

A Critical Analysis of Small and Medium Enterprise Financing and its Impact on Growth and Sustainable Development in Nigeria

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Abstract

*The study considers a critical analysis of small and medium enterprise finance and its impact on growth and sustainable development in Nigeria over the 1992-2025 with the data acquired on Real Gross Domestic Product (RGDP), Employment Generation (EGN), **Bank Loans (BKL)**, **Credit to SMEs (CSME)**, **Lending Rate (LRT)**, Inflation Rate (INF) (Control Variable). The model used in the study was an autoregressive distributed lagged model (ARDL). The study also found out that in the short-term, the significant impact of BKL and CSME on sustainable development is positive, whereas the significant impact of LRT on sustainable development in Nigeria is negative, respectively. In the long run, BKL, CSME, and LRT have a significantly negative impact on sustainable development in Nigeria, but CSME has a negative and insignificant impact on sustainable development. However, BKL and CSME have a positive significance on sustainable development through growth development in Nigeria. It was found that financing of SMEs contributes greatly to sustainable development and economic growth. Thus, the paper suggests that central banks should lower the lending rates to single digit with the aim to generate employment, alleviate poverty and bring about economic stability and sustainability. The central bank of Nigeria (CBN) should collaborate with banks in Nigeria to give out loan to SMEs with the aim of generating employment in Nigeria and government should emphasize more on creating an enabling environment of doing business rather than aid and grants that will never reach the target audience.*

Keywords: SME Finance, Sustainable Economic Growth, Sustainable Development, Credits to SME, Bank Lending Rate

1. Introduction

The term SME is an abbreviation that refers to Small and Medium Scale Enterprises. SMEs are mostly considered as the driver of economic growth in any country and they are seen as the catalyst to sustainable economic growth in any country worldwide (Owoeye, 2025). SMEs are generally known to be the driver of economic growth, development and industrialization in the developing economies especially in Nigeria (Otokiti et al. 2022). Such businesses play a critical role in the creation of jobs, alleviation of poverty, income distribution, and diversification of the Nigerian economy that relies on

oil. One of the main pillars of a sustainable Nigerian economy, SMEs make up more than 80 percent of the total employment and almost half of the national GDP (Ali, 2021).

The environments in which the Nigerian SMEs work are restrictive, despite these advantages, limiting the potentials of the SMEs. Another crucial, chronic limitation is the lack of long-term funding and failure to obtain credit loans with formal banks (Ajuwon et al. 2024). Although there are different sources of government intervention funds, most SMEs are not well-capitalized, with high-interest rates, high collateral requirements, and inadequate infrastructure (Umeaduma, 2024). Consequently, economic growth and development in Africa is possible through the establishment of powerful SMEs that will subsequently become key players in the growing economy (Mugano, 2023). SMEs contribute to the diversification of the economic activities which have substantial importation and export activities; they are dynamic and can readily respond to the dynamic market demands (Chege & Wang 2020). Therefore, SMEs are increasingly benefiting the national and global economies of the world.

SME financing is vital in fostering growth but there is a dire disconnects between the credits requirements of these businesses and the amount of credit that is available to them (Legendre, 2022). The commercial banks tend to consider SMEs as risky and hence give them high interest loans that thwart growth (Gassiah & Kikula 2022). Although the Central Bank of Nigeria (CBN) has implemented many schemes, the effect on sustainable development is contentious because of the bureaucracy and ineffective allocation (Akamike & Okonkwo 2024). The study thus aims to critically examine how financing affects SMEs performances and how it impacts on sustainability growth and development in Nigeria.

The study will present valuable information to policymakers in designing better credit initiatives, to financial institutions to know more about risks and opportunities of SMEs, and to entrepreneurs to overcome financial limitations in Nigeria. This paper critically examines the impacts of financing (or lack thereof) on the performance of SMEs and the effectiveness of the current government financial policies, high interest rates and collateral requirements to the economic growth of Nigeria. In particular, the study objectives are;

- i. To ascertain the impact of deposit money bank loans on SMEs growth and sustainable development in Nigeria.
- ii. To examine the impact of credit to private sector on SMEs growth and sustainable development in Nigeria.
- iii. To assess the impact of average deposit money bank lending rate on SMEs growth and sustainable development in Nigeria.

The following hypotheses will be tested to effectively find a solution or a useful result to the problem.

- i. H_01 : There is no positive significant influence of deposits money bank loans on SMEs growth and sustainable development in Nigeria.
- H_11 : Deposit money bank loans highly positively influence SMEs growth and sustainable development in Nigeria.

- ii. H₀₂: Credits to SME do not impact positively on the growth of SMEs growth and sustainable development in Nigeria.
- H₁₂: Credits to SME have a positive effect on growth of SMEs growth and sustainable development in Nigeria.
- iii. H₀₃: There is a negative effect of average deposit money bank lending rate on growth and sustainable development of SMEs in Nigeria.
- H₁₃: Average deposit money bank lending rate has a positive impact on the growth and sustainable development of SMEs in Nigeria.

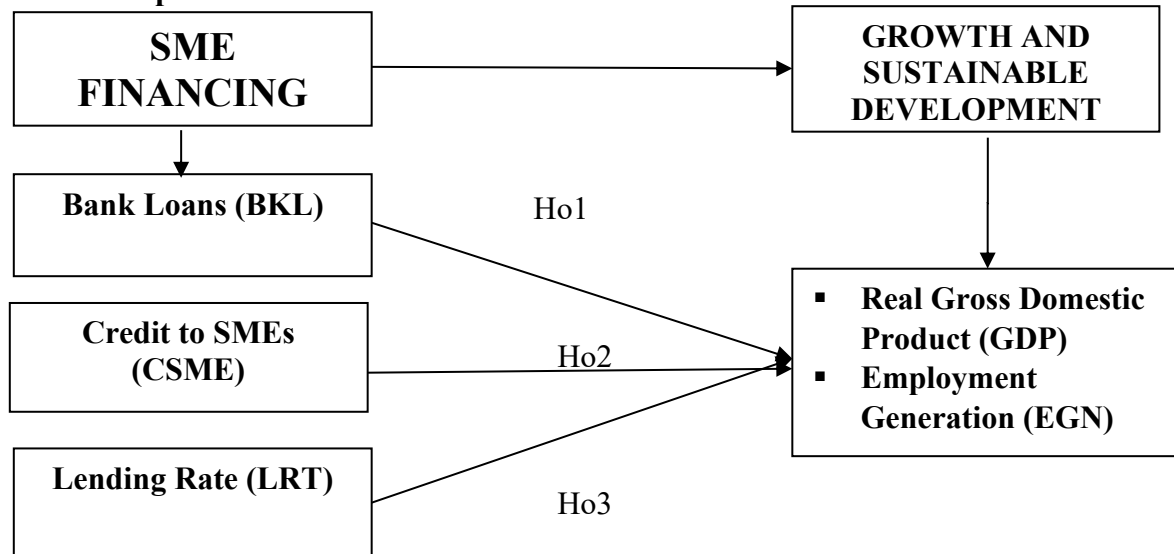
2. Literature Review

2.1. Conceptual Framework

Small and Medium Enterprises (SMEs) are business organizations whose revenues, assets, or number of employees fall to a specific limit, which is different in different countries and institutions. In Nigeria, the SMEs are prescribed by the Small and Medium Enterprises Development Agency of Nigeria. (SMEDAN) businesses that are 10-199 employees, assets between ₦5 million and 500 million without land and buildings (SMEDAN & NBS, 2020). SMEs are regarded as the engine of economic growth because of their ability to create jobs, innovate and contribute of great importance to GDP (Uche, Ekene & Miebi 2024). They are important in industrial development as they promote local content, increase entrepreneurship, and distribute income equitably (Adegbite and Machethe, 2022). Nevertheless, structural issues affecting SMEs include lack of access to finance, etc. poor infrastructure, and lower technical capacity, which impede their scaling and operation. Therefore, it is imperative to know the dynamics and contributions of SMEs in order to design them successful development policies towards inclusive and sustainable economic growth in the developing economies such as Nigeria (El-Yaqub, Ismail & Usman 2025).

Sustainable development is a comprehensive perspective towards development that aims at satisfying the needs of the current generation without affecting the capability of the future generation to satisfy their needs. It comprises three dimensions that are intertwined: economic growth, social inclusion, and environmental protection (United Nations, 2015). The idea is on long-term development plans that balance between productivity and equity as well as environmental sustainability. Sustainable development in developing countries such as Nigeria entails the endeavors that alleviate poverty, provide inclusive economic growth, provide access to quality education and healthcare, and safeguard the natural resources (Olaoye, 2025). The 2030 Agenda of the United Nations on sustainable development consisting of 17 Sustainable Development Goals (SDGs) is a universal strategy that helps countries to meet the goal of inclusive and resilient development. Given the right support and funding, SMEs can be crucial in this process as they create employment opportunities, contribute to innovation, and engage in environment-friendly activities (Adeyemi et al., 2025). This means that to ensure sustainable development, there must be concerted actions within the sectors, but especially empowering important economic players such as SMEs.

Figure 1: Conceptual Framework



Source: Author's Compilation 2026

The long-term, positive and extensive effects of Deposit Money Bank (DMB) loans on the growth, expansion and contribution of Nigerian SMEs to GDP, leading to industrialization and creation of jobs are significant and long-term effects. SMEs are commonly considered as an important source of economic growth typically making more than 50 percent of the Gross Domestic Product (GDP) in developed economies and as much as 40 percent in developing economies (Algan, 2019). SME growth requires bank loans and institutional financing, which makes it possible to expand and create more jobs, as well as enhance national productivity (Abbasi, Wang, & Abbasi, 2017). According to Kolawole (2025), DMB credit to SMEs positively and significantly impacts SME performance and GDP growth, especially by providing better capital access. SMEs have become accustomed to financial starvation despite their significance as they are characterized by high collateral requirements, high-interest rates, and unavailability of credit history (Iwegbu & Ademisola 2026).

Studies indicate that upon accessing loans, the SMEs use them mainly to grow their businesses, to modernize their infrastructure and to develop new products. The lending rates are high with poor loan terms which discourage SMEs to invest thus hurting the growth of GDP. Bank loans are necessary, but in developing economies, most SMEs use Micro Finance Institution (MFIs), which have very high-interest rates because they have to cover the administrative expenses (Oyegbade, 2022). The long-run impact of bank credits on SME performance is high, but the short-term impact on GDP may be limited or detrimental.

H₁₁: Deposit money bank loans highly positively influence SMEs growth and sustainable development in Nigeria.

SMEs credits have a positive influence on the development of the Nigerian economy as they stimulate the performance, assets accumulation, and growth (Igbinosa & Igbinosa 2025). More access to bank credit and FINTECH solutions increases operational capacity, sales and revenue. But this effect is

usually curtailed by high lending rates and tight collateral requirements and needs changes in policy. Availability of credit can enable the SMEs to increase operations and productivity though high lending rates and strict collateral requirements usually impose short-term financial limitations (Omowole et al. 2024).

The credit to SMEs serves as a major driver to making them contribute to the Gross Domestic Product (GDP) by improving their expansion, job creation, and innovation. Increased financing, especially loans, increases the operational capacity of SMEs, which has an overall positive and significant effect on economic growth. The contribution of SMEs in the developing economies is as much as 40 per cent of GDP, and as access to credit improves, the contribution can go up to 50 per cent or higher, frequently contributing more than 60 per cent of GDP growth (Tekola & Gidey 2019). Through credit, modern technology, and raw material are acquired which enables SMEs to increase their production. Through operation financing, SMEs provide additional jobs, with up to 84 percent of the workforce in some areas, which cuts down on unemployment and broadens tax base (Rehman et al. 2023).

The additional, more available financing supports SMEs in agriculture, manufacturing and services which are important contributors to overall output. Some developing economies such as Nigeria have over the years experienced a significant decline in bank credit to SMEs, which are hampering their potential. Although debt financing is mainly effective in boosting the GDP growth in developed economies, its success may be different in the developing context depending on the interest rates and inflation (Belgibayeva et al. 2022). The net positive effect on GDP may be reduced due to high lending rates that render credit expensive.

H₁₂: Credits to SME have a positive effect on growth of SMEs growth and sustainable development in Nigeria.

The high average DMBs lending rates in Nigeria do not normally positively influence SME growth, but rather tend to be a drag instead of a push (Arinzeh, 2022). The poor access to credit in the form of high interest rates and tight collateral conditions suppress the growth of SMEs, as they cannot play a role in the growth of the economy (Umeaduma, 2024). The adverse effect of lending rates on the overall contribution of SMEs to the Gross Domestic Product (GDP) is substantial and negative and is mostly evident in developing economies. With the high lending rates, the cost of borrowing increases and this limits the access to capital by SMEs, lowers their investment in growth opportunities and consequently lowers their overall output and contribution to the national economy. Increased lending rates make loans unaffordable and as a result, the loan uptake among SMEs is reduced (Oyegbade et al. 2022). This limits their chances of increasing their operations, acquiring equipment and innovating thus stalling their growth. The operating cost is high due to high interest payments and this reduces profitability, and in most instances, causes a high business failure rate and hence the overall contribution of the SME sector to the GDP. Although there is a negative impact of high interest rates, in the long term, bank credit to SMEs can have a significant long term positive impact on the output and GDP of SMEs. SMEs play an important role in employment, innovation, and growth in the GDP, often playing almost half or a bigger role in the GDP in developing nations (Chege & Wang 2020).

High collateral requirements, absence of credit history and high cost of borrowing tend to hold SMEs back in developing economies and hence often subject them to lending rate shocks.

H₀₃: There is a negative effect of average deposit money bank lending rate on growth and sustainable development of SMEs in Nigeria.

2.2. Theoretical framework

The theoretical approach to the analysis of SME financing, growth and sustainable development in Nigeria focuses on the Schumpeterian Theory of Innovation, Credit Allocation Theory and Financial Intermediation Theory. These theories cement the fact that available credit allows innovation and growth and promotes economic growth and employment.

2.2.1. Schumpeterian Theory of Innovation (Entrepreneurial Theory)

According to the Schumpeterian Theory of Innovation or the Entrepreneurial Theory, it is the entrepreneurs who spur economic growth by performing a process known as creative destruction, creating new products, processes, markets or forms of organization that disturb the existing market equilibria (Emami Langroodi 2021). Schumpeter and Swedberg (2021) made a distinction between invention and the entrepreneurial process of creating something new, and upon it, entrepreneurs with the help of credit bring about growth by unseating obsolete ways of doing things. Schumpeter identified five categories of innovation, including introduction of a new good, new method of production, opening up a new market, acquisition of new raw materials or new structure of an industry (Ziemnowicz, 2020). Bank credit is hardly ever utilized by entrepreneurs themselves; they use it to obtain the necessary funding to implement innovations. According to this theory, entrepreneurs (SMEs) lead to economic growth by innovation and by introducing new products or technologies. The driving force behind this is financing which results in sustainable growth (Emami Langroodi, 2021). Also, the theory stated that entrepreneurship is essential in fighting the problem of economic stagnation, especially by promoting knowledge-based innovative entrepreneurship (KIE). It also insinuates that the financial institutions play a pivotal role in funding this disruption (Malerba & McKelvey 2020).

2.2.2. Credit Allocation/Accessibility Theory

Credit Allocation and Accessibility Theory deals with the manner in which the available loanable funds are distributed by the financial institutions, governments, and markets among the borrowers (allocation) and the circumstances under which a borrower gets the loaned funds (accessibility). The framework plays a vital role in economic growth because the movement of credit determines the investment, consumption, and production, especially in the rural or developing economies (Dong, Wen & Liu 2020). Highlights that SMEs tend to experience gaps in financing because of information asymmetry and lack of ability to offer collateral. According to this theory, the better access to credit is, the better the performance of SMEs, long-term survival, and sustainability (Chepkoech, Joseph & Anne 2025). SMEs need access to credit to survive and to grow, enabling them to boost profitability, sales revenue, and employment (Oyegbade, Igwe, Ofodile & Azubuike 2022). According to the theory,

credit is not always available and restriction (credit rationing) by banks because of information asymmetries (risk) has an important effect on borrowers (Muli, 2017).

2.2.3. Financial Intermediation Theory

Financial intermediation theory describes why banks and other financial institutions are needed as the intermediaries between lenders (savers) and borrowers (Scholtens & Van Wensveen 2003). These intermediaries add value in terms of decreasing the transaction costs and asymmetric information, providing liquidity, and risk diversification. The key activities are mobilizing savings and investing in productive activities. Modern financial markets, which are technology based and in which information is more freely available, have challenged the traditional theory which is founded on minimizing asymmetric information. The new of the modern theories focus on the new role of intermediaries not only to reduce costs, but also to manage complex, structured, and risk-managed assets. The theory concentrates on the effectiveness of financial institutions in directing money of the savers to productive sectors (SMEs). The theory essentially holds that in the absence of perfect information the financial intermediaries play a pivotal role in ensuring an efficient capital formation and stability in the economy (Nnabugwu, 2021).

2.3. Empirical Framework

Raimi and Bamiro (2026) investigated how Islamic sustainable finance would facilitate green entrepreneurship and sustainable development goal in emerging Muslim Economies. This qualitative research involved a critical literature review (CLR) on three levels, which included conceptual, theoretical, and empirical reviews. Through a critical review of more than 64 scholarly articles that are indexed in Google Scholar and the SCOPUS database dating back to 2010-2024, the study offers an in-depth understanding of the role of ISF in selling GE and meeting SDGs in emerging Muslim Economies. The study highlights ISF's role in promoting green entrepreneurship by investing in sustainable projects, supporting SMEs, and offering alternative financing. The results underscore the need to bring together Islamic ethics and finance to become the driver of inclusive, sustainable development.

The study by El-Yaqub et. al. (2025) analyzed the influence of financing SMEs on sustainable development on the years 1992-2023 using the data on Poverty reduction (POV), proxy of sustainable development, commercial bank credit SMEs (CBSM), microfinance credit to SMEs (MFSM), aid and grant to SMEs (AGS), the model used is an autoregressive distributed lagged model (ARDL-ECM). The result of the error correction model (ECM) indicated that the speed of change is 93 and this implies that 93 pre-period disequilibrium is reinstated back to equilibrium during the following periods. The research also found out that the impacts of CBSM, MFSM and AGS on sustainable development are good and significant in the short run, whereas the effects of SCS and PLR on sustainable development in Nigeria are negative and significant, respectively. Long run effects of MFSM and PLR on sustainable development in Nigeria are highly negative whereas the effects of CBSM on sustainable development are negative and not significant. Nonetheless, AGS and SCS are positively related to

sustainable development in terms of reduction of poverty in Nigeria. It was found that SME financing can largely influence sustainable development as compared to poverty reduction.

The study by Nabais and Franco (2024) was done to gain insight into sustainable development of small and medium-sized enterprises (SMEs), examining their existing practices in social, environmental and economic sphere. To achieve this aim, a qualitative, exploratory methodology was chosen, which involved the multiple case study design and eight cases (SMEs) in Portugal. Interviews were employed to collect data, as it is the method that enables closeness and communication with the decision makers and the people who take charge of sustainability of firms. The analysis of the interviews conducted provided the data that SMEs know and care about sustainability and that the external environment and certain peculiarities of its influence on sustainable development of SMEs play a crucial role. These SMEs perform different social, environmental and economic practices, with environmental ones, particularly, being efficient consumption of resources, more sustainable resources, recycling waste and waste management.

3. Methods

This section summarizes the research method used in assessing how financing the SMEs in Nigeria has enhanced growth and sustainable development. It outlines the research design, study population, sampling methods, data collection methods and the econometric methods of data analysis.

3.1. Research Design

The research design is ex-post facto research design (historical research design). This type of design is appropriate as the research intends to study the relationship between the dependent variable (SME growth/sustainable development) and other independent variables (SME financing, bank lending, interest rates) using past data. It enables the researcher to study the already passed events, namely through time-series data of the Central Bank of Nigeria (CBN) Statistical Bulletin.

3.2. Population and Sampling Technique

Since the scope of the study is national, the population would comprise of all registered SMEs and banking institutions in Nigeria. This study employs secondary data since it is a huge population and the research runs back to 1992 up to the year 2025 ,Annual time-series data collected based on CBN Statistical Bulletins, National Bureau of Statistics (NBS) publications, and World Bank databases. 1992 is used as a starting point since it is at this time that regular data on commercial bank loans to SMEs in Nigeria started to be documented.

3.3. Model Specification

An econometric model is used to calculate the effect of SME financing on growth, using knowledge from comparable empirical research conducted in Nigeria. The relationship's functionality is:

$$RGDP = F(BKL, CSME, LRT, INF)$$

$$EGN = F(BKL, CSME, LRT, INF)$$

Where:

- RGDP = Real Gross Domestic Product

- EGN = Employment Generation
- BKL = Bank Loans
- CSME = Credit to SMEs
- LRT = Lending Rate
- INF = Inflation Rate (Control Variable)

For estimation, the linear models are:

$$\text{LOGRGDP} = \beta_0 + \beta_1 \text{LOGBKL} + \beta_2 \text{LOGCSME} + \beta_3 \text{LOGLRT} + \beta_4 \text{LOGINF} + \mu_t$$

$$\text{LOGEGN} = \beta_0 + \beta_1 \text{LOGBKL} + \beta_2 \text{LOGCSME} + \beta_3 \text{LOGLRT} + \beta_4 \text{LOGINF} + \mu_t$$

- β_0 = Intercept
- $\beta_1 - \beta_4$ = Coefficients
- LOG = Naturally Logarithm (to minimize volatility and guarantee linearity)
- μ_t = Stochastic error term

3.4. Method of Data Analysis

E-views software was used for the analysis. Among the steps are:

1. Descriptive statistics: To analyze the variables' mean, median, and volatility.
2. Unit Root Test (Augmented Dickey-Fuller): This test determines whether time series data is stationary in order to prevent spurious regression.
3. The Johansen Method Co-integration Test: To determine whether there is a long-term relationship between variables.
4. Regression: Independent (predictor) parameters and a dependent (final result) variable can have their value, normal direction, and mathematical association estimated using regression results. They are essentially used for modeling, trend forecasting, and determining which variables have a significant impact on an outcome while accounting for confounding variables.

4. Discussion of Results

The study examined a critical analysis of SME finance and its impact on growth and sustainable development in Nigeria. Using the following data, the study looked at how financing SMEs affected growth and sustainable development in Nigeria - Real Gross Domestic Product (RGDP), Employment Generation (EGN), Bank Loans (BKL), Credit to SMEs (CSME), Lending Rate (LRT), Inflation Rate (INF) (Control Variable) from 1992 to 2025.

Table 1: Descriptive Statistics of the Variable (1992-2025)

	RGDP	EGN	BKL	CSME	INF	LRT
Mean	2.021932	1.625284	4.423545	6.373277	1.181320	0.031298
Median	2.457144	1.628359	4.361515	6.935440	1.128648	-0.387216
Maximum	2.759048	1.690196	4.955093	7.036289	1.862131	1.432007
Minimum	0.255273	1.556303	4.130726	4.877694	0.732394	-0.823909
Std. Dev.	0.863513	0.044472	0.252191	0.748642	0.275888	0.858993
Skewness	-1.171931	-0.064803	0.369401	-0.671137	0.871381	0.328751
Kurtosis	2.741410	1.555231	1.817802	1.868675	3.231735	1.372246
Jarque-Bera	7.877452	2.980888	2.753179	4.365596	4.378808	4.366017
Probability	0.019473	0.225273	0.252438	0.112726	0.111983	0.112702
Sum	68.74567	55.25965	150.4005	216.6914	40.16487	1.064124
Sum Sq. Dev.	24.60663	0.065267	2.098818	18.49532	2.511768	24.34968
Observations	34	34	34	34	34	34

Source: E-View (10) Version Output, 2026

Table 1 shows the descriptive statistics that include: the mean, median, maximum, minimum, standard deviation, skew, kurtosis, and Jarque-Bra value of the variables. The average values for RGDP, EGN, BKL, CSME, INF and LRT are; 2.021932, 1.625284, 4.423545, 6.373277, 1.181320, and 0.031298, respectively while RGDP, EGN, BKL, CSME, INF and LRT have the minimum values of 0.255273, 1.556303, 4.130726, 4.877694, 0.732394, and -0.823909, respectively. The Table also contains; 2.759048, 1.690196, 4.955093, 7.036289, 1.862131, and 1.432007 as maximum values for RGDP, EGN, BKL, CSME, INF and LRT, respectively.

Kurtosis also determines how light- or heavy-tailed the dataset is in comparison to a normal distribution. Since the INF value is close to three (3), the distribution is called mesokurtic meaning that neither the tails are excessively heavy nor light compared to a normal distribution. The RGDP, EGN, BKL, CSME, and LRT distributions, on the other hand, are platykurtic as their kurtosis is less than three (3). The kurtosis values are much less than three (3) which implies that the data set contains much less values. In such circumstances the dispersion of the tail will be lesser and less fat.

The Jargue-Bera (J-B) statistics show that the variables EGN, BKL, CSME, INF and LRT are normally distributed whiles the J-B statistics for the variable RGDP is non-normally distributed.

4.1. Unit Root Test for Stationarity

The use of the Augmented Dickey Fuller (ADF) test was applied. The null hypothesis states that the process which created the time series is non-stationary. This will be compared to the alternative that the time series information of the lending rate is stationary. When the null hypothesis is rejected then the series is stationary, i.e. it is an integrated series of order zero. Nonetheless, the series is non-stationary; it is integrated to a higher order and needs to be differenced up to a point when it becomes stationary.

At level and first difference, RGDP, EGN, BKL, CSME, INF and LRT were not stationary. However, at the second difference, all the variables, RGDP, EGN, BKL, CSME, INF and LRT were stationary since their Augmented Dickey-Fuller Test Statistics. Thus, the series are stationary and integrated of order two, I (II).

Table 2: Unit Root Test (Variable in the Second Level)

Variable	1%	5%	10%	ADF	Order of integration
RGDP	-3.670170	-2.963972	-2.621007	-9.167655	I (II)
EGN	-3.670170	-2.963972	-2.621007	-8.340001	I (II)
BKL	-3.679322	-2.967767	-2.622989	-13.14196	I (II)
CSME	-3.679322	-2.967767	-2.622989	-6.182707	I (II)
LRT	-3.679322	-2.967767	-2.622989	-10.82236	I (II)
INF	-3.679322	-2.967767	-2.622989	-4.475243	I (II)

Source: E-View (10) Version Output, 2026

Table 2 displays the unit root results for the following six variables: RGDP, EGN, BKL, CSME, INF and LRT. The variable's stationary status at I(11) was shown in Table 2. It was demonstrated that all the variables were stationary at the 5% level of significance; RGDP, EGN, BKL, CSME, INF and

LRT are following the second difference. Due to the variables' mixed order of integration (I(0); I(1); I(11)). Therefore, this study's use of ARDL is justified.

4.2. ARDL Error Correction Regression

Table 3: ARDL Error Correction Regression

Dependent Variable: RGDP				
Variable	Coefficient	Std.	t-Statistic	Prob.
	Std.	Error		
RGDP(-1)	0.460835	0.153914	2.994116	0.0097
RGDP(-2)	-0.619521	0.180487	-3.432499	0.0040
RGDP(-3)	0.645503	0.176866	3.649661	0.0026
RGDP(-4)	-1.484428	0.252722	-5.873760	0.0000
BKL	8.895419	1.611468	5.520073	0.0001
BKL(-1)	-8.748552	1.993462	-4.388623	0.0006
BKL(-2)	5.983182	1.278279	4.680653	0.0004
CSME	-1.421764	0.387803	-3.666200	0.0025
CSME(-1)	-1.855259	0.437839	-4.237309	0.0008
CSME(-2)	-1.070669	0.332914	-3.216056	0.0062
CSME(-3)	-1.144350	0.279660	-4.091939	0.0011
CSME(-4)	0.919770	0.254243	3.617683	0.0028
LRT	-9.040768	1.639475	-5.514429	0.0001
LRT(-1)	8.039909	1.806344	4.450930	0.0005
LRT(-2)	-6.107599	1.319342	-4.629278	0.0004
C	5.987315	4.667135	1.282867	0.2204
R-squared = 0.972546 Adjusted R-squared = 0.943130 DW = 3.030114				

Source: E-View (10) Version Output, 2026

Table 3 shows the short run analysis of the critical analysis of SME finance (BKL, CSME, and LRT) and its impact on growth (RGDP) in Nigeria. The results show that majority of the variables have negative significant impact on growth and sustainable development while other variables reveal positive significant impact on growth and sustainable development.

That is, it has been found out that BKL positively and significantly impact on growth (RGDP) with an average 8.895419 percent increase in RGDP with the increase of BKL by about 1 percent, other things being unchanged. But, CSME and LRT have negative significant effects on growth, an average increase in CSME and LRT of about 1% will result into 142% and 904% decrease in CSME and LRT, respectively, other factors being constant.

The ECM analysis indicates that the significant value is negative indicating the rate at which the system recovers itself to the long-run equilibrium point. About 93% of disequilibrium persists from the previous period until the subsequent periods achieve equilibrium. The DW value of 3.030114 shows that the model does not have any autocorrelation as this value is greater than 2.5. The explanatory variables in this study explain 97% of the total variability found in the RGDP variable.

The 0.972546 values portray that there is a strong positive relationship between the dependent variable and explanatory variables. It was found that 3% of the variation in the dependent variable (RGDP)

could be estimated based on the variables used in the model but unexplained residuals. Thus, the model is a good fit.

Table 4: ARDL Error Correction Regression

Dependent Variable: EGN				
Variable	Coefficient Std.	Std. Error	t-Statistic	Prob.
EGN(-1)	0.247166	0.174749	1.414401	0.1701
EGN(-2)	0.437255	0.160712	2.720741	0.0119
EGN(-3)	0.189069	0.169912	1.112745	0.2768
BKL	0.006197	0.007329	0.845643	0.4061
CSME	0.011967	0.006205	1.928589	0.0657
LRT	0.001224	0.006806	0.179843	0.8588
C	0.108055	0.073926	1.461663	0.1568
R-squared = 0.991653 Adjusted R-squared = 0.989566 DW = 2.042078				

Source: E-View (10) Version Output, 2026

Table 4 shows the short run analysis of the critical analysis of SME finance (BKL, CSME, and LRT) and its impact on sustainable development (EGN) in Nigeria. The results show that BKL, CSME, and LRT have positive insignificant impact on sustainable development. That is, it has been found out that BKL, CSME, and LRT positively impact on sustainable development (EGN) in Nigeria with an average 0.006197, 0.011967 and 0.001224 percent increase in EGN with the increase of BKL, CSME, and LRT by about 1 percent, other things being unchanged.

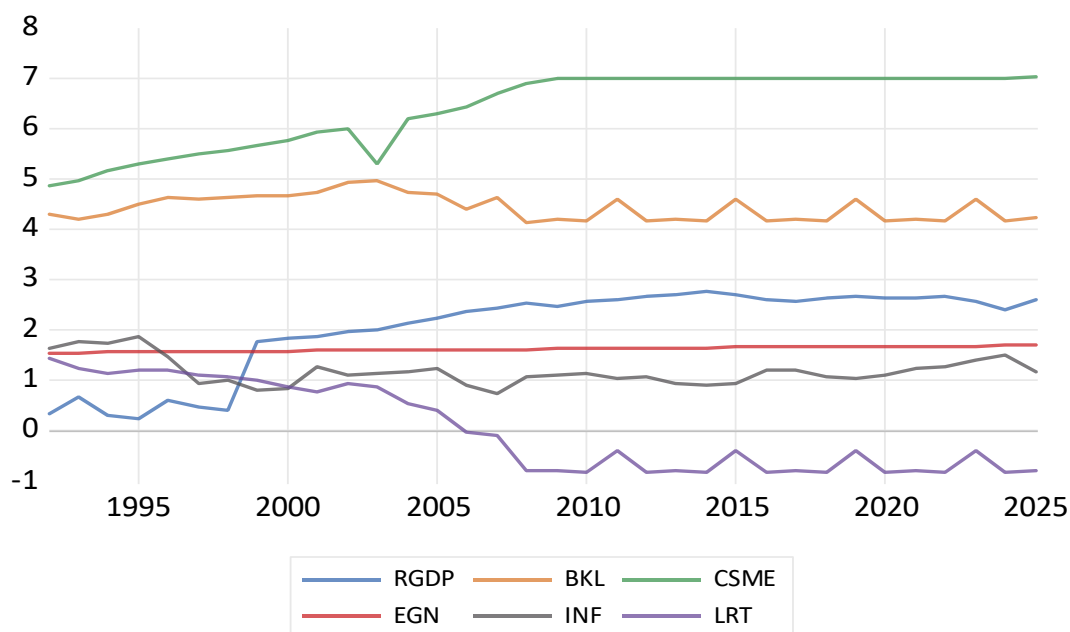
About 99% of disequilibrium persists from the previous period until the subsequent periods achieve equilibrium. The DW value of 2.042078 shows that the model does not have any autocorrelation as this value is closer to 2. The explanatory variables in this study explain 99% of the total variability found in the EGN variable.

The 0.991653 values portray that there is a strong positive relationship between the dependent variable and explanatory variables. It was found that 1% of the variation in the dependent variable (EGN) could be estimated based on the variables used in the model but unexplained residuals. Thus, the model is a good fit.

4.3. Graphical Presentation of the Parameters.

A graphical representation of the time series was used to evaluate the stationarity of the time series used in the study as shown in Figure 2 below. The indications were discovered to be trending, with variable volatility, which implied that the variable was not fixed. To determine whether the time series used in the study was stationary, a graphical representation of the time series was used as demonstrated in Figure 2 below. The indicators tended to be volatile in varying degrees, which indicated the non-stationarity of the variable.

Figure 2: Graphical Representation of the Parameters



Source: E-View (10) Version Output, 2026

4.4. Test of Hypotheses

Hypothesis testing is achieved through stating a null hypothesis (no effect, H_0), non-directional hypothesis (alternative, H_a), and comparing the p-value with some set level of significance (usually, 0.05).

Table 5: Regression Analysis displaying the variables' Relationship

Dependent Variable: RGDP					
Variable	Coefficient	Std.	Std. Error	t-Statistic	Prob.
BKL	1.642899		0.423488	3.879447	0.0006
CSME	-0.256016		0.407786	-0.627820	0.5350
INF	-0.305344		0.227791	-1.340458	0.1905
LRT	-1.367416		0.407017	-3.359606	0.0722
C	-3.210338		2.013999	-1.594011	0.1218
R-squared = 0.903731 Adjusted R-squared = 0.890452 DW = 1.102293					

Source: E-View (10) Version Output, 2026

Table 5 results show that BKL ($t = 3.879447$ $p = 0.0006 < 0.05$) has a positive effect on economic growth (RGDP) at a significant level (5 per cent). These data showed that t-statistics value does not exceed 5% ($p < 0.05$) in value. This shows that CSME and LRT ($t = -0.627820$ $p = 0.5350 > 0.05$) and ($t = -3.359606$ $p = 0.0722 > 0.05$) had a negative impact on GDP during the period that it was taken into account. In the same way, the R-SQ value and modified R represents the extent to which the impact of the independent variables can explain the data. By this we can say that the variables employed in the model explained a variance of about 0.903731 or 90 percent of the variation in the dependent variables. This was seen to be sufficiently high to decide the statistical significance of the

coefficient of determination. The F-statistic is also significant at the 5 percent level ($p=0.00$) therefore, it means that the model has been selected very well to perform the estimation. Moreover, the model is also convincing as the value of Durbin-Watson, 1.102293, means that there is no autocorrelation.

Table 6: Regression Analysis displaying the variables' Relationship

Dependent Variable: EGN					
Variable	Coefficient	Std.	Error	t-Statistic	Prob.
BKL	0.041181		0.022180	1.856679	0.0735
CSME	0.019771		0.021358	0.925727	0.3622
INF	0.033657		0.011930	2.821063	0.0085
LRT	-0.042510		0.021317	-1.994129	0.0556
C	1.278680		0.105482	12.12220	0.0000
R-squared = 0.900440 Adjusted R-squared = 0.886707 DW = 0.481044					

Source: E-View (10) Version Output, 2026

Table 6 results show that BKL and CSME ($t = 1.856679$ $p = 0.0735 > 0.05$) and ($t = 0.925727$ $p = 0.3622 > 0.05$) have a positive effect on Employment Generation (EGN) at an insignificant level (5 per cent). These data showed that t-statistics value exceeds 5% ($p < 0.05$) in value. This shows that BKL and CSME had a positive impact on EGN during the period that it was taken into account. The Table also demonstrated that LRT ($t = -1.994129$ $p = 0.0556 > 0.05$) has a negative insignificant impact on EGN. In the same way, the R-SQ value and modified R represents the extent to which the impact of the independent variables can explain the data. By this we can say that the variables employed in the model explained a variance of about 0.900440 or 90 percent of the variation in the dependent variables. This was seen to be sufficiently high to decide the statistical significance of the coefficient of determination. The F-statistic is also significant at the 5 percent level ($p=0.00$) therefore, it means that the model has been selected very well to perform the estimation. Moreover, the model is also convincing as the value of Durbin-Watson, 0.481044, means that there is no autocorrelation.

4.4.1. Restatement of Hypotheses in Null and Alternate forms:

- i. H_01 : There is no positive significant influence of deposits money bank loans on SMEs growth and sustainable development in Nigeria.
 H_{11} : Deposit money bank loans highly positively influence SMEs growth and sustainable development in Nigeria.
- ii. H_02 : Credits to SME do not impact positively on the growth of SMEs growth and sustainable development in Nigeria.
 H_{12} : Credits to SME have a positive effect on growth of SMEs growth and sustainable development in Nigeria.
- iii. H_03 : There is a negative effect of average deposit money bank lending rate on growth and sustainable development of SMEs in Nigeria.
 H_{13} : Average deposit money bank lending rate has a positive impact on the growth and sustainable development of SMEs in Nigeria.

4.4.2. Analysis and Interpretation of Regression Result

$$\text{LOGEGN} = \beta_0 + \beta_1\text{LOGBKL} + \beta_2\text{LOGCSME} + \beta_3\text{LOGLRT} + \beta_4\text{LOGINF} + \mu_t$$

The implication of this is that 1 percent increase in deposits money bank loans to SMEs will lead to 387.9447 percent increase in RGDP; while 1 percent increase in deposits money bank loans will lead to an increase in Employment Generation by 185.6679 percent. The multiple correlation co-efficient (R) of 0.903731 and 0.900440 show that there is a strong positive linear correlation between the independent variables and the dependent variables because the value is near to 1. Although the coefficient of determination (R²) of 0.890452 and 0.886707 implies that the variations in the independent variables can explain up to 89.04 and 88.67 percent of the variance in the dependent variable RGDP and EGN. This value enhances the goodness of fit of the model and due to the high value of 89.04 and 88.67 percent; this model is a good fit. Also, since the p-value (=0.000) is less than α (=0.05), the decision is to reject the null hypothesis. This means that the dependent variable RGDP and EGN is highly related to the three independent variables.

The Decision Rule: If the P-value is not significant, accept the null hypothesis (H_0); if it is, reject the null hypothesis.

H₁₁: Deposit money bank loans highly positively influence SMEs growth and sustainable development in Nigeria.

H₁₂: Credits to SME have a positive effect on growth of SMEs growth and negative effect on sustainable development in Nigeria.

H₀₃: There is a negative effect of average deposit money bank lending rate on growth and sustainable development of SMEs in Nigeria.

4.5. Discussion of Findings

Deposit money bank loans highly positively influence SMEs growth and sustainable development in Nigeria. Between 1992 and 2025, the study indicated that there were inconsistent effects on growth and sustainable development, especially on employment generation. The deposit money bank loan was discovered to have a positive short-term impact. The study is in line with Olowookere et al. (2021) who concluded that there is a positive and significant correlation between DMBs loans to SMEs and GDP growth rate. According to Schumpeterian Theory, bank loans greatly accelerate the growth and sustainable development of Nigerian SMEs by facilitating advances in technology, business growth, and higher levels of productivity. SMEs are a major force behind diversifying the economy, employment generation, and alleviating poverty in Nigeria because they are able to embrace new technologies and become more competitive when they have access to credit. As long as interest rates stay reasonable, bank lending—which is supported by credit allocation theory—acts as a vital financial intermediary, boosting the productive potential of SMEs and promoting GDP growth. Banks, which are based on Financial Intermediation Theory, act as a bridge between surplus alongside deficit units, and greater access to credit greatly improves GDP and SME performance.

Credits to SME have a positive effect on growth of SMEs growth and negative effect on sustainable development in Nigeria. In Nigeria, credit to SMEs typically stimulates SME growth by increasing funding, creativity, and output capacity. The study is in line with Okolo et al. (2023) findings from the econometric analysis showing that SMEs' activities are a significant and positive predictor of

environmental pollution in the EU. However, these loans frequently have a complicated or detrimental impact on long-term sustainable development, which is often hampered by high rates of interest, rising inflation, and insufficient infrastructure support. While expanding access to financing increases employment and output, it does frequently result in long-term, sustainable development or the eradication of poverty. According to Schumpeterian as well as financial intermediation theories, bank credit in Nigeria promotes SME growth by means of inventiveness and capacity development. However, environmental externalities and high interest rates frequently impede sustainable development.

There is a negative effect of average deposit money bank lending rate on growth and sustainable development of SMEs in Nigeria. In Nigeria, high lending rates at deposit money banks have a big negative effect on SMEs because they raise the cost of capital, which makes it harder for them to innovate, grow, and stay in business. According to financial intermediation theory, high costs slow down the flow of funds. In accordance to Schumpeterian innovation, high financing costs stop entrepreneurs from doing business.

5. Summary Recommendations and Conclusion

Nigeria heavily depends on SMEs to achieve sustainable development, as they provide significant employment opportunities and can alleviate poverty. But, the access to low-cost finance, high interest rates, and bad infrastructure severely limit growth. The availability of better credit, lower interest rates and better management capability are the essential factors to maximize their impact on the economy.

5.1. Summary

The main aim of the study was to critically analyze SME finance and its impact on growth and sustainable development in Nigeria. In accordance with the data analysis provided, the following findings can be summarized:

- Deposit money bank loans highly positively influence SMEs growth and sustainable development in Nigeria. Access to finance is a major contributor to the efficiency of operations and innovation of SMEs that directly affect growth in the GDP. Finance is a very important trigger to SMEs as it is a key driver of efficiency and innovation in operations which directly contributes to GDP growth. Through the elimination of capital constraints, the SMEs can invest in new technologies, infrastructural upgrades, and efficiency, which in the long run will lead to employment and economic development.
- In Nigeria, credits to SME have both positive and negative impacts on sustainable development and growth of SMEs. With access to credit, it is possible to expand research and create more jobs, which are important in sustainable development. The availability of credit is a critical driver to economic growth, as it allows businesses, especially SMEs, to rise above the subsistence stage and achieve long-term sustainable growth. Credit enables firms to invest in new technology, increase their operations, and venture into new markets, by relieving capital constraints.
- The average deposit money bank lending rate has a negative impact on growth and sustainable development of SMEs in Nigeria. The presence of high deposit money bank (DMB) lending

rates in Nigeria has a severe, long-term, and negative effect on growth, productivity and sustainable development of SMEs. The interest rate causes a decline in the profitability of SMEs and discourages investments, and research has shown that lending rates may decrease SMEs contribution to GDP.

5.2. Recommendations

To help improve the efficacy of SME financing in Nigeria, some policy measures are suggested based on the results. To begin with, the monetary authorities have to make sure that commercial banks operate under the regulations to the letter. The government must focus more on establishing a favorable business climate rather than giving out grants and aid, which in most cases do not reach its target beneficiaries. Interest rates should also be kept down to the single digits by the Central Bank of Nigeria (CBN) and in this case, on SME initiatives. Moreover, the CBN is also urged to liaise with institutions to provide interest-free loans and offer them funds with reduced rates to increase their lending ability. SMEs should be given priority in lending by commercial banks to enhance inclusive development. Also, lowering the lending rates to single-digits is essential in creating jobs, reducing poverty and ensuring sustainability of the economy in the long run. Finally, the entire procedure of credit disbursement and credit recovery should be carried out with strict compliance with the operational principles to avoid favoritism and hold accountable.

5.3. Conclusion

Financing of SMEs is a condition that is needed, but not a sufficient one to develop the economy in Nigeria. Credit enhances short term business but long term growth and sustainability demand a stable and enabling environment-development of infrastructure and reduced cost of funds- so that SMEs can run smoothly, create employment and enable sustainable growth. This paper evaluated the effects of external financing systems on sustainable development of SMEs in Nigeria. Results showed that microfinance credit and low lending rates can play a critical role in alleviating poverty leading to sustainable development in the long run. On the other hand, credit by commercial banks to SMEs did not show a significant positive impact on development, probably because of high interest rates and inflexible loan terms. The SME credit scheme (SCS) and interest rates became important determinants of the development outcomes and this meant that well-regulated and structured financial aid can bring about significant economic growth when well implemented.

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Appendices

YEAR	LOGRGDP	LOGEGN	LOGBKL	LOGCSME	LOGLRT	LOG INF
1992	0.340444	1.556303	4.309630	4.877694	1.432007	1.649335
1993	0.662757	1.556303	4.189291	4.948516	1.240799	1.757396
1994	0.301029	1.568201	4.312865	5.156900	1.155943	1.755875
1995	0.255273	1.568201	4.510203	5.309823	1.200303	1.862131
1996	0.623249	1.568201	4.626362	5.406289	1.220108	1.466868
1997	0.462398	1.568201	4.611131	5.493261	1.117934	0.929419
1998	0.414973	1.579784	4.625937	5.564126	1.061829	1
1999	1.771955	1.579784	4.670469	5.652299	1.018284	0.819544
2000	1.839918	1.579784	4.648773	5.769377	0.879669	0.838849
2001	1.866642	1.591065	4.719567	5.926593	0.793092	1.276462
2002	1.977952	1.591065	4.915761	5.977031	0.938519	1.110589
2003	2.020113	1.591065	4.955093	5.307922	0.874482	1.146128
2004	2.132772	1.602059	4.740214	6.181627	0.558709	1.176091
2005	2.244698	1.602059	4.704773	6.299103	0.404834	1.252853
2006	2.377397	1.612784	4.410165	6.416522	-0.004365	0.913814
2007	2.444451	1.623249	4.613846	6.683109	-0.070581	0.732394
2008	2.530814	1.623249	4.130726	6.892061	-0.769551	1.064458
2009	2.469837	1.633468	4.213956	6.985331	-0.769551	1.096910
2010	2.564654	1.633468	4.154104	6.981000	-0.823909	1.136721
2011	2.617493	1.643453	4.583439	6.978818	-0.387216	1.033424
2012	2.666489	1.643453	4.167316	7.003073	-0.823909	1.086359
2013	2.716104	1.653213	4.213956	6.985331	-0.769551	0.929419
2014	2.759048	1.653213	4.154104	6.981000	-0.823909	0.903089
2015	2.692873	1.662758	4.583439	6.978818	-0.387216	0.954243
2016	2.607079	1.662758	4.167316	7.003073	-0.823909	1.195899
2017	2.574899	1.672098	4.213956	6.985331	-0.769551	1.217484
2018	2.625045	1.672098	4.154104	6.981000	-0.823909	1.082785
2019	2.676255	1.681241	4.583439	6.978818	-0.387216	1.056905
2020	2.635685	1.672098	4.167316	7.003073	-0.823909	1.120574
2021	2.644271	1.672098	4.213956	6.985331	-0.769551	1.230449
2022	2.678882	1.681241	4.154104	6.981000	-0.823909	1.274158
2023	2.560922	1.681241	4.583439	6.978818	-0.387216	1.392697
2024	2.401590	1.690196	4.167316	7.003073	-0.823909	1.521138
2025	2.587710	1.690196	4.230448	7.036289	-0.769551	1.180413

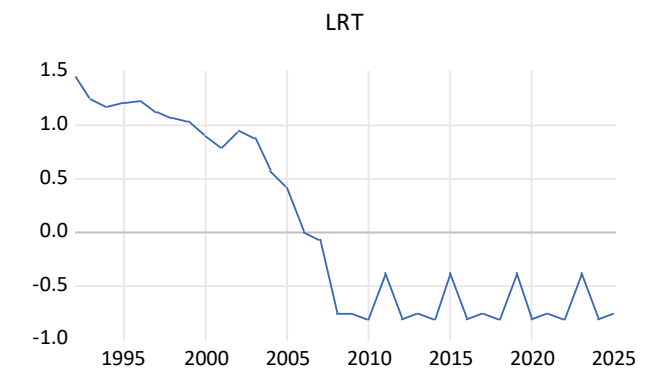
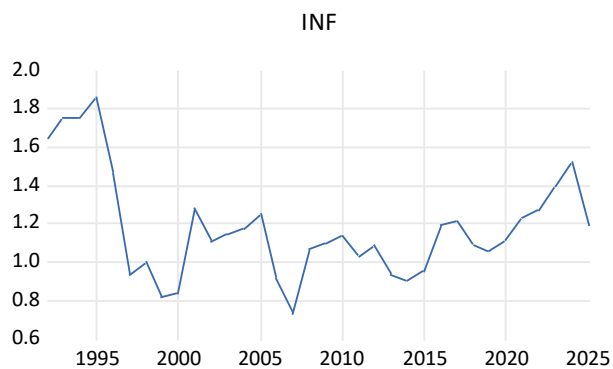
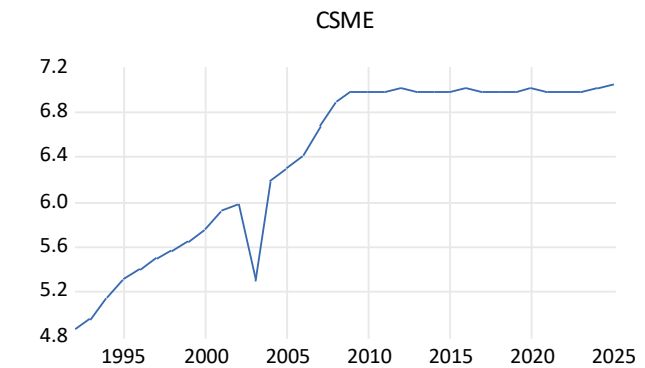
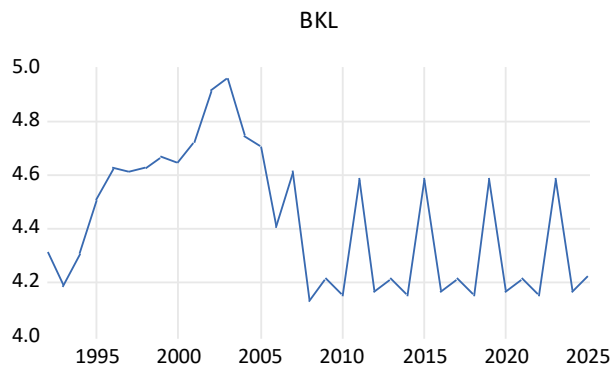
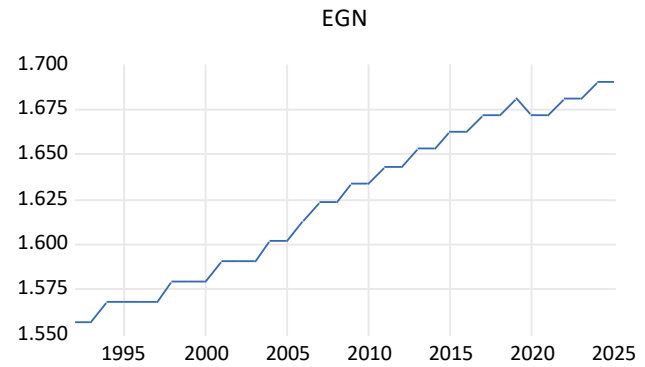
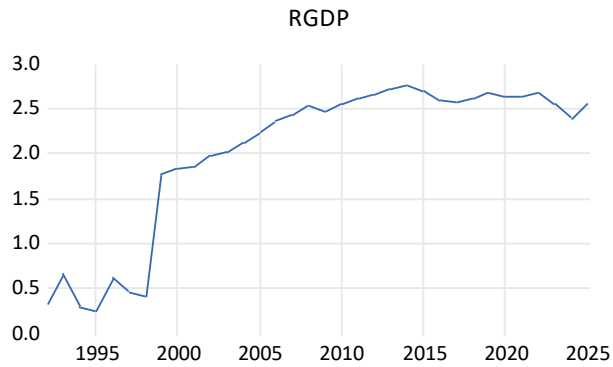
	RGDP	EGN	BKL	CSME	INF	LRT
Mean	2.021932	1.625284	4.423545	6.373277	1.181320	0.031298
Median	2.457144	1.628359	4.361515	6.935440	1.128648	-0.387216
Maximum	2.759048	1.690196	4.955093	7.036289	1.862131	1.432007
Minimum	0.255273	1.556303	4.130726	4.877694	0.732394	-0.823909
Std. Dev.	0.863513	0.044472	0.252191	0.748642	0.275888	0.858993
Skewness	-1.171931	-0.064803	0.369401	-0.671137	0.871381	0.328751
Kurtosis	2.741410	1.555231	1.817802	1.868675	3.231735	1.372246
Jarque-Bera	7.877452	2.980888	2.753179	4.365596	4.378808	4.366017
Probability	0.019473	0.225273	0.252438	0.112726	0.111983	0.112702
Sum	68.74567	55.25965	150.4005	216.6914	40.16487	1.064124
Sum Sq. Dev.	24.60663	0.065267	2.098818	18.49532	2.511768	24.34968
Observations	34	34	34	34	34	34

Dependent Variable: RGDP
Method: Least Squares
Date: 04/12/26 Time: 07:09
Sample: 1992 2025
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BKL	1.642899	0.423488	3.879447	0.0006
CSME	-0.256016	0.407786	-0.627820	0.5350
INF	-0.305344	0.227791	-1.340458	0.1905
LRT	-1.367416	0.407017	-3.359606	0.0722
C	-3.210338	2.013999	-1.594011	0.1218
R-squared	0.903731	Mean dependent var		2.021932
Adjusted R-squared	0.890452	S.D. dependent var		0.863513
S.E. of regression	0.285806	Akaike info criterion		0.468044
Sum squared resid	2.368862	Schwarz criterion		0.692509
Log likelihood	-2.956744	Hannan-Quinn criter.		0.544593
F-statistic	68.05960	Durbin-Watson stat		1.102293
Prob(F-statistic)	0.000000			

Dependent Variable: EGN
Method: Least Squares
Date: 04/12/26 Time: 07:11
Sample: 1992 2025
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BKL	0.041181	0.022180	1.856679	0.0735
CSME	0.019771	0.021358	0.925727	0.3622
INF	0.033657	0.011930	2.821063	0.0085
LRT	-0.042510	0.021317	-1.994129	0.0556
C	1.278680	0.105482	12.12220	0.0000
R-squared	0.900440	Mean dependent var		1.625284
Adjusted R-squared	0.886707	S.D. dependent var		0.044472
S.E. of regression	0.014969	Akaike info criterion		-5.430622
Sum squared resid	0.006498	Schwarz criterion		-5.206157
Log likelihood	97.32057	Hannan-Quinn criter.		-5.354073
F-statistic	65.57016	Durbin-Watson stat		0.481044
Prob(F-statistic)	0.000000			



Null Hypothesis: D(BKL,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.14196	0.0000
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BKL,3)
Method: Least Squares
Date: 04/12/26 Time: 07:16

Sample (adjusted): 1997 2025
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BKL(-1),2)	-3.732788	0.284036	-13.14196	0.0000
D(BKL(-1),3)	1.770933	0.222217	7.969372	0.0000
D(BKL(-2),3)	0.914702	0.106451	8.592715	0.0000
C	-0.011240	0.028527	-0.394005	0.6969
R-squared	0.972040	Mean dependent var		0.019325
Adjusted R-squared	0.968684	S.D. dependent var		0.866549
S.E. of regression	0.153347	Akaike info criterion		-0.784790
Sum squared resid	0.587880	Schwarz criterion		-0.596197
Log likelihood	15.37945	Hannan-Quinn criter.		-0.725725
F-statistic	289.7064	Durbin-Watson stat		1.944198
Prob(F-statistic)	0.000000			

Null Hypothesis: D(CSME,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.182707	0.0000
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CSME,3)
Method: Least Squares
Date: 04/12/26 Time: 07:17
Sample (adjusted): 1997 2025
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CSME(-1),2)	-3.351201	0.542028	-6.182707	0.0000
D(CSME(-1),3)	1.219583	0.395789	3.081395	0.0050
D(CSME(-2),3)	0.358762	0.186171	1.927059	0.0654
C	-0.014382	0.043719	-0.328962	0.7449
R-squared	0.879788	Mean dependent var		0.002256
Adjusted R-squared	0.865363	S.D. dependent var		0.640346
S.E. of regression	0.234962	Akaike info criterion		0.068653
Sum squared resid	1.380174	Schwarz criterion		0.257245
Log likelihood	3.004537	Hannan-Quinn criter.		0.127717
F-statistic	60.98891	Durbin-Watson stat		2.142525
Prob(F-statistic)	0.000000			

Null Hypothesis: D(EGN,2) has a unit root

Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.340001	0.0000
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EGN,3)
Method: Least Squares
Date: 04/12/26 Time: 07:17
Sample (adjusted): 1996 2025
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EGN(-1),2)	-2.577928	0.309104	-8.340001	0.0000
D(EGN(-1),3)	0.490340	0.164980	2.972116	0.0062
C	-0.000107	0.001097	-0.097257	0.9232
R-squared	0.899589	Mean dependent var		9.81E-05
Adjusted R-squared	0.892152	S.D. dependent var		0.018294
S.E. of regression	0.006008	Akaike info criterion		-7.296835
Sum squared resid	0.000975	Schwarz criterion		-7.156715
Log likelihood	112.4525	Hannan-Quinn criter.		-7.252010
F-statistic	120.9479	Durbin-Watson stat		2.323103
Prob(F-statistic)	0.000000			

Null Hypothesis: D(INF,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.475243	0.0014
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,3)
Method: Least Squares
Date: 04/12/26 Time: 07:18
Sample (adjusted): 1997 2025
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
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D(INF(-1),2)	-2.153842	0.481279	-4.475243	0.0001
D(INF(-1),3)	0.592801	0.347839	1.704241	0.1007
D(INF(-2),3)	0.090183	0.194916	0.462677	0.6476
C	0.004191	0.044608	0.093942	0.9259
R-squared	0.748415	Mean dependent var	0.001116	
Adjusted R-squared	0.718225	S.D. dependent var	0.452470	
S.E. of regression	0.240182	Akaike info criterion	0.112604	
Sum squared resid	1.442187	Schwarz criterion	0.301197	
Log likelihood	2.367241	Hannan-Quinn criter.	0.171669	
F-statistic	24.79000	Durbin-Watson stat	2.065630	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(RGDP,2) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.167655	0.0000
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RGDP,3)

Method: Least Squares

Date: 04/12/26 Time: 07:18

Sample (adjusted): 1996 2025

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1),2)	-2.304627	0.251387	-9.167655	0.0000
D(RGDP(-1),3)	0.606485	0.144358	4.201264	0.0003
C	0.003539	0.051816	0.068292	0.9461
R-squared	0.823174	Mean dependent var		0.000983
Adjusted R-squared	0.810076	S.D. dependent var		0.650789
S.E. of regression	0.283616	Akaike info criterion		0.412245
Sum squared resid	2.171821	Schwarz criterion		0.552365
Log likelihood	-3.183682	Hannan-Quinn criter.		0.457071
F-statistic	62.84637	Durbin-Watson stat		2.137302
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LRT,2) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.82236	0.0000
Test critical values: 1% level	-3.679322	

5% level -2.967767
10% level -2.622989

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LRT,3)

Method: Least Squares

Date: 04/13/26 Time: 02:48

Sample (adjusted): 1997 2025

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LRT(-1),2)	-3.462217	0.319913	-10.82236	0.0000
D(LRT(-1),3)	1.596506	0.252273	6.328473	0.0000
D(LRT(-2),3)	0.869435	0.124633	6.975977	0.0000
C	0.004010	0.035960	0.111507	0.9121
R-squared	0.956906	Mean dependent var		0.017780
Adjusted R-squared	0.951735	S.D. dependent var		0.879072
S.E. of regression	0.193126	Akaike info criterion		-0.323502
Sum squared resid	0.932445	Schwarz criterion		-0.134909
Log likelihood	8.690779	Hannan-Quinn criter.		-0.264437
F-statistic	185.0425	Durbin-Watson stat		1.542640
Prob(F-statistic)	0.000000			

Date: 04/12/26 Time: 07:19

Sample: 1992 2025

Included observations: 34

Lags interval (in first differences): 1 to 1

Endogenous variables: RGDP EGN BKL CSME INF LRT

Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.

Unrestricted
Cointegration
Rank Test
(Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.860576	174.9953	95.75366	0.0000
At most 1 *	0.794376	111.9478	69.81889	0.0000
At most 2 *	0.573310	61.33324	47.85613	0.0017
At most 3 *	0.420072	34.07891	29.79707	0.0151
At most 4 *	0.311734	16.64365	15.49471	0.0334
At most 5 *	0.136304	4.689084	3.841465	0.0303

Trace test indicates 6 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted
Cointegration
Rank Test (Max-
eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.860576	63.04749	40.07757	0.0000
At most 1 *	0.794376	50.61455	33.87687	0.0002
At most 2	0.573310	27.25433	27.58434	0.0550
At most 3	0.420072	17.43526	21.13162	0.1524
At most 4	0.311734	11.95457	14.26460	0.1124
At most 5 *	0.136304	4.689084	3.841465	0.0303

Max-eigenvalue test indicates 2 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b*S11*b=I):

RGDP	EGN	BKL	CSME	INF	LRT
-2.020705	23.75547	6.090542	-8.049302	-5.409559	-8.314116
3.631157	26.55765	-6.903505	-5.265450	-1.710348	1.463622
-1.602719	22.48261	9.275616	-9.220535	1.695699	-9.962861
0.331734	4.042411	3.541722	-2.105511	2.133471	-3.818799
0.704983	59.61471	-1.273319	2.634838	-0.483302	6.064393
-1.087171	49.89755	-6.753970	3.070475	-1.499666	4.761680

Unrestricted Adjustment Coefficients (alpha):

D(RGDP)	0.092074	-0.136328	0.008886	-0.108071	0.015975	0.002331
D(EGN)	7.95E-05	0.001203	-0.000946	-0.000476	-0.001054	-0.001209
D(BKL)	-0.031272	0.054738	0.006013	-0.069004	-0.074654	0.036052
D(CSME)	0.054114	0.041253	0.086196	0.006239	-0.003403	-0.033250
D(INF)	0.103427	0.110228	-0.060376	0.022514	0.022053	0.003206
D(LRT)	-0.018208	0.035196	0.006755	-0.053948	-0.085807	0.044064

1 Cointegrating Equation

Log-Likelihood: 246.2938

Normalized cointegrating coefficients (standard error in parentheses)

RGDP	EGN	BKL	CSME	INF	LRT
1.000000	-11.75603	-3.014068	3.983412	2.677065	4.114462
	(3.59903)	(0.47852)	(0.56625)	(0.26149)	(0.55291)

Adjustment coefficients (standard error in parentheses)

D(RGDP)	-0.186054
	(0.09547)
D(EGN)	-0.000161
	(0.00176)
D(BKL)	0.063191
	(0.08528)
D(CSME)	-0.109348
	(0.06366)
D(INF)	-0.208996

	(0.06680)
D(LRT)	0.036793
	(0.08893)

2 Cointegrating Equations
Log-Likelihood: 271.6011

Normalized cointegrating coefficients (standard error in parentheses)

RGDP	EGN	BKL	CSME	INF	LRT
1.000000	0.000000	-2.328008	0.633820	0.736359	1.826495
		(0.27626)	(0.32859)	(0.14131)	(0.32249)
0.000000	1.000000	0.058358	-0.284925	-0.165082	-0.194621
		(0.03060)	(0.03639)	(0.01565)	(0.03571)

Adjustment coefficients (standard error in parentheses)

D(RGDP)	-0.681083	-1.433303
	(0.16207)	(1.38965)
D(EGN)	0.004206	0.033823
	(0.00355)	(0.03043)
D(BKL)	0.261953	0.710833
	(0.17275)	(1.48123)
D(CSME)	0.040450	2.381098
	(0.12886)	(1.10489)
D(INF)	0.191258	5.384352
	(0.10281)	(0.88156)
D(LRT)	0.164596	0.502181
	(0.18431)	(1.58040)

3 Cointegrating Equations
Log-Likelihood: 285.2283

Normalized cointegrating coefficients (standard error in parentheses)

RGDP	EGN	BKL	CSME	INF	LRT
1.000000	0.000000	0.000000	-0.355610	4.359664	0.363432
			(1.07871)	(0.67565)	(0.89795)
0.000000	1.000000	0.000000	-0.260123	-0.255910	-0.157945
			(0.04086)	(0.02559)	(0.03401)
0.000000	0.000000	1.000000	-0.425012	1.556397	-0.628462
			(0.43125)	(0.27011)	(0.35898)

Adjustment coefficients (standard error in parentheses)

D(RGDP)	-0.695325	-1.233530	1.584342
	(0.17741)	(1.67819)	(0.52055)
D(EGN)	0.005722	0.012557	-0.016591
	(0.00378)	(0.03579)	(0.01110)
D(BKL)	0.252316	0.846020	-0.512571
	(0.18922)	(1.78998)	(0.55522)
D(CSME)	-0.097699	4.319010	0.844311
	(0.11507)	(1.08853)	(0.33765)
D(INF)	0.288023	4.026950	-0.691051
	(0.09699)	(0.91751)	(0.28460)
D(LRT)	0.153769	0.654050	-0.291217
	(0.20188)	(1.90974)	(0.59237)

4 Cointegrating Equations
Log-Likelihood: 293.9459

Normalized cointegrating coefficients (standard error in parentheses)					
RGDP	EGN	BKL	CSME	INF	LRT
1.000000	0.000000	0.000000	0.000000	1.991679 (0.75526)	-0.308148 (0.30650)
0.000000	1.000000	0.000000	0.000000	-1.988051 (0.69866)	-0.649194 (0.28353)
0.000000	0.000000	1.000000	0.000000	-1.273729 (1.00467)	-1.431108 (0.40772)
0.000000	0.000000	0.000000	1.000000	-6.658940 (2.64593)	-1.888528 (1.07378)
Adjustment coefficients (standard error in parentheses)					
D(RGDP)	-0.731175 (0.14853)	-1.670396 (1.40758)	1.201586 (0.45029)	0.122313 (0.44861)	
D(EGN)	0.005564 (0.00386)	0.010633 (0.03654)	-0.018277 (0.01169)	0.002752 (0.01165)	
D(BKL)	0.229425 (0.18220)	0.567079 (1.72665)	-0.756963 (0.55236)	0.053342 (0.55030)	
D(CSME)	-0.095629 (0.11795)	4.344231 (1.11778)	0.866408 (0.35758)	-1.460708 (0.35625)	
D(INF)	0.295492 (0.09710)	4.117962 (0.92021)	-0.611312 (0.29438)	-0.903624 (0.29328)	
D(LRT)	0.135873 (0.20043)	0.435968 (1.89938)	-0.482288 (0.60762)	0.012545 (0.60535)	

5 Cointegrating Equations
Log-Likelihood: 299.9232

Normalized cointegrating coefficients (standard error in parentheses)					
RGDP	EGN	BKL	CSME	INF	LRT
1.000000	0.000000	0.000000	0.000000	0.000000	-1.031429 (0.51328)
0.000000	1.000000	0.000000	0.000000	0.000000	0.072770 (0.01077)
0.000000	0.000000	1.000000	0.000000	0.000000	-0.968551 (0.20670)
0.000000	0.000000	0.000000	1.000000	0.000000	0.529676 (0.09676)
0.000000	0.000000	0.000000	0.000000	1.000000	0.363151 (0.13274)
Adjustment coefficients (standard error in parentheses)					
D(RGDP)	-0.719913 (0.15323)	-0.718052 (2.47773)	1.181245 (0.46089)	0.164405 (0.46579)	-0.488129 (0.21393)
D(EGN)	0.004821 (0.00386)	-0.052214 (0.06234)	-0.016935 (0.01160)	-2.52E-05 (0.01172)	-0.004596 (0.00538)
D(BKL)	0.176795 (0.17328)	-3.883390 (2.80197)	-0.661905 (0.52120)	-0.143359 (0.52675)	-0.025395 (0.24193)
D(CSME)	-0.098028 (0.12231)	4.141357 (1.97773)	0.870741 (0.36788)	-1.469674 (0.37180)	-0.202172 (0.17076)
D(INF)	0.311039 (0.09823)	5.432621 (1.58840)	-0.639392 (0.29546)	-0.845519 (0.29861)	-0.813027 (0.13715)
D(LRT)	0.075380 (0.18895)	-4.679413 (3.05532)	-0.373027 (0.56833)	-0.213544 (0.57438)	-0.023872 (0.26380)

Pairwise Granger Causality Tests

Date: 04/12/26 Time: 07:23

Sample: 1992 2025

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EGN does not Granger Cause RGDP	32	1.17814	0.3232
RGDP does not Granger Cause EGN		3.56233	0.0424
BKL does not Granger Cause RGDP	32	0.77112	0.4724
RGDP does not Granger Cause BKL		2.37344	0.1123
CSME does not Granger Cause RGDP	32	0.57960	0.5669
RGDP does not Granger Cause CSME		1.51581	0.2377
INF does not Granger Cause RGDP	32	5.50707	0.0099
RGDP does not Granger Cause INF		0.66094	0.5245
LRT does not Granger Cause RGDP	32	0.04767	0.9535
RGDP does not Granger Cause LRT		2.41915	0.1080
BKL does not Granger Cause EGN	32	1.82857	0.1800
EGN does not Granger Cause BKL		2.97924	0.0677
CSME does not Granger Cause EGN	32	1.40720	0.2622
EGN does not Granger Cause CSME		0.61487	0.5481
INF does not Granger Cause EGN	32	0.52567	0.5971
EGN does not Granger Cause INF		0.00824	0.9918
LRT does not Granger Cause EGN	32	3.08704	0.0620
EGN does not Granger Cause LRT		0.46297	0.6343
CSME does not Granger Cause BKL	32	3.28099	0.0530
BKL does not Granger Cause CSME		0.65771	0.5261
INF does not Granger Cause BKL	32	0.83015	0.4468
BKL does not Granger Cause INF		1.52809	0.2351
LRT does not Granger Cause BKL	32	4.38539	0.0224
BKL does not Granger Cause LRT		8.80982	0.0011
INF does not Granger Cause CSME	32	0.63704	0.5366
CSME does not Granger Cause INF		0.14374	0.8668
LRT does not Granger Cause CSME	32	1.58312	0.2238
CSME does not Granger Cause LRT		3.07370	0.0627
LRT does not Granger Cause INF	32	0.89010	0.4223
INF does not Granger Cause LRT		0.98385	0.3869

Dependent Variable: RGDP

Method: ARDL

Date: 04/13/26 Time: 03:37

Sample: 1996 2025

Included observations: 30

Dependent lags: 4 (Automatic)

Automatic-lag linear regressors (4 max. lags): BKL CSME LRT
 Deterministics: Restricted constant and no trend (Case 2)
 Model selection method: Akaike info criterion (AIC)
 Number of models evaluated: 500
 Selected model: ARDL(4,2,4,2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP(-1)	0.460835	0.153914	2.994116	0.0097
RGDP(-2)	-0.619521	0.180487	-3.432499	0.0040
RGDP(-3)	0.645503	0.176866	3.649661	0.0026
RGDP(-4)	-1.484428	0.252722	-5.873760	0.0000
BKL	8.895419	1.611468	5.520073	0.0001
BKL(-1)	-8.748552	1.993462	-4.388623	0.0006
BKL(-2)	5.983182	1.278279	4.680653	0.0004
CSME	-1.421764	0.387803	-3.666200	0.0025
CSME(-1)	-1.855259	0.437839	-4.237309	0.0008
CSME(-2)	-1.070669	0.332914	-3.216056	0.0062
CSME(-3)	-1.144350	0.279660	-4.091939	0.0011
CSME(-4)	0.919770	0.254243	3.617683	0.0028
LRT	-9.040768	1.639475	-5.514429	0.0001
LRT(-1)	8.039909	1.806344	4.450930	0.0005
LRT(-2)	-6.107599	1.319342	-4.629278	0.0004
C	5.987315	4.667135	1.282867	0.2204
R-squared	0.972546	Mean dependent var	2.239539	
Adjusted R-squared	0.943130	S.D. dependent var	0.654657	
S.E. of regression	0.156118	Akaike info criterion	-0.571880	
Sum squared resid	0.341220	Schwarz criterion	0.175425	
Log likelihood	24.57821	Hannan-Quinn criter.	-0.332811	
F-statistic	33.06263	Durbin-Watson stat	3.030114	
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent test results do not account for model selection.

Dependent Variable: EGN
 Method: ARDL
 Date: 04/13/26 Time: 03:43
 Sample: 1995 2025
 Included observations: 31
 Dependent lags: 4 (Automatic)
 Automatic-lag linear regressors (4 max. lags): BKL CSME LRT
 Deterministics: Restricted constant and no trend (Case 2)
 Model selection method: Akaike info criterion (AIC)
 Number of models evaluated: 500
 Selected model: ARDL(3,0,0,0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
EGN(-1)	0.247166	0.174749	1.414401	0.1701
EGN(-2)	0.437255	0.160712	2.720741	0.0119
EGN(-3)	0.189069	0.169912	1.112745	0.2768
BKL	0.006197	0.007329	0.845643	0.4061
CSME	0.011967	0.006205	1.928589	0.0657
LRT	0.001224	0.006806	0.179843	0.8588
C	0.108055	0.073926	1.461663	0.1568
R-squared	0.991653	Mean dependent var	1.631576	
Adjusted R-squared	0.989566	S.D. dependent var	0.041338	
S.E. of regression	0.004223	Akaike info criterion	-7.901077	
Sum squared resid	0.000428	Schwarz criterion	-7.577273	
Log likelihood	129.4667	Hannan-Quinn criter.	-7.795525	
F-statistic	475.2038	Durbin-Watson stat	2.042078	
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent test results do not account for model selection.