GDP	GDS	GFCF	TRADE
GDP	-	-	-	-
GDS	0.0701	-	-	-
GFCF	-0.0580	0.3917	-	-
TRADE	0.1523	-0.7262	-0.0857	-
CPI	-0.3171	-0.0357	0.2124	-0.1438

GDP, gross domestic product; GDS, gross domestic saving; GFCF, gross fixed capital formation; TRADE, trade openness; CPI, Consumer Price Index.

The data in Panel B show that there is a positive correlation between domestic savings and economic growth with a correlation efficient of 7.0%. Such a positive correlation implies that domestic savings and GDP move in the same direction, and that an increase in domestic savings is more likely to lead to an increase in economic growth. In addition, it suggests the likelihood that domestic savings and economic growth could share long run relationship. Contrary to the expectation, the correlation between investment and GDP is found to be negative, implying de-anchoring or divergence between investment and economic growth in SACU countries. However, TRADE and CPI have the expected signs and are consistent with economic theory.

Model specification

Following Verhoef et al. (2014), the econometric model used in this article is specified as:

$$GDP_{it} = \alpha + \beta_1 GDS_{it} + \beta_2 GFCF_{it} + \beta_3 TRADE_{it} + \beta_4 CPI_{it} + u_{it} \quad [\text{Eqn 1}]$$

where α represents constant term while the parameters $\beta_1, \beta_2, \beta_3$ and β_4 are coefficients of the respective explanatory variables. The subscript i denotes individual SACU member country with $i = 1, 2, 3, 4$ and 5. The time subscript t is the time dimension in years and u_{it} indicates the composite error term and is independent and identically distributed normally ($U \sim NIID, 0, \sigma^2$)

To analyse the relationship between savings and economic growth as well as the effect of saving on economic growth, this article applied several complementary panel estimation techniques to Equation 1. Specifically, the article first utilised the combination of panel techniques namely the panel least square (POLS), fixed effect (FE) and random effect (RE), fully modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS). Apart from the above panel techniques, this article follows recent development in the literature where it is now a common practice to distinguish the short run impacts from the long run impacts (Agu & Omolade 2021; Bolarinwa & Obembe 2017; Gatsi & Appiah 2020; Joshi et al. 2019; Keho 2018; Kok & Munir 2021; Miah & Majumder 2020; Mohanty 2018). For this reason, the article

applies the panel ARDL model proposed by Pesaran, Shin and Smith (1999). The panel ARDL model for the long run and the short run relationship between saving and economic growth can be obtained by transforming Equation 1 as:

$$\begin{aligned}\Delta GDP_{it} = & \omega_i + \sum_{i=1}^p \alpha_{1i} \Delta GDP_{it-1} \\ & + \sum_{i=1}^q \alpha_{2i} \Delta GDS_{it-1} + \sum_{i=1}^q \alpha_{3i} \Delta GFCF_{it-1} \\ & + \sum_{i=1}^q \alpha_{4i} \Delta TRADE_{it-1} + \sum_{i=1}^q \alpha_{5i} \Delta CPI_{it-1} + \\ & + \pi_1 GDP_{it-1} + \pi_2 GDS_{it-1} + \pi_3 GFCF_{it-1} \\ & + \pi_4 TRADE_{it-1} + \pi_5 CPI_{it-1} + \varepsilon_{it}\end{aligned}\quad [\text{Eqn 2}]$$

In Equation 2, all the variables are allowed to be integrated level $I(0)$, first difference $I(1)$, or the combination of $I(0)$ and $I(1)$, respectively. The short run parameters are $\alpha_{1i} - \alpha_{5i}$ while the long run parameters are $\pi_1 - \pi_5$. The constant is ω_i and Δ represents first difference operator. Finally, p, q are the optimal lag orders which are determined using the Schwarz Information Criterion (SIC). The model is flexible such that time, trends and other fixed regressors may be included (Cameron & Trivedi 2010). The cointegration test for long-run relation is examined by testing the null hypothesis of no cointegration such that $\pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = 0$ against the alternative that there is cointegration, $\pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq \pi_5 \neq 0$. However, it is important to point out that the application of the above hypothesis in a panel setting is difficult. For this reason, the Pedroni (2004) cointegration test is mostly used by studies to determine the long-run relationship (Ekanayake & Dissanayake 2022). Therefore, cointegration between savings and economic growth is tested in this article using the Pedroni (2004) cointegration test.

In order to determine the short-run relationship between savings and economic growth, Equation 2 can be reformulated into the error correction model (ECM) representation. However, it is important to note that the estimation of the ECM is dependent on presence of a long-run relationship. The ECM for this article is expressed as:

$$\begin{aligned}\Delta GDP_{it} = & \alpha_{0i} + \sum_{i=1}^p \alpha_{1i} \Delta GDP_{it-1} + \sum_{i=1}^q \alpha_{2i} \Delta GDS_{it-1} \\ & + \sum_{i=1}^q \alpha_{3i} \Delta GFCF_{it-1} \\ & + \sum_{i=1}^q \alpha_{4i} \Delta TRADE_{it-1} \\ & + \sum_{i=1}^q \alpha_{5i} \Delta CPI_{it-1} + \lambda ECT_{it} + \varepsilon_{it}\end{aligned}\quad [\text{Eqn 3}]$$

The parameter ECT_{it} is the error correction term. The validity of the error correction term depends on the magnitude and the sign of the coefficient λ , representing the speed of adjustment. Theoretically, the coefficient of the error correction term is expected to be a negative value. Such a negative value indicates how long it takes for shocks to work through the system.

The modified ARDL specification allows for a dynamic structure wherein three different estimators, namely the pool mean group (PMG), mean group (MG) and dynamic fixed effect (DFE), can be estimated by Equation 2 and Equation 3.

Importantly, all the three estimators consider the long-run and short-run relationship and the heterogeneity of the dynamic adjustment process. However, they differ in several ways because of the underlying assumptions. For example, DFE estimator assumes that data for each group are pooled but allows the intercepts to differ across groups. The PMG estimator relies on pooling and averaging by allowing the intercept, short-run coefficients, and error variances to differ across group, while the MG estimator relies on averaging of coefficients (Pesaran et al. 1999). In this article, these three estimators are applied, and the results are compared to ensure the robustness of the estimates.

Nevertheless, one major weakness of the above panel techniques is that they do not account for existence of nonlinear relationship between variables. In other words, these models assume that the saving is linearly related to economic growth. To address this weakness, this article applies the dynamic threshold regression model introduced by Hansen (1999) and extended by Caner and Hansen (2004) which controls for endogeneity and serial correlation. The threshold regression can be represented by:

$$GDP_{it} = \mu_i + \beta_1 GDS_{it} I(GDS_{it} \leq \gamma) + \beta_2 GDS_{it} I(GDS_{it} > \gamma) + \varepsilon_{it} \quad [\text{Eqn 4}]$$

In Equation 4, the subscript $i = 1 \dots 5$ indicates SACU member countries, and $t = 1, \dots, T$ represents time dimension. While μ_i denotes country specific effect and ε_{it} is the error term. Kremer, Bick and Nautz (2013) proposed different regimes that correspond with the optimal threshold value. Hence, I is an indicator function, showing the regime. GDS_{it} is gross domestic savings indicating threshold variable and regime-dependent explanatory variable, and the threshold level is given by γ .

Empirical results

This section presents and analyses the results from the various panel estimation techniques used to investigate the savings-growth nexus in SACU. For this purpose, the section is divided into four subsections. The first part covers the unit root test results. The second part focusses on the analysis of the Pedroni cointegration test result. The third part presents and discusses the results from various panel regression tests while the fourth part analyses the results from the dynamic threshold regression model.

Unit root test results

The unit root properties of the variables were analysed given the need to investigate the long run relationship between domestic saving and economic growth. For this reason, the panel unit root tests by Im, Pesaran and Shin, (IPS 2003), Levin, Lin and Chu (LLC 2002) were implemented, and the results are reported in Table 2 for both level and first difference. The unit root tests are conducted in the general form of intercept and intercept with trend to ensure robustness of the stationary tests at level and first difference.

TABLE 2: Unit root test results.

Variable	Levels		First difference	
	With intercept	With intercept and trend	With intercept	With intercept and trend
Panel A: LLC				
GDP	-0.6613	0.4524	-2.0794***	0.1088
GDS	0.3504	1.2526	-2.5890**	-1.1158**
GFCF	0.9352	-0.6535	-3.7927**	-2.4565**
CPI	-0.2084	2.5347	-6.8641**	-6.0114**
TRADE	-1.3457	-1.1868	-4.0074**	-2.7604**
Panel B: IPS				
GDP	-4.1954**	-3.4349**	-	-
GDS	0.5440	0.4287	-7.1091**	-5.8451**
GFCF	0.3470	-0.6831	-6.6104**	-5.5871**
CPI	1.7495	0.1401	-7.5266**	-6.2180**
TRADE	-1.1483	-0.6347	-6.0452**	-4.6476**

Note: *** and ** denote significance at 1% and 5% respectively. –, indicate GDP is stationary in first difference.

GDP, gross domestic product; GDS, gross domestic saving; GFCF, gross fixed capital formation; TRADE, trade openness; CPI, Consumer Price Index.

The LLC shows that all the variables are nonstationary in level but stationary in first difference, implying that the variables are integrated of order one or $I(1)$. Also, the results based on the IPS test deviate slightly from those of LLC with respect to GDP. The IPS results show that GDP is stationary in level, suggesting that it is $I(0)$. Overall, the results of the unit root tests indicate that the variables are either $I(0)$ or $I(1)$, which are consistent for the application of the ARDL model.

Panel co-integration results

In this section, the long run relationship between domestic saving and economic growth in SACU is assessed using the Pedroni cointegration test. The results of this test are provided in Table 3. As reported in the table, the panel v -statistic is a one-sided test with large positive test statistic value rejecting the null hypothesis of no cointegration among the variable. Also, the null hypothesis of no cointegration is rejected by rho, PP and ADF-statistics for both within-dimension and between-dimension. This finding implies existence of long run relationship between domestic saving and economic growth. In addition, this finding suggests that while both variables may diverge over a short-term because of economic shocks, the relationship will converge to their long-term trend. This result is consistent with the previous studies by Bolarinwa and Obembe (2017), Gidigbi and Donga (2020), Mohanty (2018), Sellami et al. (2020), Sere and Tchereni (2020), and Van Wyk and Kapingura (2021).

Analysis of panel regression results

After determining evidence of cointegrating relationship between domestic savings and economic growth, the next step is to estimate various panel regression models, specifically POLS, FE, RE, FMOLS and DOLS. Table 4 reports the results for each of these regression models. Interestingly, the results from the POLS, RE, FMOLS and DOLS show that domestic saving has positive and statistically significant effect on economic growth. The elasticity coefficient across the models ranges from 0.06 to 0.20. This finding suggests that an increase

TABLE 3: Pedroni co-integration test results.

Variable	Within-dimension		Between-dimension	
	Statistic	Probability	Statistic	Probability
GDP // GDS, GFCF, TRADE, CPI				
V	2.2273**	0.0130	-	-
rho	-3.7936***	0.0001	-2.3095**	0.0105
PP	-9.2388***	0.0000	-10.5634***	0.0000
ADF	-3.2987***	0.0005	-3.4176***	0.0003

Note: *** and ** denote significance at 1% and 5% respectively.

GDP, gross domestic product; GDS, gross domestic saving; GFCF, gross fixed capital formation; TRADE, trade openness; CPI, Consumer Price Index.

in domestic savings by 1% would likely contribute between 6% and 20% increase in economic growth of SACU. This also suggests that accumulation of domestic savings is important to stimulate economic growth in SACU countries. In other words, mobilisation of domestic saving should be a priority for SACU countries to realise sustainable economic growth. This finding supports the role of saving in promoting growth as suggested by economic theories such as Harrod-Domar model, Lucas (1988) and Romer (1986). Empirically, this finding is consistent with previous studies that found positive effect of savings on growth (Gidigbi & Donga 2020; Jagadeesh 2015; Kok & Munir 2021; Siaw et al. 2017; Soylu 2019; Van Wyk & Kapingura 2021).

However, it is shown that investment has a negative and statistically significant effect on growth in SACU countries according to the results from FE and FMOLS. This result is inconsistent with the proposition of the economic theory that GDP and investment are positively related. This negative effect could be because the level of investment is well below the required level to promote economic growth or that the available savings are not invested in productive assets. On the other hand, the coefficient for trade openness is positive and significant in all the models except for DOLS regression. This is consistent with economic theory because accumulation of domestic savings encourages importation of intermediate materials and technological transfer which enhances growth. The analysis also revealed that inflation rate has a negative effect on economic growth in the SACU countries. This finding suggests SACU countries should strive for low rate of inflation in order to promote economic growth.

While the results from various panel regression models in Table 4 appear consistent, these models have some weaknesses. In particular, these models are unable to distinguish between the short run effects from the long run effects. To address this weakness, the MG, PMG and DFE models were estimated using the optimal lag length based on SIC (the lag length selection criteria is provided in Table 1-A1 in the Appendix 1).

Table 5 reports the results from the MG, PMG and DFE model. As shown in the table, while the result from MG model shows that domestic saving has a positive long run impact on growth, the results from the PMG and DFE models show insignificant effect. The result from MG model collaborates evidence from POLS, RE, FMOLS and DOLS

TABLE 4: Panel regression results.

Variable	POLS	FE	RE	FMOLS	DOLS
C	2.2225 (1.5675)	3.5537 (1.6884)	2.2225 (1.5798)	-	-
GDS	0.0574** (3.2117)	0.0501 (1.4170)	0.0574** (3.2368)	0.1023** (2.1579)	0.1978** (2.2000)
GFCF	-0.0764 (-1.5724)	-0.1834* (-2.7077)	-0.0764 (-1.5847)	-0.3195** (-4.2535)	-0.1567 (-1.2405)
TRADE	0.0365** (3.4401)	0.0416* (2.5740)	0.0365** (3.4671)	0.0911** (5.2113)	0.0143 (0.4871)
CPI	-0.0188** (-2.6334)	-0.0137 (-1.7723)	-0.0188** (-2.6540)	-0.0277** (-3.0748)	-0.0350 (-1.9756)
Diagnostics:					
R-squared	0.1678	0.2018	0.1678	0.9788	0.8258
Durban-Watson stat	1.7636	1.7634	1.7636	-	-
Breuch- Godfrey stat	0.1159	0.1159	0.1159	0.6850	0.6850

Note: ***, ** and * denote significance at 1%, 5% and 10% respectively, t-statistics in parentheses.

POLS, panel least square; FE, fixed effect; RE, random effect; FMOLS, fully modified ordinary least square; DOLS, dynamic ordinary least square; GDP, gross domestic product; GDS, gross domestic saving; GFCF, gross fixed capital formation; TRADE, trade openness; CPI, Consumer Price Index.

TABLE 5: Results of the mean group, pool mean group and dynamic fixed effect model.

Variable	MG	PMG	DFE
Panel A: Long-run results			
GDS	0.1445** (4.28)	0.0324 (1.06)	0.0185 (0.49)
GFCF	-0.0757 (-0.56)	-0.1808** (-2.76)	-0.1000 (-1.54)
TRADE	-0.0134 (-0.66)	0.0235** (2.20)	0.0237 (1.39)
CPI	-0.0386 (-1.89)	-0.0071 (-1.56)	-0.0138 (-1.72)
Panel B: Short-run results			
DGDS	0.0206 (0.72)	0.0811** (2.96)	0.1414** (2.76)
DGFCF	-0.0792 (-0.26)	0.0316 (-0.11)	-0.2646** (-2.68)
DTRADE	0.0615 (1.20)	-0.0640 (-1.21)	0.0530** (2.46)
DCPI	0.0339* (2.22)	-0.0189* (2.11)	0.1151 (0.73)
C	5.6406 (1.19)	4.3920** (4.79)	3.7799 (1.88)
ECT	-1.0097** (-14.66)	-0.8959** (-8.49)	-0.9354** (-12.38)
Hausman test	0.7925, PMG > DFE		

Note: ** and * denote significance at 5% and 10% respectively.

MG, mean group; PMG, pool mean group; DFE, dynamic fixed effect; GDP, gross domestic product; GDS, gross domestic saving; GFCF, gross fixed capital formation; TRADE, trade openness; CPI, Consumer Price Index; ECT, error correction term.

models. This finding is in line with the previous studies that found evidence of positive long run impact of domestic savings on economic growth (Gatsi & Appiah 2020; Joshi et al. 2019; Miah & Majumder 2020; Ribaj & Mexhuani 2021). Also, the results show that investment as proxied by GFCF has negative long run impact on economic growth, while TRADE promotes economic growth in the long run.

Looking at the short run impact (Panel B), the results from the PMG and DFE models show that domestic savings contributes positively to economic growth. It is shown that a percentage increase in domestic saving would likely lead to approximately 8% to 14% increase in GDP. This finding is consistent with previous studies that found a positive relationship between saving and economic growth in the short-term (Kok & Munir 2021; Sere & Tchereni 2020; Van Wyk & Kapingura 2021). The error correction terms from three models are negative and significant as expected, implying existence of long run relationship between domestic savings and economic growth. This finding supports the evidence from the Pedroni cointegration test result. Furthermore, the error correction term shows that speed of adjustment to equilibrium ranges from 90% to 100% across the three models. That is, it suggests that it takes about 1 year for the system to revert to equilibrium after a given shock. The model analysis using the Hausman test shows that the PMG model provided more robust results than DFE.

TABLE 6: Threshold regression results.

Variable	Lower regime	Upper regime
Lagged GDS	0.0569** (2.7205)	-0.1285** (-3.1746)
$\gamma = 15.8936^{**}$ (4.6712)	-	-
Linearity test	-	-
P value = 0.0037	-	-

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

GDS, gross domestic saving.

Subsequently, the stability of the estimated models was performed using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) tests. The results, as displayed in Figure 1-A1 in Appendix 1, show evidence that the estimated models are stable and consistent.

Analysis of the dynamic threshold regression result

The dynamic threshold regression is estimated with GDP as the dependent variable while domestic saving is treated as a threshold variable. The estimated model is divided into two regimes, the lower regime and the upper regime (Kremer et al. 2013). The result of the dynamic threshold regression is provided in Table 6. The result shows that domestic saving is a suitable threshold variable as confirmed by the linearity test which is significant at 5% level. In addition, the probability values for the two regimes indicate the rejection of the null hypothesis of linearity which confirms the existence of nonlinear or asymmetric relationships between domestic savings and economic growth. This finding is interesting given that domestic savings stimulate economic growth through investment channel, rather than by itself as suggested by economic theories (such as Domar 1946; Harrod 1939; Romer 1986; Solow 1956).

Table 6 also revealed that domestic saving contributes approximately 6% to economic growth at a lower regime whereas it reduces economic growth by approximately 13% at the upper regime, with estimated threshold value of approximately 16%. This finding implies that for SACU countries to achieve the growth target of 6%, the domestic saving to GDP ratio of less than or equal to 16% will be required. By contrast, saving to GDP greater than 16% is likely to reduce economic growth by about 13%. The above finding is consistent with the idea of Solow (1956) that rising savings influence economic growth until the economy reaches a steady state. In addition, this threshold level might

be the result of low rate of saving among SACU countries given the low rate of income coupled with high level of unemployment, poverty and inequality. Consequently, a higher threshold level may lead to crowding out household spending and consumption, which may in turn affect economic growth.

Conclusion

This article sought to investigate the savings-growth nexus among SACU member countries, namely South Africa, Botswana, Lesotho, Namibia and Eswatini. To achieve this goal, the article applied several complementary panel estimation techniques namely the POLS, FE, RE, FMOLS, DOLS, MG, PMG and DFE. In addition, dynamic threshold regression model was applied to analyse the non-linear relationship between domestic savings and economic growth as well as to determine the required threshold level of saving to GDP ratio. The empirical analysis utilised a balanced panel data from 1990 to 2021.

The findings of this article can be summarised into four parts. Firstly, the cointegration analysis shows strong evidence of long run relationship between saving and economic growth in SACU countries. Secondly, the analysis of various panel estimation techniques shows that domestic saving exhibits a positive and statistically significant effect on economic growth both in the short-and long-term. Thirdly, the analysis of the threshold regression shows that domestic savings exhibit non-linear relationship with economic growth. Lastly, it is shown that the threshold level of domestic savings to GDP ratio of 16% is consistent with 6% GDP aspired by SACU union.

The above findings have several policy implications for the SACU countries. In particular, the findings of this article suggest that domestic saving is a prerequisite for economic growth as it provides fund for expansion and creation of productive capacity. From a policymaking perspective, there is a need to design appropriate policies that can help to promote and mobilise savings as well as ensure that such savings are channelled to productive investments. In this regard, two approaches can be followed namely, incentive-based measures and productivity-based measures. The incentive-based measures serve to encourage individual to save while the productivity-based measures serve to improve income which strengthens the ability of individuals or households to save. In addition, policies to encourage domestic investment by eliminating or reducing leakage because of capital flight should be implemented.

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Competing interests

The authors have declared that no competing interest exists.

Authors' contributions

L.T. was involved in the conceptualisation of the idea and the development of the initial draft which covered the introduction,

methodology and running the regression analysis. I.C.A. was also involved in the conceptualisation of the idea, investigation, review of the literature, analysis of the results and editing the final manuscript. P.L.R. was the main supervisor and administrator. He was also involved in development of the idea and analysis of the results as well as checking and validation of the results.

Ethical considerations

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Data availability

The data for this study is available on request from the corresponding author, I.C.A.

Disclaimer

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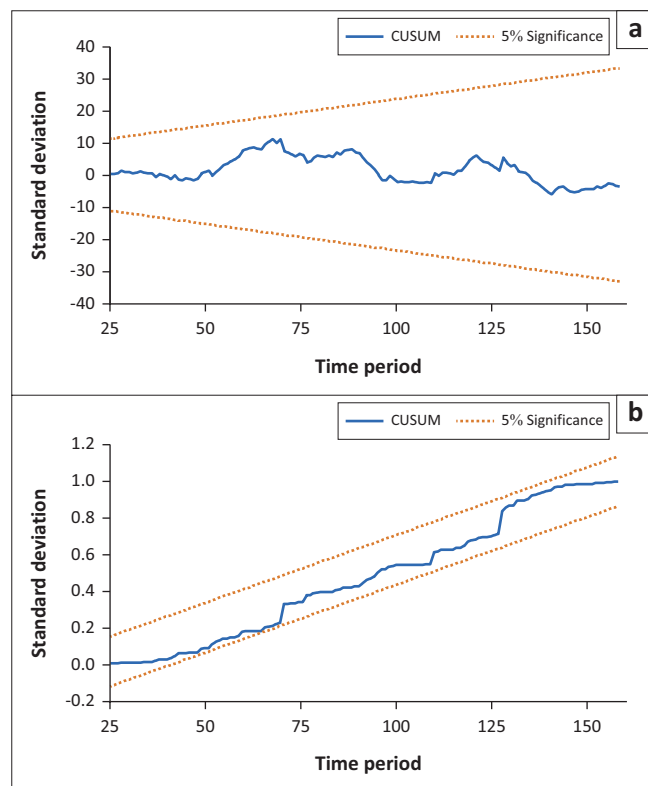
Appendix 1

TABLE 1-A1: Lag order selection criteria.

Lag	AIC	SIC	HQ
0	39.6873	39.8035	39.7345
1	31.3956	32.0925*	31.6787*
2	31.2871*	32.5647	31.80595
3	31.4056	33.2639	32.1603
4	31.6001	34.0391	32.5906
5	31.6198	34.6396	32.8461
6	31.5838	35.1844	33.0460
7	31.5978	35.7790	33.2958
8	31.7042	36.4661	33.6380

Note: * indicate the optimal lag length.

AIC, Akaike information criterion; SIC, Schwarz information criterion; HQ, Hannan-Quinn information criterion.



CUSUM, cumulative sum.

FIGURE 1-A1: Cumulative sum and cumulative sum of squares results.