Financial development and growth nexus: A dynamic causality linkage

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Theme: Economic growth

Abstract

Purpose: This study investigated the relationship between financial development and economic growth in South Africa using the annual time series data (1980 to 2022) from the South African Reserve Bank and Quantec Easy Data.

Method: The study employed both the cointegrated autoregressive distributed lag (ARDL) and the Granger causality approach for the analyses.

Results: The unit test revealed that the variables were stationary and nonstationary at level, implying a mixture of I(0) and I(1), hence the ARDL approach. The cointegration analysis revealed that the variables are cointegrated, which means there is a long run equilibrium relationship among them. Furthermore, the Granger causality test results showed that causality runs from GDP to interest rate liberalisation or vice versa.

Originality/relevance: This study took a different angle by splitting financial development into four proxies and used interest rate liberalisation as an additional variable in the system.

Keywords: financial development, interest rate liberalisation, economic growth, bounds test, autoregressive distributed lag, South Africa.

Lien entre développement financier et croissance : un lien de causalité dynamique

Résumé

Objectif : Cette étude a examiné la relation entre le développement financier et la croissance économique en Afrique du Sud à l'aide des données de séries chronologiques annuelles (1980 à 2022) de la Banque de réserve sud-africaine et de Quantec Easy Data.

Méthode : L'étude a utilisé à la fois le décalage distribué autorégressif cointégré (ARDL) et l'approche de causalité Granger pour les analyses.

Résultats : Les résultats des tests unitaires ont révélé que les variables étaient stationnaires et non stationnaires au niveau, impliquant un mélange de $I(0)$ et $I(1)$, d'où l'approche ARDL. L'analyse de cointégration a révélé que les variables sont cointégrées, ce qui signifie qu'il existe entre elles une relation d'équilibre à long terme. En outre, les résultats du test de causalité de Granger ont révélé que la causalité va du PIB à la libéralisation des taux d'intérêt ou vice versa.

Originalité/pertinence : Cette étude a adopté un angle différent en divisant le développement financier en quatre indicateurs et en utilisant la libéralisation des taux d'intérêt comme variable supplémentaire dans le système.

Mots clés : développement financier, libéralisation des taux d'intérêt, croissance économique, test des limites, décalage distribué autorégressif, Afrique du Sud.

1. Introduction and background

Since the 19th century, several empirical studies highlighted the connection between financial development and economic growth. Even though Megnigang (2024) regards financial development as a significant determinant of economic growth, whether the financial sector leads economic development has been disputed for decades. Its impact on economic growth is uncertain because of the broad definition and interaction with other areas of economic development. Hence, Attah, et al (2024) assert that financial economics traditionally paid little attention to the influence of financial contracts, markets, and intermediaries on long-term economic growth, technological innovation, poverty reduction, and income distribution. While researchers may have varying opinions, the challenge of establishing the relationship between financial development and economic growth persists.

To thrive, any economy needs a sophisticated and effective financial system; consequently, a more effective system offers better financial services, which permits a higher growth rate. On the other hand, a compromised financial system harms the economy (Challousmis, 2024). Similarly, Alwadeai et al (2024) indicated that a strong stock market is widely regarded as a sign of a country's overall macroeconomic performance, underscoring the importance of stable financial markets for national development. Since financial liberalisation has been recognised, several countries have begun to reform their economies to develop the financial sector. Economic expansion and financial development have never made for easy bedfellows. Even though some research has shown that financial development is essential for promoting growth, some recent research indicates that financial deepening has a negative impact on growth. Kwakwa et al. (2023) stated that the financial system has proven unstable for many African nations, with numerous banks failing and others falling into trouble.

According to Ekonomou and Halkos (2023), higher savings and investments result from higher interest rates that support economic expansion. Insofar as achieving growth is concerned, one of the determinants to be considered is the interest rates. Meng et al (2020) state that one way to look at the relationship between interest rate liberalisation and economic growth is from the standpoint of how interest rates impact the expansion of the financial sector. This is because financial liberalisation increases financial development's efficiency. This paper offers an analytical framework for analysing how financial reforms and adjustments to interest rate policy affects economic growth. According to Azmeh (2021), the financial system makes transactions easy, reduces risk, mobilises and distributes savings, and watches managers' behaviour following project funding.

Given the plethora of literature in this field, this study took a different angle by splitting financial development into four proxies credit extensions, leasing finance, stock market capitalisation and bank deposits to determine their impact on economic growth. Furthermore, interest rate liberalisation was introduced as an additional variable in the system. This variable is relevant because it is one of the five measures of the financial conditions index that gives a comprehensive view of how the financial variables are likely to impact future inflation and economic activity levels (Quantec, 2024). In certain cases, the easing of interest rate regulations has been hailed as a chance for expansion. It has been held responsible for causing economic instability and disasters because lowering interest rates impact the economy positively. Financial integration could also lead to financial instability, misallocation of capital, and speculation in a nation with imperfect markets and weak institutions that would harm the economy (Lopez and Stracca, 2021).

Most nations have found it difficult to sustain economic growth despite being their top priority. The COVID-2019 pandemic also worsened the situation. According to Ayoo (2022), developing nations still

have major challenges to increasing growth and reducing poverty and unemployment. The IMF (2023) states that economic and social issues facing South Africa's economy were becoming more intense; from 4.9 percent in 2021 to 2.0 percent in 2022, and growth went down. Despite the prevailing negative investor mood, the private-sector growth credit is expected to be slow, estimated at around 4.5 percent in 2023. This is attributed to stringent lending criteria and unsatisfactory growth prospects, which negatively impact banks' capacity and desire to extend credit. Simultaneously, it is anticipated that institutions' government debt holdings will rise, accompanied by a decrease in lending availability. Furthermore, in response to the increasing inflation, the South African Reserve Bank increased the interest rate benchmark from 5.5% in July 2022 to 6.25% in September 2022.

According to Nwosu and Metu (2020), there are numerous cross-national studies on the relationship between finance and growth with varying degrees of success. On the other hand, research on the industrialised economies with long-term real output growth revealed that their financial sectors are strong and stable. The current study was further influenced by Wen (2022) who noted that recent studies have shown an inconclusive impact of financial development on economic growth. In the quest to contribute to the literature, this study investigated the relationship between financial development and economic growth in South Africa from 1980 to 2022. The study examined the correlation between financial development, interest rate liberalisation, and economic growth, and establish the causal relationship among these variables. The remaining part of the paper is as follows. Both the theoretical and empirical literature reviews are presented in Section 2. Section 3 focuses on data and methodology. The estimated outcomes are explained in Section 4, and Section 5 presents the conclusion and policy implications.

2.   Literature review

The current study is based on the new classical approach and the endogenous growth theories. In the 1980s, mainstream economic theory abandoned Keynesianism and reverted to its roots in classical markets, emphasising the freedom of the market and a minimum role for government. The Keynesian perspective that dominated the 1970s, was repudiated by new-classical theorists. They have tended to concur that it is best to leave development to markets, notwithstanding their differences in focus. According to new classical economists, trade union power must be curtailed, risk-taking entrepreneurship must be encouraged, and state-owned enterprises privatisation and labour market reform must be implemented for a nation to prosper. Coincidentally, most of these issues seem relevant to the context of this study since they resonate well with both the economic challenges and proposed solutions of the South African economy. In the New-classical model, if credit creation declines, bad debts and deflation rise, demand and growth decline, and banks become more risk-averse. Credit crunch, bankruptcies, and unemployment also rise (Yang and Liping, 2024).

Endogenous growth theory posits that economic growth internal processes occurring within the overall system. Considering this, the original work on endogenous growth theory was proposed in two different ways: the passing of perfect competition and the convergence controversy. The convergence controversy suggested that a higher investment rate would be required to achieve the same result. Furthermore, endogenous growth is long-term economic growth at a pace set by inherent factors. Monetary disruptions are more akin to banking crises and it would be possible if the model were expanded to incorporate intertemporal credit mediated by an expensive procedure like exchange credit (Liberto and Esteves, 2023).

The endogenous growth theory, by the McKinnon-Shaw hypothesis, comprises the explicit modelling of the services offered by financial intermediaries, such as risk-sharing. The present hypothesis asserts that government interference within the financial sector has a detrimental impact on economic growth, whereas financial intermediation exerts influence on steady-state growth. The fundamental endogenous growth model is that the financial sector's development could have three different effects

on economic growth. An efficient financial sector lowers transaction costs, which raises the percentage of savings directed toward profitable ventures. An effective financial system increases investment liquidity. Lastly, the financial industry growth may encourage or discourage saving (Machado, et al. 2021)

Evidence from empirical literature suggests that the financial structure has no discernible affection for growth. More precisely, growth is greatly aided by bank expansion, the stock market, and the financial sector. Bekele and Degu (2023) discovered a favourable correlation between financial depth and economic growth. Boikos et al (2022) noted that a liberalised financial sector may enhance economic growth by effectively distributing resources. As a result, economic growth and financial development are positively correlated. Furthermore, economic growth is generally strongly and positively correlated with private-sector credit, indicating that private-sector credit drives growth in the continent. Raifu et al (2024) state that the findings of unrelated regression estimators revealed an inverse relationship between financial development and economic growth in three nations belonging to the South African Development Community (SADC) (Swaziland, Zambia, and Zimbabwe). As a result, within the SADC the relationship between finance and economic growth is weak. The fact that most African entrepreneurs rely on friends and family for private equity investment to engage in economic activity may strain relationships. Therefore, there is a significant reliance on unofficial financial intermediaries to supply the capital required for investment. Financial market indices, which employ formal metrics for the financial sector, might miss this. Thus, one explanation for the SADC's weak finance-growth link could be the growing number of informal financial intermediaries.

Moreover, interest rate liberalisation ensures that the market set rate encourages saving and improves investment. Growth is anticipated to be accelerated by increased investment and liberalisation proponents contend that financial market liberalisation will boost the expansion of the stock market (Saada, 2024). At the same time, Wang, (2024) contended that interest rate liberalisation had a favourable impact on economic performance and that, in some cases, the elimination of interest rate regulations has been welcomed as a growth opportunity. Gomado (2025) states that the liberalisation of interest rates will result in a great deal of uncertainty. After deposit rates are liberalised, interest rates will probably increase to address imbalances and shake off investor complacency. This will also compel a renewed focus on risk in all bank and financial products. According to Lawal and Abdullahi (2024), a slight short-term recession and a moderate long-term expansion are the interest rate liberalisation results.

The existing literature on the causal relationship between financial development and economic growth is somewhat confined, and it has not provided a clear explanation for the endogeneity of these factors. Furthermore, due to the distinct institutional and structural characteristics of each economy, the results may differ. Securing sufficient financial resources is necessary to obtain a highly skilled workforce and cutting-edge technology to enhance the production of commodities and services. However, research revealed varied and contradictory conclusions on the nature of correlation. According to research, there is a negative correlation between finance development and economic growth. Specifically, economic growth is negatively affected by shortcomings in bank loan allocation to the private sector (Kharel, et al., 2024).

The financial sector also plays a role through interest rates. Nyeche, et al (2025) established that the interest rates liberalisation has a beneficial impact on the process of financial deepening, therefore enhancing economic growth. Financial tools that impede financial deepening and thus slow down economic expansion include interest rate ceilings, hefty reserve requirements, and directed lending regulations. Despite efforts to restructure the financial sector and liberalise financial institutions and market regulations, Uganda's GDP fell from 7.8% in the late 1990s to roughly 5% in the mid-2000s. These efforts were partially made to support efficient savings mobilisation and channelling to private sector investment and, as a result, positively contribute to economic growth (Wanzala and Obokoh, 2024).

3. Research questions

This paper attempts to answer two critical questions.

- Is there a relationship between financial development and economic growth?
- Does financial development cause economic growth or does economic growth cause financial development?

4. Research methodology

This section covers data descriptions, sources, model specification and estimation techniques.

4.1 Data and Model Specification

This study utilised the secondary yearly time series data from 1980 to 2022 from the South African Reserve Bank (SARB) online statistical query and Quantec Easy Data. Equation 1 presents the economic growth model where financial development is proxied by credit extensions, leasing finance, bank deposits, and stock market capitalisation. In addition, interest rate liberalisation has been added to the system because of its close relationship with financial development and economic growth. It was also introduced to minimise the possibility of the omitted variable bias.

The linear form of the specified model is presented as follows,

$$GDP_t = \beta_0 + \beta_1 Credex_t + \beta_2 LFin_t + \beta_3 SMC_t + \beta_4 BD_t + \beta_5 INT_t + u_t \quad \text{(1)}$$

where credit extensions (CREDEX), leasing finance (LFIN), stock market capitalisation (SMC) and bank deposit (BD) are regressed on economic growth, proxied by the GDP. β is the coefficient of the explanatory variables and μ is the error term. Finally, (INT) represents the interest rate liberalisation.

4.2 Estimation Techniques

In line with Komape and Tshehla (2024), this study employed the Autoregressive Distributive Lag (ARDL) approach to examine cointegration, even in cases when the variables under consideration represent a mixture of I(0) and I(1) variables. The essential formulation of the ARDL regression model is as follows,

$$Y_t = \beta_0 + \beta_1 y_{t-1} + ... + \beta_p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + ... + \alpha_q x_{t-q} + \varepsilon_t \quad \text{(2)}$$

where ε_t is a random disturbance term. Furthermore, the model is considered "autoregressive", in the sense that y_t is "explained (in part) by lagged values of itself. Equation 2 consists of a "distributed lag" component, in the form of successive lags of the "x" explanatory variables. If the disturbance term, ε_t, the model displays autocorrelation, resulting in an inconsistent estimator for the ordinary least squares (OLS) method. Consequently, instrumental variables estimation has been traditionally used in applications of this model.

Before conducting the analysis, descriptive statistics and unit root analyses were performed to assess the *characteristics of a data set* and stationarity of the variables and establish their order of integration. After the cointegration study, the causality analysis was conducted, followed by diagnostic and stability testing.

5. Results and discussions

This section presents all the estimation techniques and the empirical results of all the tests conducted to determine the financial development and growth nexus in South Africa

5.1 Descriptive statistics

Descriptive statistics demonstrate the correlation between variables within a specific sample and are frequently employed to organise and condense dispersed data for inferential statistical analyses. A statistical model articulates the prior knowledge of the probability experiment that generated the observed data (Dong, 2023).

Table 1: The summary of descriptive statistics

	GDP	CREDEX	LEASFIN	SMC	BD	INT
Mean	5.999145	5.785133	4.145009	4.200658	4.469303	10.75516
Maximum	6.821419	6.692366	4.779286	5.086965	5.575258	19.33333
Minimum	4.842840	4.523980	3.267875	2.754348	3.232234	3.541667
Std. Dev.	0.603623	0.664481	0.380236	0.803063	0.780240	4.602530
Skewness	-0.364325	-0.306618	-0.475728	-0.582947	0.107572	0.244992
Kurtosis	1.896125	1.815149	2.661678	1.699760	1.506959	1.817682
Jarque-Bera	3.134465	3.189044	1.827016	5.464467	4.076866	2.934681
Probability	0.208622	0.203006	0.401115	0.065074	0.130233	0.230538
Observations	43	43	43	43	43	43

Source: Authors' computation

The results in Table 1 show the summary of descriptive statistics of the variables from 1980 to 2022. The descriptive statistics indicate a wider spread in the values of interest rate liberalisation as it ranged from 3.541667 to 19.33333. By comparing all variables, the standard deviation for the interest rate liberalisation of 460.2% was much larger than the others, and the standard deviation for GDP, credit extension, leasing finance, stock market capitalisation and bank deposit were smaller which indicates data points were clustered closer to the mean. Additionally, the percentage change in GDP, credit extensions, leasing finance and stock market capitalisation were left-skewed (negative skewness) and platykurtic, because the kurtosis values were less than 3. The Jarque-Bera statistical probability values for all the variables were greater than 0.05 implying that the values are normally distributed and therefore, cannot reject the null hypothesis.

5.2 Unit root/stationarity

According to Stock and Watson (2015), the most popular test used is the Augmented Dickey-Fuller (ADF) test, the first created for evaluating a unit root's null hypothesis. The idea that an ADF value is smaller than its critical values indicates that the underlying series is non-stationary and will serve as the foundation for the decision rule. The Dickey-Fuller Generalised Least Square (DFGLS) served as a confirmatory test. The ADF and DFGLS unit root tests were preferred mainly for their simplicity and relevance to the study's approach.

The DFGLS test was originally proposed to test the null hypothesis that Y_t follows a random walk trend, possibly with drift, and the alternative hypothesis that Y_t is stationary around a linear time trend. Therefore, this paper presents the findings of the unit root test in Tables 1 and 2.

The ADF unit root tests were carried out at intercept, intercept, and trend and none. The results are presented in Table 2.

Table 2: ADF unit root test results

Variables	Model	Lag-length	t-statistic	p-value	Order of integration
GDP		0	-2.933158	0.0000	I(0)
$CREDEX$	linear	0	-3.523623	0.0014	I(1)
$LFIN$	Constant, trend & none.	0	-1.949097	0.0206	I(1)
SMC		0	-2.935001	0.0000	I(1)
BD		0	-1.949319	0.0061	I(1)
INT		0	-3.523623	0.0031	I(0)

Source: Authors' computation

The DFGLS results in Table 3 indicate that, except interest rate liberalisation, all the variables acquire stationarity after the first difference I(1). On the other hand, GDP was found to be stationary at level I(0) under the ADF analysis.

Table 3: DFGLS unit root test results

Variables	Model	Lag-length	t-statistic	p-value	Order of integration
GDP		0	-3.190000	0.0000	I(1)
$CREDEX$	linear	0	-3.190000	0.0000	I(1)
$LFIN$	&	0	-3.190000	0.0062	I(1)
SMC	Constant trend	0	-3.190000	0.0000	I(1)
BD		0	-3.190000	0.0596	I(1)
INT		0	-3.190000	0.0000	I(1)

Source: Authors' computation

The ARDL approach became the relevant choice for cointegration analysis because of unit root test results of a mixture of I(0) and I(1) variables.

5.3 Cointegration Analysis Results

As far as the ARDL bounds tests are concerned, each variable is considered the dependent variable and is systematically analysed by regressing on the other variables. This violated the weak exogeneity criteria of the limits testing paradigm by implicitly permitting each variable to be endogenous. The results are presented in Tables 4 and 5.

Table 4: ARDL Bounds Test Results

Test Statistic	Value	
F-Statistic	9.669354	
Bounds Critical Values Sample size 35		
Significance	**I(0) Bounds**	**I(1) Bounds**
10%	2.331	3.417
5%	2.804	4.013
1%	3.900	5.419
Sample size: 40		
10%	2.306	3.353
5%	2.734	3.920
1%	3.657	5.256
Asymptotic		

10%	2.080	3.000
5%	2.390	3.380
1%	3.060	4.150

Source: Authors' computation

The results in Table 4, show that the computed F-statistic, that is 9.669354, exceeds both the upper and lower limits at all levels of significance. The presented empirical evidence confirms the cointegration equation between GDP and financial development in the long run.

Table 5 provides a summary of the long run relationship between LGDP and the proxies of financial development.

Table 5: Estimated Long Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCREDEX	0.433945	0.508953	0.852623	0.4000
LLEASFIN	0.103058	0.089745	1.148338	0.2591
LSMC	0.038641	0.130969	0.295037	0.7698
LBD	0.098831	0.164352	0.601339	0.5517
LINT	-0.000967	0.013857	-0.069798	0.9448
C	2.968941	2.096294	1.416281	0.1661

Source: Authors' computation

The results presented the enduring influence of each independent variable on economic growth. The findings indicate that the interest rates liberalization has a detrimental and statistically insignificant impact on GDP by -0.000967. However, credit extensions, leasing finance, stock market capitalisation, and bank deposits exert a positive and insignificant influence in the long term, indicated by the p-values greater than 0.05 significance level.

Furthermore, the short-run analysis was conducted to ascertain the speed at which the system reverts to equilibrium. Therefore Equation 3 was considered.

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta GDP_{t-i} + \sum_{i=1}^{n} \beta_2 \Delta CREDEX_{t-1} + \sum_{i=1}^{n} \beta_3 \Delta LFIN_{t-i} + \sum_{i=1}^{n} \beta_4 \Delta SMC_{t-i} + \sum_{i=1}^{n} \beta_5 \Delta BD_{t-i} + \sum_{i=1}^{n} \beta_6 \Delta INT_{t-i} + \beta_7 ECT_{t-i} +$$

$$\mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where Δ is the first different operator; β_1 to β_5 characterises the short-run dynamics of the model, the uncorrected error term ECT_{t-i} is derived from the equation. Given β_7 as the ECT coefficient is expected to be negative, it will accurately reflect the acceleration towards long-run equilibrium.

Table 6: Estimated Short Run Results

Variable	Coefficient	Std. Error	t-Statistic	p-value
D(LGDP (-1))	-0.277667	0.135551	-2.048423	0.0488
D(LSMC)	-0.012289	0.009471	-1.297506	0.2037
D(LINT)	0.000678	0.000513	1.320107	0.1962
CointEq (-1)	-0.116051	0.012715	-9.127168	0.0000

Source: Authors' computation

The findings shown in Table 6 demonstrate that the error correction coefficient has a negative of -0.116051 and a statistically significant value of 0.0000. This implies that following any economic shock, there is an annual adjustment of 11% towards the long-run equilibrium. The estimated lagged error term, denoted as CointEq, has a negative sign and is empirically significant. Thus, the established long-

term link between the variables was confirmed. Furthermore, it demonstrated a consistent approach towards the equilibrium.

5.4 Granger causality test

The Granger causality test is a cause-and-effect test between two sets of variables. Causality is tested among the cointegrated variables (Asterious and Hall, 2007). The results are presented in Table 7.

Table 7: Granger causality test results

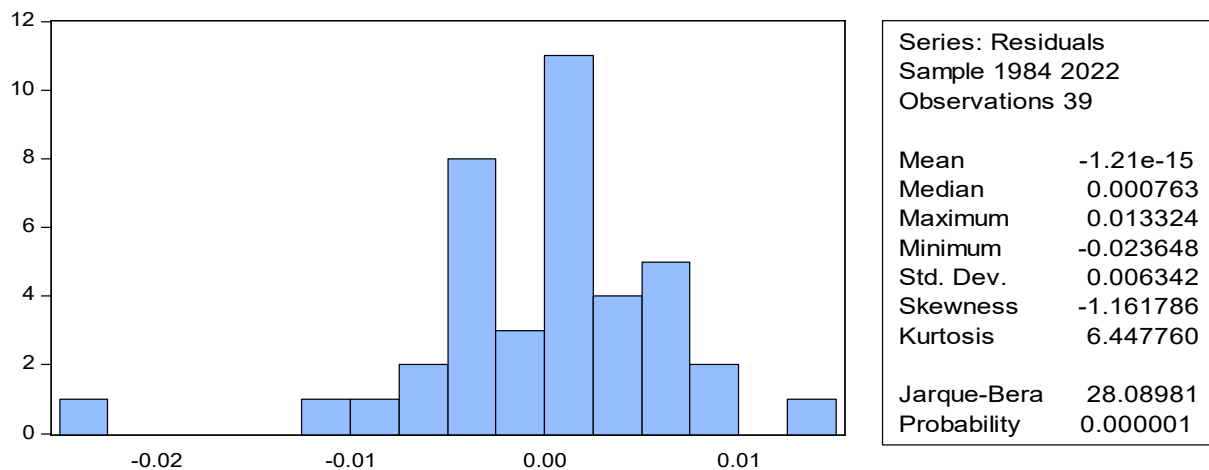| Null Hypothesis	Obs	F-Statistic	Prob.
LCREDEX does not Granger cause LGDP	41	0.34189	0.7127
LGDP does not Granger cause LCREDEX		7.51705	0.0019
LLEASFIN does not Granger Cause LGDP	41	2.33827	0.1110
LGDP does not Granger Cause LLEASFIN		0.53227	0.5918
LSMC does not Granger Cause LGDP	41	1.82575	0.1757
LGDP does not Granger Cause LSMC		0.62957	0.5386
LBD does not Granger Cause LGD	41	1.00000	0.3779
LGDP does not Granger Cause LBD		1.20856	0.3105
LINT does not Granger Cause LGDP	41	3.63805	0.0364
LGDP does not Granger Cause LINT		8.16660	0.0012
LLEASFIN does not Granger Cause LCREDEX	41	4.64542	0.0160
LCREDEX does not Granger Cause LLEASFIN		2.07538	0.1403
LSMC does not Granger Cause LCREDEX	41	1.42870	0.2529
LCREDEX does not Granger Cause LSMC		0.50164	0.6097
LBD does not Granger Cause LCREDEX	41	3.45080	0.0426
LCREDEX does not Granger Cause LBD		2.20795	0.1246
LINT does not Granger Cause LCREDEX	41	1.21775	0.3078
LCREDEX does not Granger Cause LINT		11.4987	0.0001
LSMC does not Granger Cause LLEASFIN	41	0.34109	0.7133
LLEASFIN does not Granger Cause LSMC		1.30673	0.2832
LBD does not Granger Cause LLEASFIN	41	1.32534	0.2784
LLEASFIN does not Granger Cause LBD		1.46298	0.2450
LINT does not Granger Cause LLEASFIN	41	2.42634 5.96008	0.1027
LLEASFIN does not Granger Cause LINT			0.0058
LBD does not Granger Cause LSMC	41	0.23851 4.17308	0.7890
LSMC does not Granger Cause LBD			0.0234
LINT does not Granger Cause LSMC	41	1.39763 4.50621	0.2603
LSMC does not Granger Cause LINT			0.0179
LINT does not Granger Cause LBD	41	8.51975	0.0009
LBD does not Granger Cause LINT		7.27504	0.0022

Source: Authors' computation

Based on the probability values disclosed in Table 7, the hypothesis of Granger causality tests indicates that a bi-directional causality runs from interest rate liberalisation to gross domestic product, indicated by 0.0364 and 0.0012 p-values. The test results indicate a bi-directional causality between interest rate liberalisation and bank deposits, indicated by 0.0009 and 0.0022 p-values. However, there is a one-way interest rate liberalisation to the credit extension direction with 0.3078 and 0.0001 p-values. A 0.3078 p-value is greater than 0.05 significance level, hence there is a one-way direction between the two variables. The results showed that out of the four proxies of financial development, GDP and bank deposits showed a significant causality with interest rate liberalisation. Similarly, economic growth showed a one-way direction with credit extension. There is a counterpart error correction representation whereby the equilibrium deviations exert an influence on the short-run dynamics within the system. Furthermore, the unidirectional nature of the relationship suggests alterations in the dependent variable. The values of variables are determined by the degree of imbalance in the

cointegration, which is measured by the error correction term and the change in certain explanatory variables.

5.5   Diagnostic test results

The misspecification issues are identified is by investigating the regression of residuals. Violation of residuals leads to the inferential statistic of a regression model not being valid. Therefore, it is essential to test for the normality of residuals (Asterious and Hall, 2007). The results are presented in Figure 1.

Figure 1: Normality test result

Series: Residuals	
Sample 1984 2022	
Observations 39	
Mean	-1.21e-15
Median	0.000763
Maximum	0.013324
Minimum	-0.023648
Std. Dev.	0.006342
Skewness	-1.161786
Kurtosis	6.447760
Jarque-Bera	28.08981
Probability	0.000001

Source: Authors' computation

The Kurtosis of 6.447760 implies that there is a normal distribution of residuals. Such a conclusion is based on Brooks (2008) that the kurtosis should be equal to or higher than 3 for normal distribution, and with the Bera-Jarque statistic more than 0.05, we do not reject the null of normality at a 5% level. Additional evidence of normal distribution is provided by the bell-shaped superimposed line drawn on the histogram.

In line with Brooks (2008), other diagnostic tests were also performed to determine whether the estimated model is adequate and ensure that the VAR is correctly specified. The results are summarised in Table 8 as follows.

Table 8: Summary of Diagnostic Tests

| Diagnostic analysis	Test	p-value	Conclusion
Serial correlation	Breusch-Godfrey Serial Correlation LM	0.0963	Do not reject null
Heteroskedasticity	ARCH	0.2052	Do not reject null
Heteroskedasticity	Breusch-Pagan-Godfrey	0.7983	Do not reject null

Source: Authors' computation

The serial correlation results indicate a p-value of 0.0963. Since it is more than 0.05, it implies there is no serial correlation. The ARCH test indicates a p-value of 0.2052, which suggests that we do not reject the null hypothesis, which suggests no heteroskedasticity. Furthermore, the Breusch-Pagan-Godfrey test indicates a p-value of 0.7983, which implies that the null hypothesis could not be rejected. It also reveals that there is no problem with heteroskedasticity. Finally, the normality test with a p-value of 0.0000 implied the study does not accept the null hypothesis of normality at a 5% level.

5.6   Stability test results

The stability tests were performed to assess the stability of the model throughout the study. The results are presented in Figures 2 and 3 respectively.
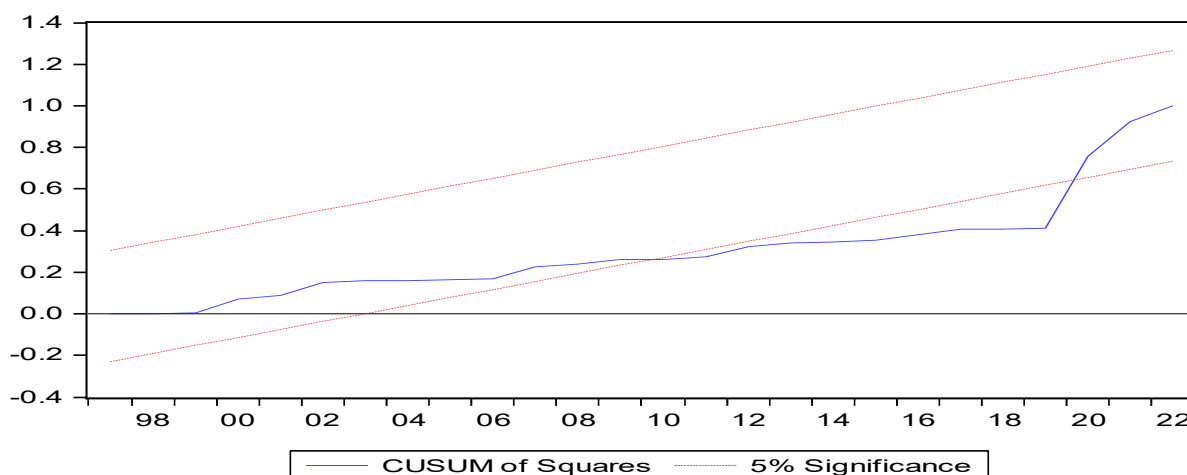
Figure 2: CUSUM test results
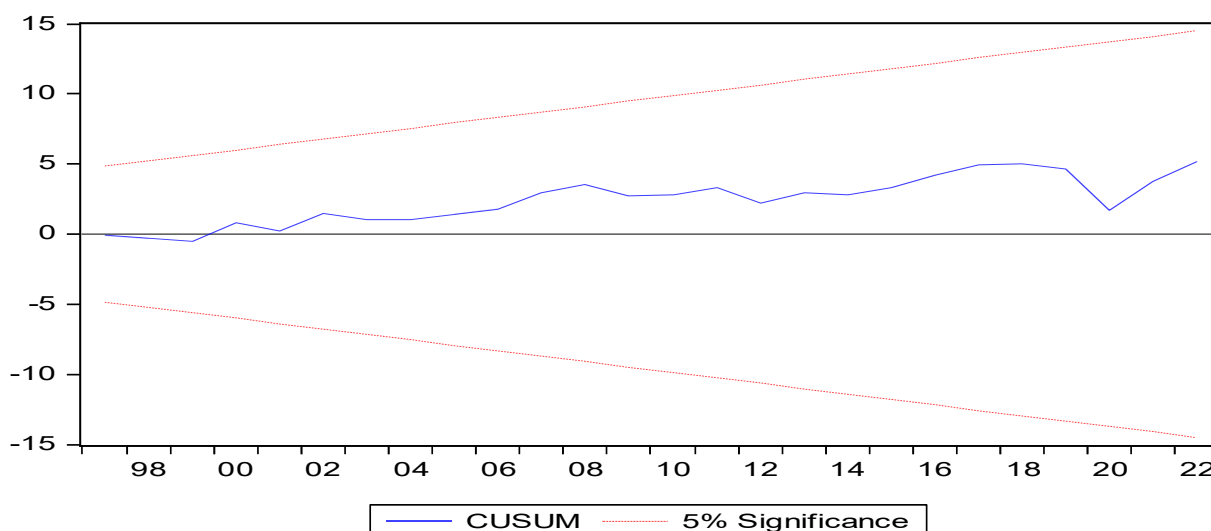
In Figure 2 the CUSUM stability test results are displayed at a 5% significance level. The test statistic lies within the critical boundaries confirming that the estimated model coefficients are stable throughout the study.

Figure 3: CUSUM of Squares test results

The CUSUMSQ test results indicate that the model was stable and became unstable between 2009 and 2019 because the line moved outside the critical bounds at a 5% level of significance. Stability was restored after 2019 until the end of the period of investigation.

The most used test for generalised misspecification Ramsey's Regressions Specifications Error Test (RESET) tests confirmed model stability (Asterious and Hall, 2007). The RESET test investigated whether the non-linear combinations of the fitted values help to elucidate the response variable. The findings are displayed in Table 9.

Table 9: Ramsey Reset Test Results

Stability analysis	Test	p-value	Conclusion
Ramsey reset	Squares of fitted values	0.6654	Appropriate

Source: Authors' computation

In line with Brooks (2008), the probability must be above 0.05 to be appropriate. Therefore, the 0.66 p-value in Table 9 implies the model remained stable during the entire study period.

6.   Conclusions and recommendations

The ARDL bounds testing methodology was employed to investigate the relationship between financial development and economic growth by analysing yearly data from 1980 to 2022. The results are in tandem with Musembi and Chun (2020), who discovered that financial development fosters long-run economic growth. Similarly, Boikos and Panagiotidis (2022) determined that liberalised financial sector could stimulate economic growth by efficiently allocating resources. Similarly, this study revealed that economic growth and financial development are positively correlated in South Africa. The empirical evidence indicates a cointegration between financial development and economic growth that validates the existence of a long-term correlation between the variables. Furthermore, interest rate liberalisation is also linked positively with economic growth.

Moreover, the Granger causality analysis showed a bi-directional causality from interest rate liberalisation to GDP. However, there is a one-way direction from economic growth to credit extensions, which might be due to a high amount of credit extensions with less or no savings that might hurt GDP.

The findings of this study have implications for various stakeholders, including financial analysts, academics, and policymakers in a developing nation such as South Africa. Considering the contentious nature and the scarcity of scientific evidence about the accessibility of literature, this study contributes to the existing knowledge and is expected to inspire more investigation in this field. Furthermore, the study contributes to the ongoing finance-growth nexus debate and policymaking. In line with Shah et al. (2023), this study recommends that policymakers concentrate on increasing both financial development and growth and liberating the interest rate.

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