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The causal dynamics between the domestic bond market and economic growth in Botswana.

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Abstract

Purpose

This study aims to scrutinise the causal relationship between the domestic bond market and the growth of the economy in Botswana from 2006 to 2020.

Design/methodology

The Trivariate Granger-causality model within an ARDL-bounds testing approach was employed on gross savings, economic growth, corporate bond market, and government bond market.

Findings

The empirical results revealed the neutrality hypothesis in the government bond market. This implies that the government bond market does not affect economic growth in Botswana, nor does economic growth impact the government bond market. In the short run a unidirectional causal link existed between the corporate bond market and economic growth, running from economic growth to the corporate bond market, which evidenced the demand hypothesis.

Practical Implications

The Botswana Government and Regulators of the financial markets should concentrate on fostering the growth of the corporate bond market by implementing favourable bond market listing requirements. Policymakers should decrease the market capitalisation of government bonds to encourage the growth of the corporate bond market.

Originality

This study provides new empirical evidence on the relationship between bond market development and economic growth in Botswana, a context that remains underexplored in the literature. By employing a Trivariate Granger-causality within an ARDL framework, the study addresses methodological limitations found in previous research. It provides a comprehensive insight into how domestic bond market granger-causes economic growth in a developing country context. It recommends valuable policy implications to policymakers in developing countries seeking to leverage domestic bond markets as a catalyst for sustainable economic growth.

Keywords

Domestic Bond market, Economic growth, Causal Dynamics, Botswana.

1. Introduction.

Botswana's economic growth has been very strong since 1966 due to a strong revenue base derived from the mining sector. The mining of diamonds contributes about 50% towards government revenue, 75% of the country's export earnings, and 42% of the gross domestic product (Sekwati, 2010). So, the diamond revenue has been the major source of income for the government and the major catalyst of economic growth. However, there was economic growth volatility between 2001 and 2010 due to a significant drop in diamond revenues, as shown in **Figure 1**.

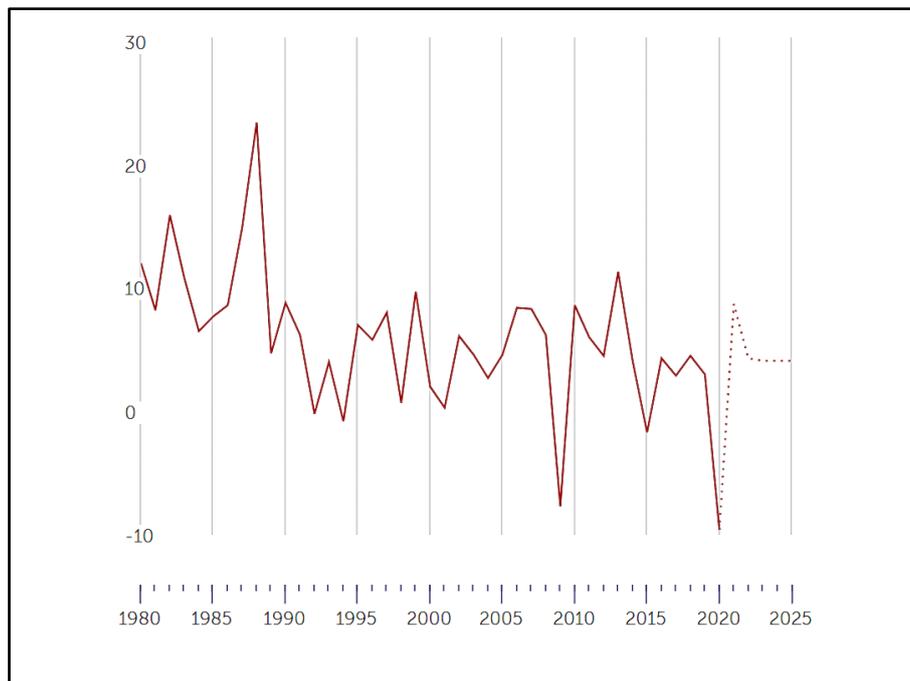


Figure 1. Botswana real gross domestic product growth (1980–2020).

Source: International Monetary Fund (2020).

The decrease in diamond revenue was also experienced between 2015 and 2020 due to the weaker performance of the diamonds, trade wars between China and the USA, and the COVID-19 pandemic, causing the real gross domestic product growth rates to become negative. For example, in 2019, the seventh sale circle for rough diamonds plummeted by 44% from US\$503 million in 2018 to US\$280 million in 2019 (Modiakgotla, 2019). As a result, the Botswana government has been experiencing a fiscal deficit for the past 4 years, from 2017 and 2020, as shown in **Figure 2**.

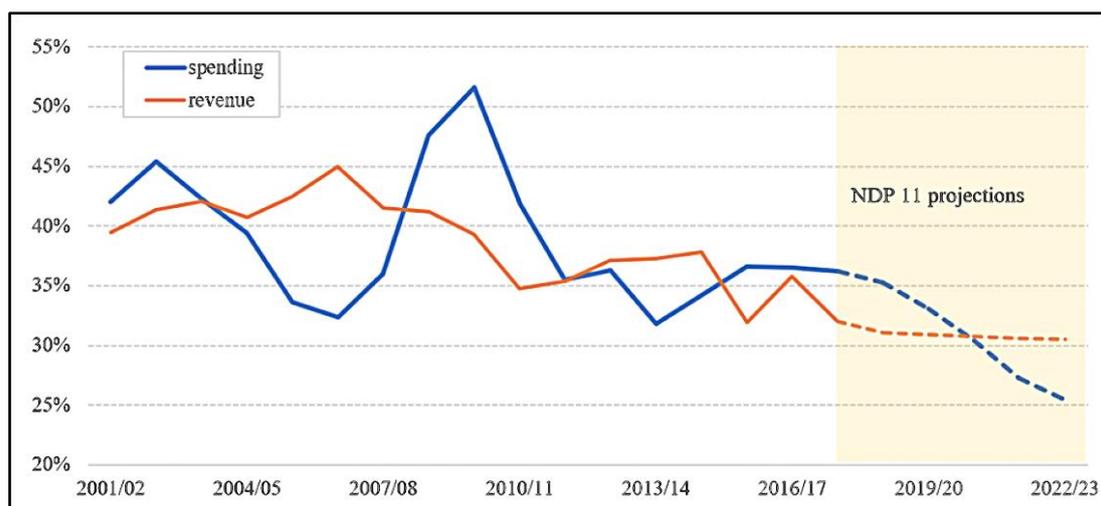


Figure 2. Botswana Government Revenue and Spending 2001–2017.

Source: Econsult (2018) – data from Botswana Ministry of Finance and Economic Development (MFED) (Budget in Brief), Botswana NDP11 and Statistics Botswana (National Accounts).

In 2017, the deficit was -1.06% of GDP, 2018 (-4.59%), 2019 (-6.29%), and 2020 (-8.83%) due to a decrease in government revenue from selling diamonds and the impact of COVID-19. Furthermore, the decrease in revenue affected the government’s capacity to cover its expenditure in the future. Seretse (2016) stated that Botswana should not depend on diamond revenue alone but should diversify through the development of the financial market. Therefore, the Botswana government embarked on the development of the Botswana domestic bond market.

The development of financial markets has gained increasing attention in emerging and developing economies as a tool for strengthening financial systems and promoting sustainable economic growth. The development of financial markets is widely recognised because of their crucial role in developing a country’s economy (Asante et al., 2023). This is because financial markets fulfil several critical functions in an economy, including the movement of savings and investments in an economy, promoting liquidity, facilitating efficient price discovery, allocating financial resources to activities that bring the greatest returns, and reducing transaction costs (Giovannini et al., 2013; Rahman et al., 2020). These roles collectively support sustainable economic development by optimising the flow and utilisation of capital within the economy.

Empirical evidence from several scholars has concluded that financial market development is positively associated with economic growth (Guru & Yadav, 2019; Ekanayake & Thaver, 2021). Conversely, Nordin and Nordin (2016) stated that an inefficient financial market hinders a country's economic development and the implementation of productive projects due to insufficient funds. Most of these researchers focused on the relationship between economic growth and the banking sector, as well as the stock market, paying little attention to the bond market (Kapaya, 2020; Nguyen, 2022; Nwagu et al., 2023; Puscasu, 2025). Wahidin et al. (2021) noted that despite their importance, the bond markets have been excluded from the literature. This view was echoed by Nkwede (2020, p178), who stated that "the bond market is an integral aspect of the capital market, but it has not received foremost research attention like the stock market counterpart". This corroborates the findings of Pradhan et al. (2020), who concluded that over the years, bond markets were almost omitted in the literature, and the focus was more on the stock market. This has been attributed to the fact that banks and stock market processes and concepts are easily understood by the financial market participants rather than the bond market (Nkwede, 2020).

While some studies have examined the causal relationship between the domestic bond market and economic growth, the majority have focused on developed economies, emerging markets, and a limited number of African countries (Fink et al., 2003). Notably, Botswana has remained largely absent from this area of research. Furthermore, findings on the nature and direction of the relationship between domestic bond market development and economic growth remain inconclusive. This ambiguity has been echoed in more recent studies by Puatwoe and Piabuo (2017), Hwang (2020), Asteriou et al. (2023), and Puscasu (2025), who all highlighted the continued lack of consensus, sparking more empirical and theoretical debates.

Given this context, the primary aim of this paper is to scrutinise the causal relationship between the domestic bond market and the growth of the economy both in the short and long run, which has not been investigated in Botswana between 2006 to 2020. This study seeks to fill a gap in the literature by focusing on a relatively under-researched market within Sub-Saharan Africa and contributes to ongoing debates about the role of bond markets in fostering sustainable economic growth.

2. An Analysis of the Botswana Bond Market.

The Botswana domestic bond market traces its origins back to 1997. According to Bolokwe (2016), the Botswana domestic bond market development commenced not because the Government wanted to borrow from the public but rather out of the intent to develop, remain active in the bond market, and promote corporate sector bond issuance. Since the discovery of diamonds around the early 1970s, Botswana has enjoyed fiscal surpluses (government revenue exceeded government expenditures). The Government used the revenue generated from selling the diamonds to finance their expenditure, but they remained with surplus funds (Botswana Bond Market Association, 2019). The Botswana Bond Market Association (2019) stated that Botswana had a history of budget and current account surpluses, which led to the government not having a reason or urgency to issue debt. The Government did not borrow from the public but lent out part of its reserves as long-term loans to parastatals and other official agencies through the Public Debt Service Fund (PDSF).

In the late 1990s, the Botswana government embarked on developing its domestic bond market, and several initiatives were implemented, such as the Bond Issuance Programme and Note Issuance Programme. Botswana Bond Market Association (2019) stated that between 1997 to 2002, the bond market growth rate was very slow because commercial banks continued to offer the private sector favourable loans, hence there were no new bonds issued. Also, the public sector had no incentive to issue more bonds due to the consecutive years of fiscal surplus. The growth of the issuance of domestic bonds gathered more momentum later in 2002 after the Government of Botswana announced two (2) initiatives through their budget speech (Bolokwe, 2016). The first initiative was the bond issuance programme, which was implemented in 2003 by the Government, floating three (3) government bonds (BW001, BW002, and BW003) on the Botswana Stock Exchange. This initiative triggered more issuance from parastatals, banks, and larger corporates and diversified the domestic bond portfolio.

The Second initiative was the selling of the Public Debt Service Fund Loan Book (PDSF) to Debt Participation Capital Funding Limited (Special Purpose Vehicle) in 2004. The Public Debt Service Fund was formed by the Government of Botswana in 1973, and its

mandate was to ensure that the government had adequate funds to service the public debt. In addition, it provided long-term loans to other official government agencies and parastatals. The Debt Participation Capital Funding Limited securitised the 72 outstanding loans worth BWP1,058million owed to PDSF through the issuance of four (4) bonds, which had different maturities to the public. Following this initiative, the Parastatals had to seek funds from the domestic capital market as the PDSF stopped issuing new loans. Since then, Botswana has experienced a growth in bond issuance, as shown in **Figure 3** from 2006 to 2021.

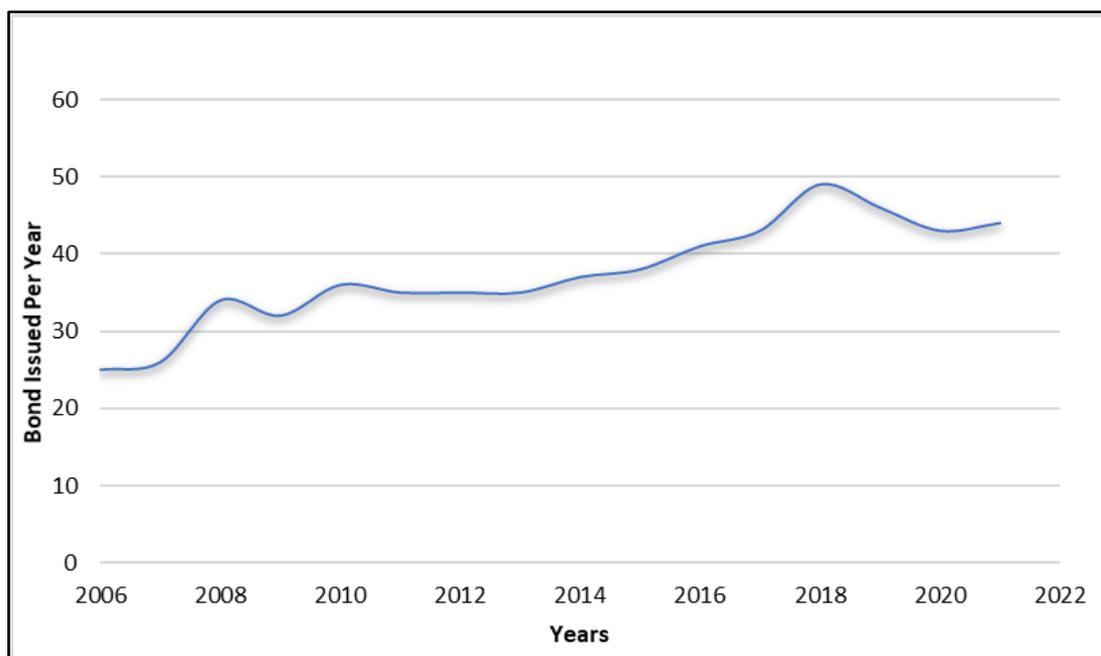


Figure 3. Total number of bonds issued.

Source: Botswana Stock Exchange (2022) and Botswana Bond Market Association (2019).

Figure 3 shows an increase in the number of bonds issued by both the government and corporates from 25 bonds in 2006 to 46 bonds in 2019 due to the implementation of various government initiatives. However, in 2020, three (3) bonds matured, reducing the total number of issued bonds to 43. As of 2018, government bonds accounted for 63.7% of the total market capitalisation, Corporates (24.3%), Parastatals (8.9%), Supranational (1.8%) and Quasi-government (1.3%) (Botswana Bond Market Association, 2019). The higher government bond market capitalisation was mainly attributed to the introduction of the Government domestic note issuance programme worth P5 billion in 2008, which increased the government’s domestic debt to P15 billion (Bolokwe, 2016). The

Government managed to issue bonds with long-term maturities ranging between 18 to 25 years to this date. In light of the initiatives undertaken by the Government of Botswana to foster the development of the domestic bond market, it is imperative to empirically assess the domestic bond market's contribution to the country's economic growth. Understanding this causal relationship is crucial for evaluating the effectiveness of the current policy measures and guiding future domestic market development strategies.

3. Theoretical framework.

The four (4) hypotheses that explain the causal relationship between the domestic bond market and economic growth are supply-leading, neutrality, demand-leading, and feedback hypotheses (Pradhan et al., 2015). Patrick (1966) is credited with identifying the supply-leading and demand-following hypotheses in his seminal work, where he made the first attempt to analyse the causal relationship between financial development and economic growth (Masih et al., 2009).

The supply-leading hypothesis, alternatively known as the finance-led growth hypothesis, posits that financial development granger causes economic growth (Patrick, 1966; McKinnon, 1973; Shaw, 1973). According to this view, a well-developed financial market promotes financial intermediation, which efficiently channels funds from savers to deficit units, thereby increasing the savings rate and investment levels (Chow et al., 2019; Pradhan et al., 2020; and Pinshi & Kabeya, 2020). This enhanced capital accumulation ultimately stimulates economic growth. The supply-leading hypothesis emphasises the significance of having a well-developed financial market to promote economic growth (Pradhan et al., 2015; Adeyeye et al., 2015). In contrast, the demand-following hypothesis states that economic growth granger causes the development of the financial market. This implies that expanding economic activities create increased demand for financial services and instruments, which in turn leads to the development of the financial market.

Patrick's (1966) seminal work laid the foundation for further research into the dynamic relationship between financial development and economic growth, which subsequently led to the formulation of the feedback and neutrality hypotheses. The feedback

hypothesis posits that both financial development and economic growth mutually cause each other, and hence they are positively interdependent (Fuinhas et al., 2019; Pradhan et al., 2020). The feedback hypothesis combines the elements of both the supply-leading and demand-following hypotheses (Acaravci et al., 2009). On the other hand, the neutrality hypothesis, also known as the Lucas neutrality hypothesis, was put forward by Lucas (1988). It asserts that financial development and economic growth are independent of each other, meaning there is no causal relationship between the two variables. These four hypotheses help to elucidate the potential relationship between the domestic bond market and the economy.

4. Review of literature.

Prior empirical investigations into the causal link between bond market development and economic growth have yielded inconclusive and heterogeneous results. These earlier studies approached this relationship using different methodological frameworks and country-specific contexts, resulting in varying conclusions about the causality relationship. **Yener et al. (2017)** explored the relationship between capital market development and economic growth in Turkey between January 2006 to June 2006. They used the Toda and Yamamoto (1995) Causality test and the normal Granger Causality test. Economic growth was measured by the Gross Domestic Product, while capital market proxies were corporate bond market capitalisation, the total market value of mutual funds and pension funds, the total value of short and long-term government bonds, and equity market capitalisation. The results revealed that there was evidence of a demand hypothesis in Turkey. This means that economic growth influenced government bond market development (unidirectional causality). Similarly, **Wanaset (2018)** evaluated the relationship between economic growth and capital markets in Thailand for the period covering 1997 to 2016 using quarterly data. The findings revealed that economic growth had a positive impact on the bond market, while the bond market did not affect economic growth. In a study of 11 European Economic and Monetary Union countries from 1980 to 2013, **Gomez-Puig and Sosvilla-Rivero (2015)** found mixed results. While bi-directional causality between economic growth and government debt was observed in France and Finland, no causal relationships were found in Portugal,

Belgium, Germany, Ireland, and Greece. In contrast, in the Netherlands, Austria, and Italy, government debt granger caused economic growth.

Mahara (2018) explored the causal relationship between the bond market and economic growth across ten East Asian countries. The study employed the Granger Causality test, analysing the data from 2004 to 2016. The bond market was measured by the composite bond market index, which included local and foreign bond market size, which was developed following the Pradhan et al. (2016) principal component analysis. The results of the Granger causality test revealed the existence of a demand-following hypothesis. In a like manner, **Muharam et al. (2018)** examined the relationship between bond market development, foreign investment, and economic growth among eight (8) countries in Africa, America, Europe, and Asia. The study focused on the period between 2004 to 2015 and used the Granger causality method, the Vector Autoregressive (VAR) model, and the Vector Error Correction model. In Mexico, Indonesia, and Thailand, bond market development granger caused economic growth. Also, there was evidence of no causal relationship between bond market development and economic growth in Malaysia, the Czech Republic, South Africa, Turkey, and Poland. **Pradhan et al. (2020)** used the panel Vector Auto-regression model to investigate the relationship between equity market development, bond market development, inflation rate, and interest rate in G-20 countries between 1991 - 2016. The empirical results revealed the existence of a supply-leading hypothesis in G-20 countries. This means that bond market development influences economic growth. Also, other control variables such as equity market development, inflation rate, and interest rate had a positive impact on economic growth. The authors urged the governments of the G-20 countries to put more effort into developing their financial markets and controlling interest rates and inflation rates.

Another study was conducted by **Rahman et al. (2020)**, who investigated the causal relationship between the bond market return and economic growth in four (4) Asian countries, which are Japan, India, Hong Kong, and Indonesia, from 2000 to 2019. The Granger causality tests revealed diverse relationships. In India, there was a bidirectional relationship between bond market return and economic growth. While in Indonesia, there was evidence of a unidirectional relationship, and in Japan, the relationship was

unidirectional. However, in Hong Kong, there was no causal relationship between bond market return and economic growth.

More recently, **Mbelu and Ebi (2024)** examined the causal connection between the bond market and economic growth in Nigeria from 1981 to 2021. The variables such as gross domestic product, government bond market, external bonds, and corporate bond market. Bidirectional and unidirectional relationships were found to exist among the variables. The unidirectional relationship ran from economic growth to the corporate bond market and from economic growth to the government bond market, while a bidirectional relationship existed between external bonds and economic growth.

Ugbam et al. (2023) analysed the economic growth and bond market development nexus in thirty-two developing countries from 2015 to 2022. The GDP growth rate was used as a measure of economic growth, while the three bond market proxies included bond yield, government bond capitalisation as a percentage of GDP, and corporate bond capitalisation as a percentage of GDP. The Vector autoregressive (VAR) Granger causality test was employed to conduct the regression analysis. The findings revealed evidence of the demand-following hypothesis. In contrast, the results revealed the neutrality hypothesis, as economic growth and government bond market capitalisation did not Granger-cause each other.

4.1 Research Gaps in Literature.

Recent research by Ugbam et al. (2023) and Mbelu and Ebi (2024) continued to reveal inconsistency and heterogeneity in empirical findings, as the two studies reported contrasting empirical results as discussed in the literature review. These disparities indicate that the causal relationship between the domestic bond market and economic growth is not universal and varies from country to country, reinforcing the need for country-specific investigations. As the current existing literature is dominated by panel studies. Moreover, most of the existing empirical research focused on developed countries and emerging markets such as studies by Gomez-Puig and Sosvilla-Rivero (2015) and Rahman et al. (2020), with relatively limited research conducted on African countries, particularly those in Sub-Saharan Africa, except for South Africa.

Additionally, most studies used the bivariate Granger causality test, which evaluates the relationship between two variables, which, while it's useful, captures short-term relationships and is susceptible to spurious causality. Moreover, the majority of the studies examined the domestic bond market as a monolithic entity, whereas only a few such as Ugbam et al. (2023) and Mbelu and Ebi (2024) segmented the domestic bond market into the government bond market and corporate bond market. This segmentation is important because it provides a more detailed understanding of which domestic bond market exerts the greatest influence on economic growth.

This study on Botswana seeks to fill these gaps by contributing to the literature on the nexus between domestic bond market development and economic growth within the African context area which remains sparsely investigated. It applies advanced econometric techniques, including the trivariate Granger causality test within the ARDL bounds testing model, enabling the analysis of both short- and long-run relationships. Furthermore, by differentiating between government and corporate bond markets, this study aims to identify which segment has a greater impact on economic growth. The findings will provide valuable insights to inform Botswana's policymakers in crafting targeted domestic bond market development strategies.

5. Methodology.

This study examined the causal relationship between the domestic bond market and the growth of the economy in Botswana between 2006 to 2020 using quarterly data, building upon the works of Nyasha and Odhiambo (2018). To reduce the risk of spurious causality caused by the bivariate causality model, the study employed a trivariate Granger causality model within the ARDL, which is considered more robust than the bivariate models commonly used in previous research. Additionally, the model is more robust as it accounts for the influence of an additional variable and shows both long and short-run causality relationships. This offers a more thorough and precise understanding of the causal link among the variables (Nyasha & Odhiambo, 2018).

The variables that were included in the trivariate Granger causality test within the ARDL bound test model were domestic bond market capitalisation, economic growth, and gross savings. Two proxies were employed to measure the domestic bond market,

following the methodology of Mu et al. (2013): the market capitalisation of corporate bonds and government bond market capitalisation measured in the local currency of Botswana (Botswana Pula). The gross savings proxy was the gross savings expressed as a percentage of the GDP, while economic growth was measured by the GDP per capita growth expressed as a percentage. The quarterly data for these variables were obtained from the Botswana Stock Exchange Annual reports, Statistics Botswana, and the Botswana Bond Market Association Report. These data sources were selected because they are the primary custodians of financial and economic statistics in Botswana and are widely recognised for providing accurate and reliable data that adheres to international reporting standards. **Table 1** summaries the variables.

Table 1: Sources of Information for Data.

Acronym	Variable	Measure	Data Source
GBM	Domestic Bond Market Capitalisation	Total nominal value for the government domestic bond market capitalisation in local currency	Botswana Stock Exchange Annual Reports (2006 to 2022) Botswana Bond Market Association (BBMA)
CBM	Domestic Bond Market Capitalisation	Total nominal value for the corporate domestic bond market capitalisation in local currency	Botswana Stock Exchange Annual Reports (2006 to 2022) Botswana Bond Market Association (BBMA)
GDP	Economic Growth	GDP per capita growth (%)	Statistics Botswana (2022)
GSAV	Savings	Gross savings (% of GDP)	Statistics Botswana (2022) Bank of Botswana Annual Reports

Source: Authors own work (2025).

Gross savings were selected as a control variable because they influence economic growth and bond market capitalisation. This relationship is supported by financial intermediation theory, the Solow Growth Model, the Harrod-Domar model, and empirical studies such as those by Ribaj and Mexhuan (2021) and Nguyen and Nguyen (2019). The Financial Intermediation theory posits that, through direct financing, savings are funnelled into financial markets, where surplus units purchase bonds, thereby positively influencing domestic bond markets. In addition, Harrod and Domar (1946), in the Harrod-Domar model, asserted that as savings increase, economic growth also rises. Similarly,

the Solow Growth Model states that high levels of savings as a result of financial development promote economic growth.

Using two proxies for the domestic bond market, two models were formulated, which are Model 1 and Model 2. Model 1 had the government bond market capitalisation (GBM), savings (Sav), and Economic Growth rate (GDP) as variables, while Model 2 incorporated the corporate bond market capitalisation (GBM), savings (SAV), and Economic Growth rate (GDP). Therefore, the two trivariate Granger-causality models within an ARDL-bounds testing approach were estimated as Model 1 and Model 2, as shown by equations 1 to 6.

Model 1: Government Bond Market Capitalisation Vs Economic Growth Equation.

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta GBM_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta Sav_{t-i} + \alpha_4 ECT_{t-1} + \mu_{1t} \quad (1)$$

$$\Delta GBM_t = \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta GBM_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta GDP_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta Sav_{t-i} + \beta_4 ECT_{t-1} + \mu_{2t} \quad (2)$$

$$\Delta Sav_t = \delta_0 + \sum_{i=1}^n \delta_{1i} \Delta Sav_{t-i} + \sum_{i=0}^n \delta_{2i} \Delta GDP_{t-i} + \sum_{i=0}^n \delta_{3i} \Delta GBM_{t-i} + \delta_4 ECT_{t-1} + \mu_{3t} \quad (3)$$

Model 2: Corporate Bond Market Capitalisation Vs Economic Growth Equation.

$$\Delta GDP_t = \phi_0 + \sum_{i=1}^n \phi_{1i} \Delta GDP_{t-i} + \sum_{i=0}^n \phi_{2i} \Delta CBM_{t-i} + \sum_{i=0}^n \phi_{3i} \Delta Sav_{t-i} + \phi_4 ECT_{t-1} + \mu_{4t} \quad (4)$$

$$\Delta CBM_t = \gamma_0 + \sum_{i=1}^n \gamma_{1i} \Delta CBM_{t-i} + \sum_{i=0}^n \gamma_{2i} \Delta GDP_{t-i} + \sum_{i=0}^n \gamma_{3i} \Delta Sav_{t-i} + \gamma_4 ECT_{t-1} + \mu_{5t} \quad (5)$$

$$\Delta Sav_t = \vartheta_0 + \sum_{i=1}^n \vartheta_{1i} \Delta Sav_{t-i} + \sum_{i=0}^n \vartheta_{2i} \Delta GDP_{t-i} + \sum_{i=0}^n \vartheta_{3i} \Delta CBM_{t-i} + \vartheta_4 ECT_{t-1} + \mu_{6t} \quad (6)$$

Where:

GDP: Economic growth (GDP per capita growth %)

Sav: Gross Savings as a % GDP

GBM: Government market capitalisation in Botswana Pula (BWP)

CBM: Corporate market capitalisation in Botswana Pula (BWP)

Δ - the difference operator

$\alpha_0, \beta_0, \delta_0, \phi_0, \gamma_0, \vartheta_0$: respective constants

$\alpha_1 \dots \alpha_4, \beta_1 \dots \beta_4, \delta_1 \dots \delta_4, \phi_1 \dots \phi_4, \gamma_1 \dots \gamma_4, \vartheta_1 \dots \vartheta_4$: respective coefficients

$\mu_{1t}, \mu_{2t}, \mu_{3t}, \mu_{4t}, \mu_{5t}, \mu_{6t}$: residual terms

n = lag length

ECT: error-correction term

The ECT_{t-1} shows the long-run relationships between variables and the speed of convergence from the short-run towards the long-run equilibrium path in all models.

6. Results and Explanation.

6.1 Descriptive Statistics.

Table 2 displays descriptive statistics for both the dependent and regressor variables. The mean values for the independent variables were all positive: CBM was at BWP3.276 billion, GBM at BWP7.2924 billion, and SAV at 32.72%. The minimum values for the predictor variables were also positive, with corporate bond market capitalisation having the lowest value at BWP1.08 billion. The skewness values for CBM, GBM, and SAV were 0.343539, 0.826242, and 0.009392, respectively, indicating positive skewness since these values are greater than zero. This suggests that the mean value is higher than the median value, and there are few high values in the data set. The low standard deviation values indicated that the data for all variables are closely clustered around their mean, suggesting minimal dispersion within the dataset and low variability. CBM and SAV exhibited platykurtic distributions, while GDP and GBM displayed leptokurtic characteristics.

Table 2: Descriptive Statistics.

	CBM	GBM	SAV	GDP
Mean	3.276000	7.292417	32.72033	2.813952
Median	2.82000	6.695000	32.00000	3.742136
Maximum	5.400000	17.02500	45.00000	31.56898
Minimum	1.080000	2.580000	22.00000	-30.83707
Std.Dev.	1.336254	3.760811	5.973271	9.278984
Skewness	0.343539	0.826242	0.009392	-1.022527
Kurtosis	1.874724	3.019183	2.286405	7.174720
Observations	60	60	60	60

Source: Authors own work (2025). **Note:** where CBM=corporate bond market capitalisation, GBM=government bond market capitalisation, GDP=Economic growth, and SAV=gross savings.

Time series data often suffers from non-stationarity. Conducting stationarity tests on the variables is a standard procedure before implementing an econometric model. According to Fink et al. (2003, p17), conducting stationarity tests is crucial “to ensure unbiased inference about the order of integration of the variables of interest”. To achieve this, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PPU) unit root tests were employed. **Table 3** revealed that only GDP was stationary at level I (0), and the other variables were stationary at I (1). The t-statistics for CBM, GBM, GDP, and SAV were found to be significant at the 5% level. Therefore, the ARDL Granger causality test was suitable to run the regression for Model 1 and Model 2.

Table 3: Results of Unit Root Test.

Variables	Level I (0)	First Difference I (1)	Integration Order	Level I (0)	First Difference I (1)	Integration Order
	ADF			PPU		
CBM	-	-3.887818**	I (1)	-	-3.435619**	I (1)
GBM	-	-2.957445**	I (1)	-	-3.113433**	I (1)
GDP	-4.612907**	-	I (0)	-4.691514**	-	I (0)
SAV	-	-3.048784**	I (1)	-	-3.236527**	I (1)

Source: Authors own work (2025). **Note:** ADF and PPU unit root tests results where CBM=corporate bond market capitalisation, GBM=government bond market capitalisation, GDP=Economic growth, and SAV=gross savings. P-value at the 10%, 5%, and 1% levels are represented by *, **, and ***, respectively.

Table 4 shows that all the criteria for lag selection recommend Lag 2, as shown by the asterisk * on the 104.0519, 0.000130, 2.390786, 3.704677, and 2.898878 values. As the sample size of this study of sixty (60) is small, Lag 2, as suggested by the AIC criterion, was selected.

Table 4: Lag Selection Criteria.

<i>Lag</i>	<i>LogL</i>	<i>LR</i>	<i>FPE</i>	<i>AIC</i>	<i>SC</i>	<i>HQ</i>
0	-411.0836	N/A	42.20154	-15.09395	15.23994	15.15040
1	-91.95159	580.2400	0.000690	4.070967	4.800906	4.353240
2	-29.74662	104.0519*	0.000130*	2.390786*	3.704677*	2.898878*
3	-18.48199	17.20417	0.000158	2.562981	4.460824	3.296892
4	-6.468804	16.600003	0.000192	2.707956	5.189750	3.667686
5	14.29840	25.67581	0.000174	2.534604	5.600349	3.720152

Source: Authors own work (2025). **Note:** Lag selection results where: *FPE*: Final prediction error, *AIC*: Akaike information criterion; *LR*: sequential modified LR test statistic; *HQ*: Hannan-Quinn information; *SC*: Schwarz information criterion.

The ARDL F-bound test was employed to investigate the existence of cointegration among the variables. A total of six equations were estimated based on Models 1 and 2. The F-statistic values for the six equations were compared with both the upper and lower bound critical values, along with the Narayan (2004) Bound Test Critical Values (Case III), to determine the presence of cointegration among the variables. The results presented in **Tables 5 and 6** show that cointegration exists among the variables in four out of the six estimated equations at 5% and 10% significance levels. This suggests the presence of a long-run equilibrium relationship; in the short run, the variables would diverge, but they would eventually converge over the long term. Therefore, the error correction term was incorporated in the four equations when conducting the trivariate Granger causality test. In the other two equations, the error correction term was excluded from the equations due to the lack of cointegration among the variables.

Table 5 Model 1: Government Bond Market (GBM), Gross Savings (Sav) and Economic Growth (GDP).

Dependent Variable	Function	F-statistic Value	Level of Significance	Lower Bound I (0)	Upper Bound I (1)	Cointegration Results
GBM	F (GBM/GDP, SAV)	3.080905	1%	5.15	6.36	No Cointegration
GDP	F (GDP/GBM, SAV)	9.225754	5%	3.79	4.85	Cointegration exists
SAV	F (SAV/GBM, GDP)	4.483987	10%	3.17	4.14	Cointegration exists
Narayan (2004) Bound Test Critical Values (Case III)						
Sample Size		60	1%	5.697	6.987	
No. of Regressors(K)		2	5%	4.000	5.057	
			10%	3.270	4.260	

Source: Authors own work (2025). **Note:** The Bound Test Results where GBM=government bond market capitalisation, GDP=Economic growth, and SAV=gross savings. P-value at the 1%, 5%, and 10% levels, respectively.

Table 6 Model 2: Corporate Bond Market (GBM), Savings (Sav) and Economic Growth (GDP).

Dependent Variable	Function	F-statistic Value	Level of Significance	Lower Bound I (0)	Upper Bound I (1)	Cointegration Results
CBM	F (CBM/GDP, SAV)	2.063247	1%	5.15	6.36	No Cointegration
GDP	F (GDP/CBM, SAV)	10.43212	5%	3.79	4.85	Cointegration exists
SAV	F (SAV/CBM, GDP)	6.867571	10%	3.17	4.14	Cointegration exists
Narayan (2004) Bound Test Critical Values (Case III)						
Sample Size		60	1%	5.697	6.987	
No. of Regressors(K)		2	5%	4.000	5.057	
			10%	3.270	4.260	

Source: Authors own work (2025). **Note:** The Bound Test Results where CBM=corporate bond market capitalisation, GDP=Economic growth, and SAV=gross savings. P-value at the 1%, 5%, and 10% levels, respectively.

6. 2 Causal Link between Domestic Bond Market and Economic Growth.

Table 7: Model 1 Trivariate Granger Causality Analysis.

Dependent Variable	F-statistic Value (probability) Independent Variables			(t-statistics) Lagged Error-Correction Term - ECT_{t-1}
	ΔGBM_t	ΔGDP_t	ΔSAV_t	
ΔGBM_t	-	1.17944 (0.1354)	1.74053 (0.1853)	-
ΔGDP_t	1.24022 (0.29022)	-	3.40061** (0.0408)	-0.665989*** (0.0000)
ΔSAV_t	4.04825** (0.0231)	1.01410 (0.3697)	-	-0.111255*** (0.0005)

Source: Authors own work (2025). **Note:** where CBM =corporate bond market capitalisation, GBM =government bond market capitalisation, GDP =Economic growth, and SAV =gross savings. P-value at the 10%, 5%, and 1% levels are represented by *, **, and ***, respectively.

The results displayed in **Table 7** for Model 1 show that there is an inexistent causal relationship between government bond market capitalisation (GBM) and economic growth (GDP) in both the short run and long run. This is evidenced by the F-statistic value of ΔGDP_t of 1.17944, which is insignificant because the p-value is greater than 0.05, as shown in the equation ΔGBM_t . Also, it is confirmed by the F-statistic value of ΔGBM_t of 1.24022 in the equation ΔGDP_t with a p-value of 0.29022, which is statistically insignificant. This suggests that government bond market capitalisation does not influence the growth of the economy in Botswana. This result may be attributed to the fact that the Botswana government has primarily been issuing government bonds with a focus on developing and stimulating the growth of the domestic bond market, not for economic growth. Hence, the government might not have directed the funds raised toward economic projects. Moreover, over time, the proceeds from selling bonds have been increasingly used to finance the government's budget deficit and meet other financial obligations, rather than being invested in projects that directly promote economic growth. This result aligns with the neutrality hypothesis put forward by Lucas (1988), which states that a causal relationship does not exist between economic growth and financial development. Rather, the two are not dependent on each other, meaning that government bond market capitalisation does not influence the growth of the economy, and economic growth does not increase government bond market capitalisation. The result is consonance with the studies of Ugbam et al. (2023). In their study examining the nexus between economic growth and the bond market, Ugbam et al.

(2023) found that the government bond market did not have a causal effect on economic growth among G-20 countries.

In addition, Model 1 results revealed that when the ΔGBM_t was the dependent, an absence of causation was found between the government bond market capitalisation (GBM) and savings (SAV). This is due to the p-value of the F-statistic being statistically insignificant at the 5% level. However, there is a unidirectional short-run and long-run causal flow from government bond market capitalisation (GBM) to savings (SAV), as the p-value is statistically significant at the 5% level. The lagged error correction term showed the expected negative sign, with the t-statistic being significant at the 1% level. This means that the development of the government's domestic bond markets stimulates an increase in savings. The Botswana Government should ensure that investors have easier access to the government bond market, as this would encourage them to save through bond investments, ultimately contributing to the market's growth. This result aligns with the research of Masoud and Hardaker (2012), which found that well-developed financial markets offer surplus units a range of diversified financial instruments to invest in, thereby leading to an increase in savings. Furthermore, the results for Model 1 in **Table 7** show a long-run and short-run causal connection that runs from savings to economic growth, meaning savings Granger-cause economic growth in Botswana. An increase in savings can influence the growth of the economy. This occurs because savings are directed through the banking sector, where banks transform them into various loans. These loans are then given to businesses, allowing them to increase production, expand operations, and foster economic growth. Additionally, when banks extend loans to households, it boosts consumption, which raises demand for goods and services. As a result, businesses increase production to meet this demand, further driving economic growth.

In summary, the results of Model 1 presented in **Table 7** revealed that for all the independent variables, only savings Granger-cause economic growth in Botswana. On the other hand, economic growth does not granger-cause the two regressors during the period 2006 to 2020. Therefore, this indicates that the past values of economic growth are not useful in predicting the future government bond market development and savings levels. The Botswana government must enhance economic growth through

diversification, as this will attract more foreign investors and corporations who would engage with the bond market.

The Model 2 results, summarised in **Table 8**, revealed that a short-run unidirectional relationship existed running from economic growth to the corporate bond market at a 10% significance level. The unidirectional causal relationship is validated by the F-statistic of ΔGDP_t at 2.80424, which is significant. This implies that economic growth drives Botswana's corporate bond market development. The past values of economic growth predict the future of corporate bond market development. The null hypothesis that economic growth (GDP) does not granger-cause corporate bond market capitalisation is rejected. The result corroborates the demand hypothesis proposed by Patrick (1966), which asserts that as a country's economy grows, the financial services demand and funding increases, subsequently leading to the expansion of the bond market. Thus, as the economy grows, more businesses and expansion opportunities emerge, leading corporates to issue bonds to secure the necessary capital to support their development. Mbelu and Ebi (2024) also observed a similar result in Nigeria, where economic growth influenced the growth of the corporate bond market. This result aligns with the findings of Wanaset (2018), who reported that bond market development was influenced by economic growth in Thailand, and Rahman et al. (2020), who similarly noted that the bond market in Japan was stimulated by economic growth.

Table 8: Model 2 Trivariate Granger Causality Analysis.

Dependent Variable	F-statistic Value (probability) Independent Variables			(t-statistics) Lagged Error-Correction Term - ECT_{t-1}
	ΔCBM_t	ΔGDP_t	ΔSAV_t	
ΔCBM_t	-	2.80424* (0.0696)	0.02937 (0.9711)	-
ΔGDP_t	1.76327 (0.1814)	-	3.40061** (0.0408)	-0.873584*** (0.0000)
ΔSAV_t	6.70481** (0.0025)	1.01410 (0.3697)	-	-0.148492*** (0.0000)

Source: Authors own work (2025). **Note:** where CBM =corporate bond market capitalisation, GBM =government bond market capitalisation, GDP =Economic growth, and SAV =gross savings. P-value at the 10%, 5%, and 1% levels are represented by *, **, and ***, respectively.

Additionally, Model 2 **Table 8** results revealed a short-run and long-run unidirectional causality flow from savings (SAV) to economic growth (GDP) as shown by the F-statistics and t-statistics of 3.40061 and -0.873584, respectively, which are both statistically significant at 5 % and 1%, respectively. When ΔSAV_t was the dependent, a causal flow was observed from the corporate bond market (CBM) to savings (SAV), as both the t-statistic and the F-statistic values of 0.148492 and 6.70481, respectively, were statistically significant at 1% level. Also, the ECT_{t-1} exhibited a negative sign as anticipated. This suggests that a well-developed corporate bond market incentivises individuals to save through investment. The Government and regulators in Botswana should develop policies aimed at encouraging greater corporate participation in the bond market, thereby fostering higher savings rates.

In summary, the results for Models 1 and 2 revealed that the government bond market does not cause economic growth in Botswana, nor does economic growth granger-cause the government bond market development, both in the long and short run, as shown in **Table 9**. However, a short-run causal link exists between the corporate bond market and economic growth, which evidences the demand hypothesis put forward by Patrick (1966). This suggests that economic growth influences corporate bond market trading activities in Botswana.

Table 9: Model 1 and 2 Granger Causality Summary Results.

Model	Causality Direction		Conclusion
	Short Run	Long Run	
Model 1 (GBM and GDP)	No causality	No causality	No causality in both the short run and the long run.
Model 2 (CBM and GDP)	GDP  CBM	No causality	Short-run causality -demand hypothesis

Source: Authors own work (2025). **Note:** where CBM=corporate bond market capitalisation, GBM=government bond market capitalisation, and SAV=gross savings.

6.3 Post-Estimation Diagnostic Tests.

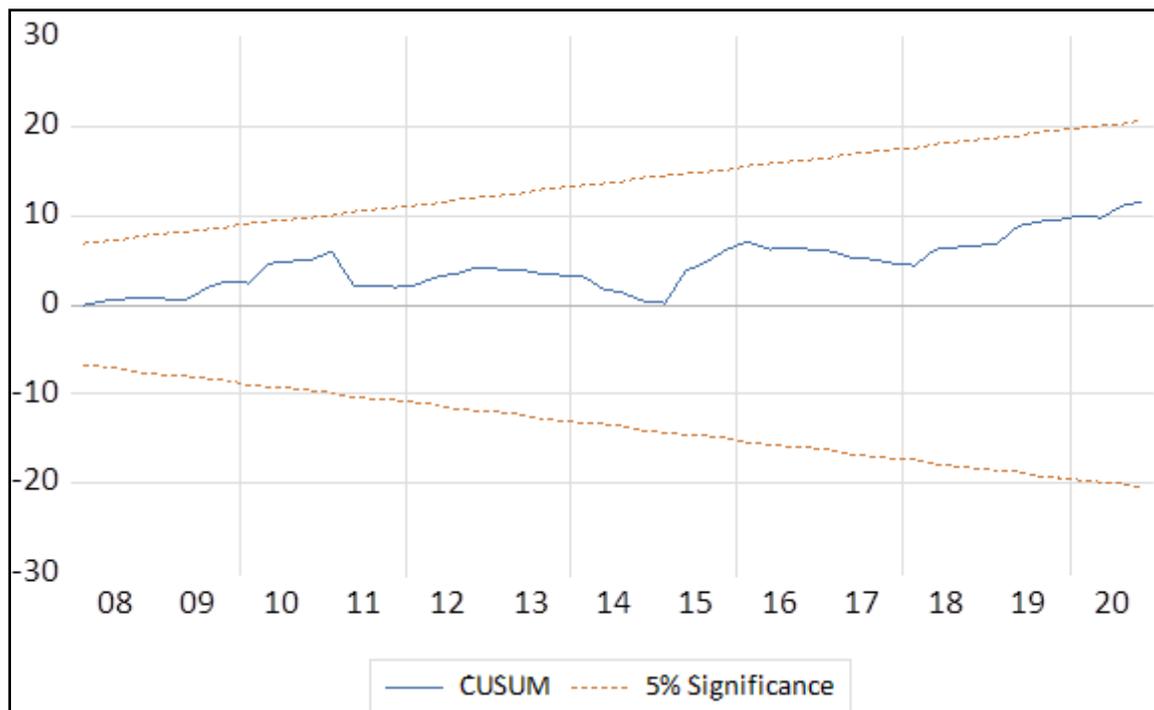
No serial correlation in Models 1 and 2 is shown in **Table 10** as the p-values from the Breusch-Godfrey Serial Correlation Test, which are 0.6180 and 0.9850, respectively, are

above the 5% significance level. The null hypothesis of no serial correlation is upheld. The Breusch-Pagan-Godfrey Test p-values for Models 1 and 2 were 0.8697 and 0.2751, respectively, which are statistically insignificant. This denotes that there is homoscedasticity in the models. Hence, the null hypothesis cannot be dismissed. Additionally, the models were examined to check for any omitted variables using the Ramsey Reset Test. The probability values for the models were 0.1546 and 0.8551, respectively, which are above the 5% significance level. This implies the models are appropriately specified. **Figure 4 and Figure 5** shows the results of the stability of the models, which were conducted using CUSUMSQ and CUSUM. The CUSUM and CUSUMSQ statistics are represented by the blue lines, which are entirely within the critical lines (red lines) at a 5% significance level. It can be concluded that the empirical models are stable.

Table 10: Models 1 and 2 Post Diagnostic Test Results.

Model	Diagnostic Tests			
	Breusch-Godfrey Serial Correlation Test	Breusch-Pagan-Godfrey Test	Ramsey Reset Test	Stability Test
Model 1	0.6180	0.8697	0.1546	Significant
Model 2	0.9850	0.2751	0.8551	Significant

Source: Authors own work (2025).



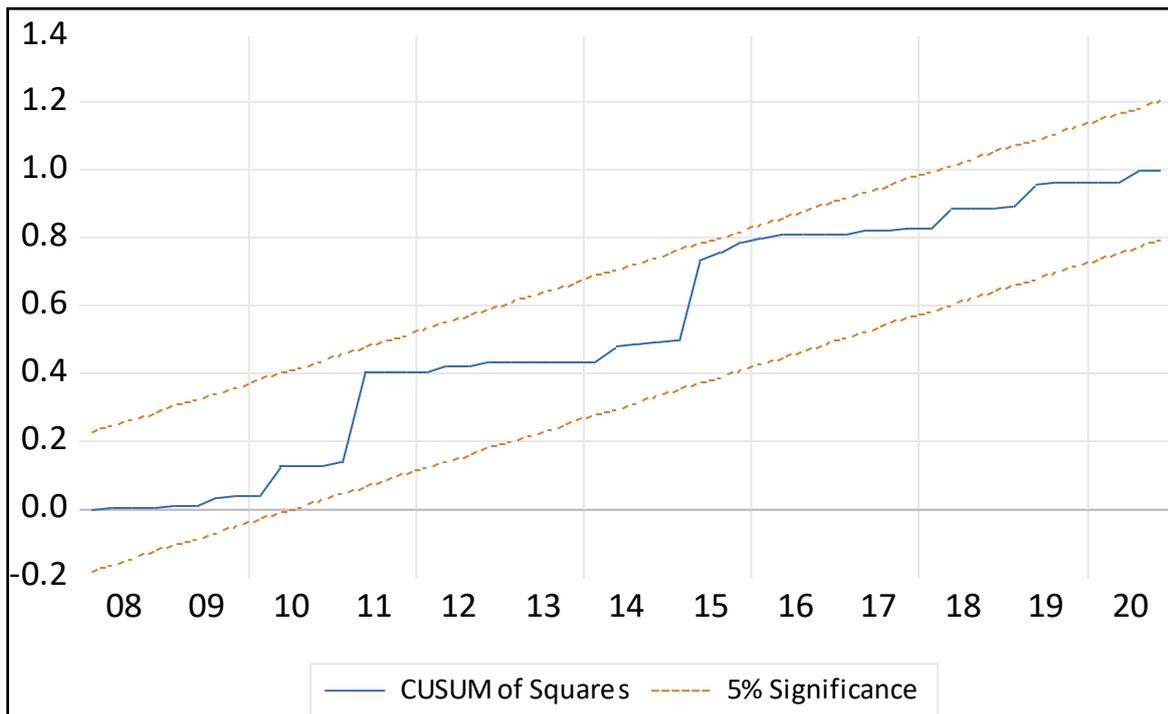
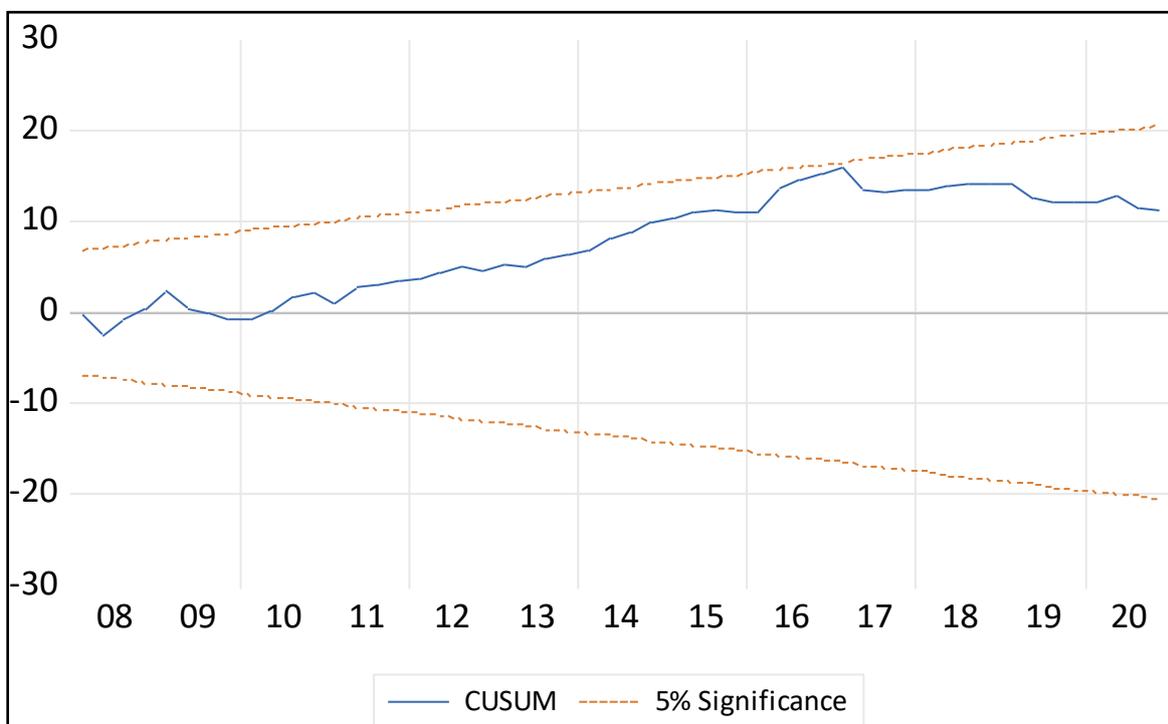


Figure 4: Model 1: CUSUM and CUSUMQ Graphs.

Source: Authors own work (2025).



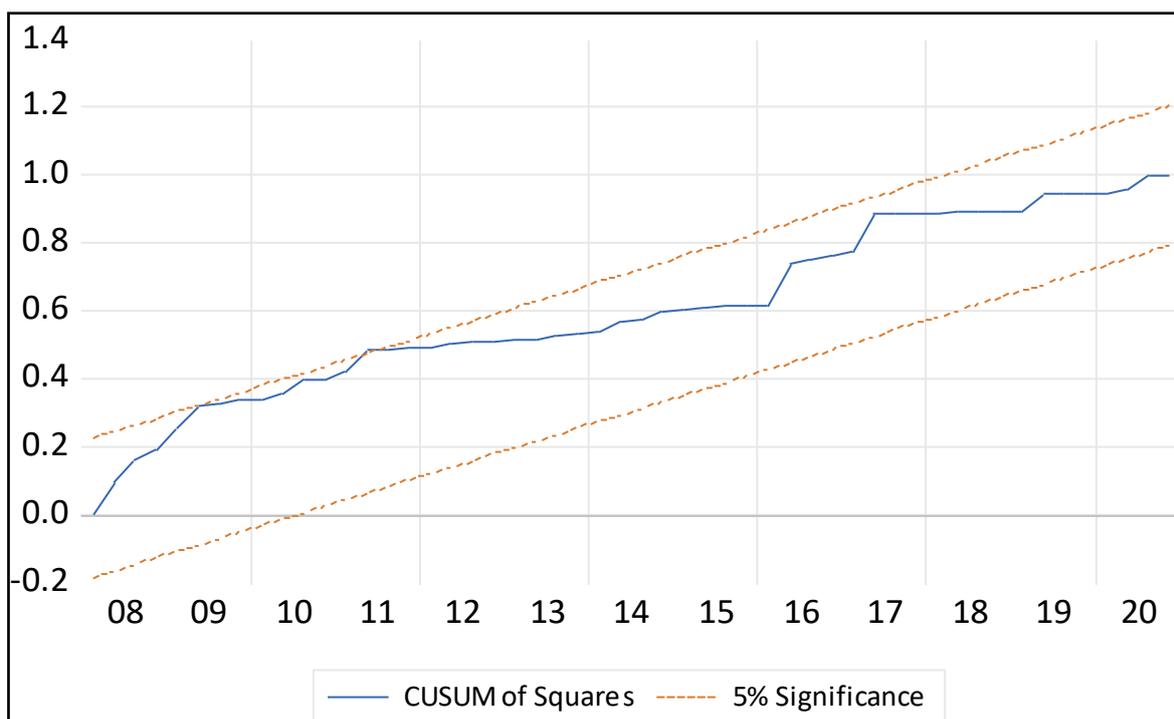


Figure 5: Model 2: CUSUM and CUSUMQ Graphs.

Source: Authors own work (2025).

7. Conclusion and Policy Suggestions.

This study contributed to the literature on the finance-growth nexus by examining this relationship in Botswana, covering the period from 2006 to 2020. This study used time series data, unlike existing studies that have been panel data-based. This approach enabled this study to reveal more detailed information and dynamics that might not have been conveyed by panel studies. It addressed this gap by uncovering the current causal link that exists between the domestic bond market and economic growth in Botswana, which has never been investigated. Also, the ARDL trivariate Granger-causality model was employed in contrast to the commonly used bivariate Granger causality method in empirical studies, as it provided more precise insights into short and long-run causal relationships and reduced the risk of omitted variable bias. Additionally, the study segmented the domestic bond market into two, government bond markets and corporate bond markets. This division enabled this study to provide a more detailed analysis of which domestic bond market contributes to Botswana's economic growth. In contrast, the majority of the previous studies examined the bond market as a whole.

Based on the empirical findings of this study, the main conclusions are that the government bond market does not Granger-cause economic growth in Botswana, nor

does economic growth impact the government bond market. This suggests that, although the government bond market is larger than the corporate bond market, it has not played a significant role in driving economic growth. However, a short-run causal link existed between the corporate bond market and economic growth, which evidences the demand hypothesis. In light of these results, Policymakers should decrease the market capitalisation of government bonds in Botswana to encourage the growth of the domestic bond market. This strategy would prevent the government bond market from overshadowing the development of the corporate bond market and help mitigate the crowding-out effect on other bond types. Additionally, the Botswana Stock Exchange (BSE) and the Botswana Bond Market Association (BBMA) should concentrate on fostering the growth of the economy and corporate bond market by crafting and implementing favourable bond market listing requirements that are not too steep for corporates or small firms. Currently, some corporates struggle to access the bond market due to stringent listing requirements, leading to a market dominated by corporate bonds issued by financial institutions such as ABSA, Stanbic Bank, FNB Bank, BBS Bank, Standard Chartered Bank, and Letshego Holdings, which typically buy and hold bonds for the long term. This approach would support the growth of corporations that have the potential to raise more funds in the bond market. Furthermore, the policymakers should enhance the accessibility of domestic bond markets for both local and foreign investors by simplifying the bond investment process. This involves streamlining regulatory procedures, minimising complex documentation requirements, enhancing transparency, reducing administrative costs, and upgrading market infrastructure to facilitate easier entry and participation. These recommended strategies are essential to support the development of a vibrant and inclusive domestic bond market that contributes meaningfully to Botswana's economic growth and broadens the investor base.

The limitation of the study is that it used the bond market data from 2006 to 2020, despite the Botswana domestic bond market being established in 1997. It would be necessary to conduct another study that includes data from 1997 to 2005 once it's availed to the public to ascertain whether the results would divert from those of this study. Also, it would provide a full overview and trends about the Botswana domestic bond. Even though the

years 1997 to 2005 were excluded still the period under consideration provided sufficient data required by various regression models used in this study, resulting in robust results. Further research can be conducted by comparing Botswana's domestic bond market with other African bond markets to evaluate its performance relative to regional benchmarks and expectations.

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