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Financial Development and Economic Growth in Cameroon: An ARDL Bound Test and Multivariate Granger Causality Framework

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Abstract: *Although the financial system development is vital for a country's economic growth, it is still underdeveloped in most developing countries due to poor financial policies in terms of formulation and implementation. Therefore, this study aims to examine the effects of financial system development on the economic growth of Cameroon from 1980-2020. The study makes use of the ARDL bound test and multivariate Granger causality test. The results indicate that the financial development index and liquid liabilities have short and long run positive and significant effects on economic growth. Also, the result further reveals that in the short run, there is bidirectional causality between liquid liabilities and economic growth and a unidirectional causality running from financial development index to economic growth while in the long run, causal relationship runs from financial development to economic growth. The study recommends that the government should improve its financial system by constantly monitoring the sector to create an efficient, competitive, and stable financial sector that can contribute significantly to boosting economic growth.*

Keywords: *Cameroon, economic growth, financial development.*

JEL Codes: *G1, G23, O41*

1. Introduction

One of the macroeconomic objectives of any nation especially that of developing countries is to achieve sustainable economic growth using physical, financial, and fiscal measures. In the light of financial measures put in place, financial assets like liquid liabilities, stocks, and bank deposit are very influential instruments used to regulate economic growth. This is because the behaviour of these variables largely defines the investment activities and hence the economic growth of a country. Financial development has played an influential role in many less-developed economies as it enhances productivity (Puatwoe & Piabuo 2017). It is also a

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key ingredient used to justify why some countries continue to grow richer than others (Barro 1991; Nell & Thirlwall 2018). Schumpeter (1912) argues that the services provided by the financial mediator are imperative for the innovation and development of a country. Experts have always been concerned about the nexus between financial development and output. While some agree that financial development is one of the most important determinants of economic growth (Biplob & Halder 2018; Kar & Pentecost 2000; Levine 1997; Nguyen *et al*. 2022; Nguyen 2022; Nyalihama 2022), others are sceptical about the role of monetary assets on gross national income(Adeniyi *et al*. 2015; Nafziger & Yoder 2021; Nwani & Orie 2016; Steger 2006). A modern financial system encompasses the elevation of investment by detecting and funding satisfactory business opportunities, assembles savings, enables trading, monitors the performance of managers, and eases the exchange of goods and services (Beck *et al*. 2011; International Monetary Fund 2004; Levine 1997). Schumpeter (1911) argues that economic growth is motivated by the aptitude of the financial system to apportion capital towards creative investments and ease the execution of other economic policies. Thus, financial development comprises of the creation and extension of financial institutions, appliances, and markets (Assefa & Mollick 2017).

Financial development as an indivisible facet of economic growth in the contemporary economy has received global attention. The nexus debate is ongoing and policymakers and researchers in the world at large and Cameroon in particular continue to consider which financial instrument is more imperative to ignite growth.

Cameroon interns to become an emerging country by 2035 through the development of the growth and employment strategy paper (GESP) initiated in 2009 (Achamoh & Baye 2016; GESP, 2009). The realisation of this objective depends on the development of the financial system as one of the key aspects of economic growth. A key question is how developed is the Cameroon financial system to boost growth. This is important as growth in financial system indicators such as domestic credit by banks to private sectors and liquid liabilities remain relatively low as compared to peer countries. The World Bank report indicates that liquid liabilities and domestic credit to the private sector as a percentage of GDP in Cameroon was 25.23% and 14.7% respectively in 2020 (World Bank 2020). This remains comparatively low matched with other lower middle-income countries such as Algeria, Bolivia, and Morocco. For instance in 2020, domestic credit to the private sector for Algeria was 29.7%, 71.2% for Bolivia, and 91.0% for Morocco while liquid liabilities was 87.52% for Algeria, 106.11% for Bolivia, and 105.19% for Morocco (WorldBank 2020).

Few studies in Cameroon attempt to identify which indicators of financial development promote growth and deserve more attention (Achamoh & Baye 2016; Puatwoe & Piabuo 2017; Tabi *et al*. 2011). Puatwoe & Piabuo (2017) use financial depth (broad money and financial system deposit) and financial efficiency (private sector domestic credit) as explanatory variables, Tabi *et al* (2011) use the size of the financial sector and bank credit allocated to private enterprises by the financial sector while Achamoh & Baye (2016) use domestic credit to private sector as explanatory variables. Two of the studies found a positive short and long-run relationship between financial development and economic growth (Achamoh & Baye 2016; Tabi *et al*. 2011) while one of the studies found both positive and negative relationship in the short run but positive nexus in the long run (Puatwoe & Piabuo 2017). This paper distinguishes itself as it makes use of the financial development index as a measure of the financial development system developed by the IMF in Cameroon context. This study provides a new insight using the financial development index, which is a cumulative of the financial markets index and the financial institution's index. It benchmark various aspects of countries financial systems as it ranks them on their efficiency, depth, and access of their financial institution which can accurately predict their relationship with growth (Svirydzenka 2016). The index has been fluctuating in Cameroon over time with the highest point registered in 2013 while the lowest point was in 1993 with a value of 0.05 (see Figure 1.1). The liquid liabilities which measures the size of financial intermediaries (financial depth) will also be used as one of the explanatory variables and it has been rising but fluctuating since 1996 (see Figure 1.2). The highest point was registered in 2020 with a growth point of 25.3 while the lowest point was in 1996 with a point of 11.18. These low values registered by the financial development index and liquid liabilities were due to the economic crisis Cameroon experienced during the period. This resulted in a devaluation of the FCFA by 50%, a fall in the exchange rate from 283.16 FCFA to 555.2 per unit of US Dollar, and a fall in total private credit from 10.3 to 9.2% of real GDP (Achamoh & Baye 2016). However, between 1993 to 1994 there was a slight improvement in the growth rate from -3.2 to -2.5% (Achamoh & Baye 2016). Both Figures 1 and 2 reveal that economic growth has grown faster than financial development in recent times. Nevertheless, the growth in liquid liabilities is more than that of the financial development index at the point of even attaining equilibrium with GDP in 2020 (see Figure 1.1). Liquid liabilities is considered one of the widest indicators of the size of the financial system and past studies have shown it has a strong correlation with economic growth (Andini 2009; Ductor & Grechyna 2015; Koumparoulis 2015). Also, given the fact that the causal

relationship between financial development and growth is not clear (Achamoh & Baye 2016; Tabi *et al*. 2011), the multivariate Granger-causality test will be used to examine the causality between the financial development indicators and economic growth unlike bivariate Granger causality utilised in previous studies in Cameroon (Tabi *et al*. 2011; Tabi & Ondoa 2011). The rest of the paper will focus on the literature review by empirically reviewing similar studies, source of data collection and justification for the inclusion of each variable used in the study, methodology applied in the study, short run and long run presentation and discussion of ARDL and multivariate Granger causality results. The study will also look at diagnostics test (checking for heteroscedasticity, serial correlation, normality, and specification), conclusion on major findings, and proposed recommendations.

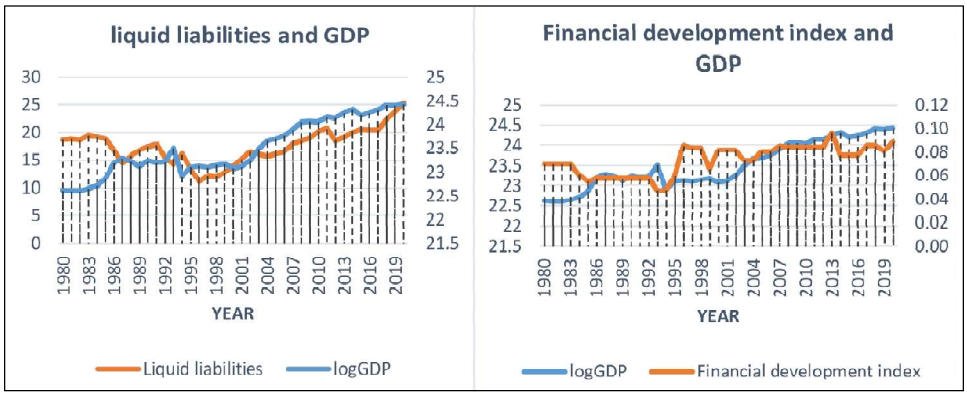

Figure 1.1: Liquid liabilities and GDP

Figure 1.2: Financial development index and GDP

Source: Computed by author from IMF and World Bank.

2. Overview of Cameroon's financial system

In Cameroon, banks dominate the financial system enveloped under the umbrella of Bank of Central African States (BEAC) with headquarters in Yaounde. BEAC harbours all six member countries of the Economic Community of Central Africa States (CEMAC) with Cameroon being the largest economy in the region having almost *half of* the region's total financial assets (Essiane 2022). BEAC oversees the activities of Cameroon's banking system under the supervision of the French Treasury. The Central African Banking Committee (COBAC), created by member states in 1993 regulates the activities of the banking sector within the CEMAC zone (ITA 2019).

Cameroon's banking system has been rising. It comprised of just nine commercial banks with 60 branches in 1999 which further increase to 15

operational commercial banks with a cumulative assets of 1,700 billion CFA francs in 2017 and subsequently to 17 in 2022 according to Cameroon's Ministry of Finance (ITA 2021). In Cameroon, the banking sectors comprised of 17 commercial banks, 26 insurance companies, a state pension fund, a state-owned mortgage bank, more than 400 micro-financial institutions, a postal bank, and a stock exchange market (Bureau of Economic and Business Affairs 2020). These banking sectors are monitored but the institutions tend to agonise over unpaid loans from individuals and commercial debtors (ITA 2019). However, in recent years, the banking industry has played a pivotal role in Cameroon's financial sector and economic growth. In 2017, Cameroon was the leading economy in the region contributing *nearly 29% of the regional GDP while* in 2019, its banks had 5,300 billion CFA (US$9b) in assets, representing over 27% of Cameroon's economic growth and around 40% of CEMAC's overall banking assets. This increased economic growth by 3.7% (IMF 2022).

Although Cameroon has the largest financial sector in the CEMAC region, it has many challenges amongst which are; the lack of key institutions in financial system development such as hire-purchase companies, leasing institutions, and housing institutions. These institutions have a great role to play in developing the financial system, which is lacking in Cameroon. The ownership of shares in most financial institution by the government also poses a problem in the development of the financial system. A report by the magazine ''business in Cameroon'' indicates that the government of Cameroon owned 98% of shares in Commercial Bank-Cameroon (CBC) in 2021.

Another challenge in Cameroon's biggest bank risk is the rise in unpaid loans. The slowdown in the economy coupled with COVID-19 led to a rise in unpaid loans or non-performing assets (NPAs). The World Bank report on banks nonperforming loans to total GDP in Cameroon is 13.4% in 2020 from an increase of 12.8% in 2019. The Cameroon legal system is weak in protecting property rights. Thus, loan recoveries become ambiguous and require more securities (Maino & Veyrune 2009).

Other hitches include poor access to credit, which is exaggerated by a high level of information asymmetry leading to moral hazards, contract enforcement, and adverse selection while high-interest rate also reduces the incentives for people to obtain loans from banks. Schwab (2019) States that access to funding is the most challenging factor to exploit business in Cameroon after corruption. The IMF report of 2020 indicates that more than 85% of Cameroonians do not have access to financial services(IMF, 2020).

3. Empirical literature

The link between financial system development and economic growth was initially initiated by Schumpeter (1911) who asserts that financial sector development is crucial for economic growth through technological innovations. As time went on, two contentions were developed; structuralists and repressionists. The structuralists view is based on the quantity and structure of financial indicators that will facilitate growth through the assembling of savings to boost capital formation which is a catalyst of economic growth (Guha-Khasnobis & Mavrotas 2008). The repressionist view or "McKinnon-Shaw" hypothesis predicts that in developing countries, a high real interest rate policy will boost savings and investment and thus promote economic growth. The hypothesis encourages high interest rates to boost savings which will increase the supply of loanable funds for investment thereby increasing growth (McKinnon 1973; Shaw 1973). Similarly, Patrick's (1966) hypotheses argue that in the early stage of economic progress, the financial system leads growth while as a country advances in its level of growth and development growth creates demand to develop the financial sector (Bist 2018).

However, the Neo-structuralist model criticised the "McKinnon-Shaw" hypothesis as they fail to include the unorganised money market such as the curb market in their model given the important role it plays in developing countries. They emphasised that financial liberalisation negatively affects investment and growth. To them, when official money market rate deposit increase due to financial liberalisation, total credit supply reduces and spurs on the curb market rate which in turn dampens the level of investment and damages the rate of economic growth (Usman & Adeyemi 2017).

The debate between financial development and economic growth is heterogeneous as empirical evidence is inconclusive. The literature can be divided into four domains; positive, negative, nonlinear, and no relationship. Many researchers have recognised financial system to play a positive role in economic growth. Starting with a country's specific-study, Tabi *et al* (2011) found a long-run positive effect of financial development on economic growth from 1970-2005 using the Johansen cointegration test. Similarly, Achamoh & Baye (2016) using ARDL and VECM model reveal that Financial Development affects economic growth positively in Cameroon. In a related study, Tabi & Ondoa (2011) found that increase in money supply boost growth in Cameroon. Equally, Puatwoe & Piabuo (2017) using ARDL from 1980 to 2014 found that broad money has a long run positive and significant effect on economic growth.

In other economies, Assefa & Mollick (2017) using Nigeria as a case study in a dynamic time series model from 1960 to 2014 found a long run positive effects of financial development on economic growth. In addition, the direction of causality between the two is sensitive to the variables used to capture financial development. Similarly, Guru & Yadav (2019) using dynamic one-step SYS-GMM from 1993 to 2014 confirm a positive and significant relationship between credit-to-deposit ratio, financial intermediaries, private sector domestic credit, and growth in five BRICS emerging economies. This conclusion is consistent with the findings of Bist (2018) using 16 low-income countries for a period of 20 years. Mandiefe (2015) verifies the gap between financial development on economic growth that separates Cameroon and an emergent country like South Africa. Using VECM, the study confirms a long run positive association between economic growth and financial development in Cameroon while in South Africa, bank deposits and economic growth exhibit a short run relationship. However, the Cameroon economy adjusts slower towards its long-run equilibrium after economic shocks than South Africa. Nguyen *et al* (2022) using 22 emerging markets from 1980–2020 confirms that financial development has a positive linear effect on economic growth. The result further reveals that bidirectional causality exists between both concepts. These findings are true with the recent work of Nyaliham (2022) who argues that financial system development has contributed to macroeconomic stability via investment in Rwanda. Similarly, Nguyen (2022) using 25 transition countries for a period of 24 years also found evidence to conclude that Financial efficiency and access stimulate growth. Azmeh (2023) indicates that for financial development to boost economic growth in high-income countries, they must build a strong financial sector through the mobilisation of capital. Nkansa *et al*. (2023) also consider political stability, rule of law, and regulatory quality to magnify the positive effect of financial development on economic growth in SSA countries. Likewise, Asteriou *et al*. (2023) using 26 EU countries affirm the importance of the stock market but found financial institution to be more effective in promoting growth. Similarly, Igbinovia & Igbinovia (2023) found financial development to exert a positive impact on economic growth in the ECOWAS sub-region between 2012 and 2020.

From a negative perspective, Anwar (2014) using Ordinary Least Squares from 1978 to 2013 concludes that financial development has a negative impact on growth plus primary and secondary industries in China. Similarly, Ayadi *et al*. (2015) indicate that private sector domestic credit and bank deposits are negatively connected with growth. Likewise, Demetriades & Rousseau (2016) affirm that financial depth is not a significant ingredient of future growth. They consider bank regulation and supervision as key factors

of the financial growth nexus. Also, Nguyen (2022) found a negative relationship between financial market depth, financial institution depth, and growth in 25 transition countries from 1995–2019.

Other studies believe that the relationship between both concepts could be non-linear or have a threshold limit. Cecchetti & Kharroubi (2012) find that financial development is positively connected with growth up to a definite point outside which the effect becomes negative. The authors emphasised that the negative effect is due to the competition for resources as some sectors of the economy are deprived. Similarly, Arcand *et al*. (2015) found financial development to have a diminishing effect on growth. They concluded that once the private sector credit reaches a limit, financial effect on growth becomes negative. Similarly, Soedarmono *et al*. (2017) using the square of the financial development variable found finance to have a positive effect on growth but the effect becomes negative once a particular threshold is attained. This is opposite to the findings of Tariq *et al*. (2020) who found that the impact of finance on growth is originally negative but turns positive after attaining a certain threshold. Also, Bijlsma *et al*. (2018) concluded that finance has an initial positive impact on growth but decreases over time. Swamy & Dharani (2019) using Hansen's threshold model of 24 advanced countries for 30 years found that above a 124% threshold limit, finance has a negative impact on growth.

In some situations, no impact is found to exist between the two concepts as they are considered independent factors in this case (Alimi 2015; Andersen & Tarp 2003; Bloch & Tang 2003; Ram 1999; Turgut 2023).

Concerning causality, there is no consensus among studies (Tadesse & Jemal 2019). However, authors have obtained one of the following observations between financial development and economic growth; supply leading hypothesis, demand following causality, bidirectional or no causality. For instance, some empirical investigations support the 'supply leading' hypothesis (Eric *et al*. 2019; Kar *et al*. 2014; Muyambiri 2020; Tabi *et al*. 2011; Tabi & Ondoa 2011). They obtain a uni-directional causality running from financial developments to economic growth. Contrarily, others confirm the demand following hypothesis indicating that economic growth is the main engine of financial development (Demirguc-Kunt & Levine 2009; Eric *et al*. 2019; Pinshi 2020; Rafindadi 2013; Turgut 2023). In addition, some studies have confirmed a bi-directional causality between financial development and economic growth (Cândida 2021; Ekanayake & Thaver 2021; Fakudze *et al*. 2022; Nicholas *et al*. 2022) while others settle for no causality (Asongu & Odhiambo 2020; Fakudze *et al*. 2022; Musakwa & Nicholas 2022; Nicholas *et al*. 2022).

4. Data and variable justification

This study makes use of annual time series data extracted from world development indicators and IMF from 1980-2020. Economic Growth is the dependent variable defined as GDP in dollars and obtained from World Bank while financial development is captured using the financial development index and liquid liabilities of the IMF. Each country index is derived using the principal component analysis. The inclusion of this variable in the study is motivated by the study of Nyaliham (2022) while Liquid liabilities is supported by the study of Ductor & Grechyna (2015) and Koumparoulis (2015). In addition, as done in previous literature, some control variables were used in the finance growth nexus. This study makes use of inflation (INF) which affects consumption level and it is expected to correlate negatively with growth (Alexiou *et al*. 2018) and trade openness (TO) defines as exports plus imports as a percentage of GDP. Its affects economic growth through competition and technological progress (Hye & Lau 2015). The inclusion of these variables is also justified by past empirical investigations (Asteriou *et al*. 2023; Nyalihama 2022; Tabi *et al*. 2011).

5. Methodology

Ascertaining stationarity is primordial to avoid spurious regression in time series data (Gujarati 2004). Traditional unit root test like Dickey & Fuller (1981) and Phillips & Perron (1988) are widely used to verify stationarity. But the ADF unit roots are biased in cases of structural breaks as it reduce the ability to reject a false unit root hypothesis (Glynn *et al*. 2007; Perron 1989). Nevertheless, both the ADF and PP are paramount as the ADF uses a parametric autoregression to approximate the structure of errors while the PP is a *non-parametric* test (Afriyie *et al*. 2020). To tackle structural breaks, it is usually imperative to also conduct a unit root test that accounts for possibilities of structural breaks especially in time series data which usually suffer from structural breaks (see Figure 1.1 and 1.2). This is also to make sure none of the variables are integrated of order 2 in order not to render the autoregressive distributive lag (ARDL) invalid (Ewane & Abonongi 2022). In this case, the Zivot-Andrews unit root test with a single structural breakpoint is applied (Andrews & Zivot 1992). It tests the null hypothesis that the series has a unit root with structural break(s), which is rejected if the t-statistic is less than the critical value.

Due to the outcome of the unit root test in Tables 1.2 and 1.3, the study adopts the Pesaran *et al*. (2001) ARDL bound test approach which is more reliable for small samples (Haug 2002). Adopting the Kripfganz & Schneider (2016), the specification of ARDL (p, q) model looks as follows:

$$y_t = \varphi_{oj} + \Sigma_{j=1}^{p} \vartheta_j y_{t-1} + \Sigma_{j=o}^{q} \rho_j x_{t-1} + \mu_{jt} \quad (1)$$

Where y_t is a vector; x_t are regressors that can be integrated at levels or first difference, ϑ and ρ are the estimated parameters, pq is the optimal lag, j range from 1,……k representing the number of variables, μ_{jt} is the error term vector and φ is the constant.

The ARDL bound test the null hypothesis of the coefficient of the long run equation being zero. That is; Ho: $w_{1i} = w_{2i} = w_{3i} = w_{4i} = 0$, (no co-integration) against the alternatives; H1: $w_{1i} \neq w_{2i} \neq w_{3i} \neq w_{4i} \neq 0$ (co-integration). Once the calculated F-statistics is greater than the critical values for the upper bound, cointegration is assumed. If there is cointegration, it is an indication that the series are related and would merge with time in the long run (Ewane & Abonongi 2022).

The ARDL equation with error correction representation in the case of cointegration will then appear thus;

$$\Delta \log GDP_t = w_{01} + \Sigma_{i=1}^{p} w_{1i} \Delta LL_{t-i} + \Sigma_{i=i}^{q1} w_{2i} \Delta FDindex_{t-i} + \Sigma_{i=1}^{q2} w_{3i} \Delta INFL_{t-i} + \Sigma_{i=1}^{q3} w_{4i} \Delta T0_{t-1} + \lambda ECT_{t-1} + \mu_{1t} \quad (2)$$

If the bound test proves no cointegration, the equation looks as follows;

$$\Delta \log GDP_t = w_{01} + \Sigma_{i=1}^{p} w_{1i} \Delta LL_{t-i} + \Sigma_{i=i}^{q1} w_{2i} \Delta FDindex_{t-i} + \Sigma_{i=1}^{q2} w_{3i} \Delta INFL_{t-i} + \Sigma_{i=1}^{q3} w_{4i} \Delta T0_{t-1} + \mu_{1t} \quad (3)$$

Where;

GDP = Gross domestic product

LL = liquid liabilities

FDIndex = Financial development index

TO = Trade openness

INF=Inflation

μ_{1t} = eror term

λ = Adjustment speed

ECT = Error correction term

b_{2i} b_{3i} b_{4i} b_{5i} = Short-run estimates,

∇ = Difference operator.

This procedure is widely used because of its advantages; first, the method can be applied irrespective of the variable's order of integration. Hence, it

can bypass unit root tests. Secondly, the test is more reliable for small size data and it yields unbiased long run estimates (Harris & Sollis 2003; Kripfganz & Schneider 2016).

5.1. Multivariate Granger causality test

After stationarity is conducted, it is relevant to conduct a cointegration test to verify long run convergence. Once cointegration is ascertained, there must be at least Granger causality in one direction (Granger 1986; Halil & Kum 2013). Cointegration does not indicate the direction of causality among variables in ARDL bound test. Hence, inferring causality is done with the assistance of vector error correction model (VECM). Therefore, the multivariate VECM for testing Granger causality is specified thus;

$$\Delta \log GDP_t = \alpha + \Sigma_{i=1}^{k-1} a_i \Delta \log GDP_{t-i} + \Sigma_{j=i}^{k-1} \theta_j \Delta LL_{t-j} + \Sigma_{m=1}^{k-1} \alpha_m \Delta FDIndex_{t-m} + \lambda_1 ECT_{t-1} + \epsilon_{1t} \quad (4)$$

$$\Delta LL_t = \theta + \Sigma_{i=1}^{k-1} a_i \Delta loggdp_{t-i} + \Sigma_{j=i}^{k-1} \theta_j \Delta LL_{t-j} + \Sigma_{m=1}^{k-1} \alpha_m \Delta FDIndex_{t-m} + \lambda_1 ECT_{t-1} + \epsilon_{1t} \quad (5)$$

$$\Delta FDIndex_t = \sigma + \Sigma_{i=1}^{k-1} a_i \Delta \log GDP_{t-i} + \Sigma_{j=i}^{k-1} \theta_j \Delta LL_{t-j} + \Sigma_{m=1}^{k-1} \alpha_m \Delta FDIndex_{t-m} + \lambda_1 ECT_{t-1} + \epsilon_{1t} \quad (6)$$

From the equation 4, Δ is the difference operator, λ is the adjustment speed because it measures the speed at which the dependent variable is restored to equilibrium after changes in the regressors and it must come out with a negative sign to show long run convergence otherwise the model is explosive. ECT is the lag value of the error correction term which is the residual obtained from the long run equation. The a_i, θ_j, α_m, a_h, a_w are the short run dynamic coefficient. The error term ϵ_{1t} is assumed to be white noise. There are two sources of causation; the shortrun and longrun. The shortrun causalities are determine from F-statistics while the long run causalities are determined from the t-significant of the error correction term (ECT_{t-1}) which also determines the convergent speed (Tadesse & Jemal 2019). The null hypothesis of Granger causality is that the lagged x-values does not cause y, which is rejected when the p-value is less than 5%. From the null hypothesis of multivariate Granger causality, equation 4 implies liquid liabilities and financial development index does not Granger cause economic growth.

6. Discussion of results

6.1. Summary statistics and correlation table

The summary statistics in Table 1.1 indicates that the mean value of growth domestic product, liquid liabilities, financial development index, inflation, and trade openness are respectively; 23.64, 17.24, 0.07, 3.53, and 0.38. Their deviations from the sample average are 0.51 for GDP, 3.30 for liquid liabilities, 0.01 for financial development index, 6.24 for inflation, and 0.13 for trade openness. The Financial development index has the least value of 0.05 while inflation has the highest value of 35.09.

In addition, the statistics reveal that GDP, liquid liabilities, inflation, and trade openness are positively skewed while the financial development index is negatively skewed. Also, GDP, liquid liabilities, and financial development index are platykurtic while inflation and trade openness are leptokurtic.

Table 1.1: Descriptive statistics and correlation matrix

variable	*logGDP*	*LL*	*FDIndex*	*Infla*	*logTO*
mean	23.6421	17.2401	0.0749	3.5303	0.3822
Std. dev	0.50682	3.3006	0.0125	6.2425	0.1294
min	22.9096	11.1791	0.0500	-3.2066	0.1841
max	24.4321	25.2964	0.1000	35.0945	0.7386
variance	0.25686	10.8938	0.0002	38.9687	0.0167
skewness	0.2352	0.3109	-0.3377	3.9084	0.7384
Kurtosis	1.4381	2.7644	2.3009	20.0583	3.0321
Correlation matrix					
logGDP	1.0000				
LL	0.6481	1.0000			
FDIndex	0.6275	0.3854	1.0000		
INF	-0.3025	-0.1517	-0.3178	1.0000	
TO	-0.5712	-0.5588	-0.6251	0.1525	1.0000

Source: Author's computation

Table 1.2: Variance inflation factor (VIF)

Variables	*VIF*
LL	1.12
FDIndex	1.47
INF	1.31
TO	1.46
Mean VIF	1.34

Source: Author's computation

The correlation matrix results in Table 1.1 reveal that liquid liabilities and financial development index are moderately and positively connected to economic growth while inflation and trade openness are negatively correlated with economic growth with inflation having a weak correlation while trade openness has a moderate correlation. The correlation table also shows there is no exact linear association existing between the independent variables as the correlation coefficient for each variable is less than 0.75. This is because multicollinearity only becomes a problem when two regressors are highly correlated with one another which is absent in this study (Kim 2019). This is further confirmed by the variance inflation factor (VIF) results in Table 1.2 revealing that all values are below 10.

6.2. Stationarity and cointegration test results.

The traditional unit root test in Table 1.3 shows evidence of first difference series only while the Zivot Andrew unit root test in Table 1.4 shows a mixed order of integration with most of the variables stationary at levels. This indicates that the traditional unit root tests are indeed weak in cases of structural breaks. However, they are imperative to make sure that none of the variables order of integration is greater than 1 (Musakwa & Nicholas 2022). Based on the conclusion of the unit root tests, the Pesaran *et al*. (2001) bound test will be used to ascertain if the model exhibits a long run association.

Table 1.3: The ADF and PP Unit Root Test

Test	*variables*	*T-statistics at levels*	*P-values*	*T-statistics at first difference*	*p-values*	*Decision*
ADF TEST	logGDP	0.217	0.9732	-4.890	0.0000	I(1)
	LL	0.002	0.9587	-4.294	0.0000	I(1)
	FDIndex	-1.913	0.3260	-4.930	0.0000	I(1)
	INF	-0.273	0.9292	-4.089	0.0000	I(1)
	TO	-0.621	0.8661	-8.460	0.0000	I(1)
PP TEST	logGDP	-0.055	0.9537	-7.939	0.0000	I(1)
	LL	0.124	0.9677	-5.381	0.0000	I(1)
	FDIndex	-2.199	0.2068	-7.161	0.0000	I(1)
	INF	-0.565	0.8786	-5.326	0.0000	I(1)
	TO	-2.551	-2.551	-7.690	0.0000	I(1)

Note: I(0) is stationary at levels is and I(1) is stationary at first difference.

Source: Author's computation.

Table 1.4: The Zivot-Andrew unit root test

variables	*T-statistics at levels*		*T-statistic at first difference*		
	Break in trend	*Break in intercept*	*Break in trend*	*Break dates*	*Conclusion*
logGDP	-2.903	-4.999	——	1994	I(0)
LL	-3.759	-2.724	-5.425	1994	I(1)
FDindex	-4.529	—-	——	1999	I(0)
INF	-5.919	—-	——	1994	I(0)
TO	-6.728	—-	——	1986	I(0)
	CV @5%=-4.42 for a break with trend CV@ 5%=-4.80 for a break with intercept				

Note: I(0) is stationary at levels is and I(1) is stationary at first difference.
Source: Author's computation

The results of the bound test in Table 1.5 evidence long-run convergence between the variables. The F-statistics value of 8.899 exceeds all critical values of the upper bound. Thus, GDP, liquid liabilities, and financial development index have a long-run relationship. Hence, it is imperative to run two tests in this study; the ARDL which will capture the short run and ECM which capture the long run (Ewane & Abonongi 2022).

Table 1.5: The bound test for cointegration

CV	*I(0)*	*I(1)*
1%	2.45	3.52
5%	2.86	4.01
25%	3.25	4.49
10%	3.74	5.06
	F = 8.899	t = -3.623

Note: I(0) is the lower bound and I(1) is the upper bound.
Source: Author's computation

6.3. The ARDL estimates

The analysis in Table 1.6 reveals the short-run and long-run results. It reveals that the past realisation of GDP increases current GDP by 75.3% at a 1% significant level *ceteris paribus*. The result further indicates that in the short run, both the first lag of financial development index and liquid liabilities has a positive and significant impact on GDP and it is significant at 1% level. Also, in the long run, liquid liabilities and financial development index have a positive and significant effect on economic growth at a 1% significant level. Their respective contribution to GDP are; 15.36% and 0.11%. This proves that these coefficients are statistically relevant to predict changes in GDP and they are consistent with a priori expectations. The findings are in

line with that of Nyalihama (2022) who indicates that financial development had contributed to stabilising output in Rwanda using the financial development index as a proxy. The conclusion is also true with past empirical investigations (Achamoh & Baye 2016; Guru & Yadav 2019; Nguyen 2022; Tabi & Ondoa 2011) but contradict the finding of some studies (Alimi 2015; Anwar 2014; Nguyen *et al*. 2022). In this study, based on the magnitudes of the coefficient, the effect is more when the financial development index is used as a proxy for financial system development.

In the case of control variables, inflation has negative and significant effects on GDP at a 1% significant level in the short run while trade openness has a positive effect at a 5% significant level. In the long run, both trade openness and inflation have a negative and a 1% significant impact on economic growth. This is contrary to the finding of Tabi *et al*. (2011) and Nyalihama (2022) respectively in the long run.

The result also shows that the adjustment coefficient of the error correction model (ECM) has a negative sign and it is significant at 1% indicating cointegration. The adjustment term of -0.329 indicates that about 32.9% percent of the errors in the previous period would be corrected in current periods at a speed of 32.9%. The R-square of 0.881 implies that 88.1% of the variation in GDP is explained in the model leaving only less than 12% to the error term. The DW statistics of 1.96 also show evidence of no autocorrelation.

Table 1.6: The short and long run ARDL estimates

Variables	*coeff*	*Std. errors*
Shortrun		
L.logGDP	0.753***	(0.094)
LL	-0.033**	(0.014)
L.LL	0.059***	(0.015)
FDindex	1.373	(1.782)
L.FDindex	3.931***	(1.927)
INF	-0.013***	(0.003)
TO	-0.544***	(0.169)
L.TO	0.402**	(0.180)
Constant	5.125**	(2.067)
Longrun		
LL	0.107***	(0.017)
FDindex	15.363***	(5.660)
INF	-0.031***	(0.013)
TO	-0.9478***	(0.211)
Aj.Coeff	-0.329***	(0.091)
Observations	39	
R-squared	0.881	
DW statistics	1.957804	

Notes: *** indicates 1%, ** indicate 5%
Source: Author's computation

6.4. Multivariate Granger causality test results

The short run result in Table 1.6 indicates that liquid liabilities and financial development index are significant at 1% in the GDP equation; GDP and financial development index are significant at 1% in the liquid liabilities equation while GDP is significant in the FDIndex equation. This indicates that in the short run, there is strong bidirectional causality between GDP and liquid liabilities and between GDP and FDIndex while a unidirectional causality runs from financial development index to liquid liabilities. The result is true with that of supply lead growth hypothesis indicating that financial development is paramount for short run growth (Tadesse & Jemal 2019).

For long run causal effect, since all variables in models 4, 5, and 6 are cointegrated, the causal relationship will be examined using VECM. The t-statistics coefficient of one period lagged error-correction term (ECT) is negative and significant for all equations at a 1% significant level confirming the bound test for cointegration in Table 5. Hence, all the variables in the GDP equation have a positive and significant causal impact on economic growth. This is also true for the liquid liabilities equation and financial development index equation.

Using VECM to test for Granger causality in the long run depends on whether two variables are integrated or not (Tamba *et al*. 2014). Thus, the Granger causality results indicate that financial development has a causal impact on economic growth in Cameroon. This confirms to earlier empirical findings (McKinnon 1973; Shaw 1973) and later investigations (Agyei 2015; Helmi *et al*. 2013; Nguyen *et al*. 2022). However, the findings contradict that of Ofori-Abebrese *et al*. (2017) who found long run causality relationship running from economic growth to financial development.

Table 1.7: Multivariate Granger causality tests

variables	*Short run (F-stats)*			ECT_{t-1}
	ΔlogGDP	*ΔLL*	*ΔFDIndex*	*[t-statistics]*
logGDP		24.323***	7.0145***	-0.212***
LL	3.1211***		12.125***	-3.181***
FDIndex	1.289***	0.32719		-0.031***

Notes: *** indicates 1% significant level

Source: Author's computation

6.5. Diagnostics test results

A key ingredient in time series data is to make sure that the series is not serially correlated, there is no heteroscedasticity, the model is correctly

specified, and the residual term is normally distributed (Ewane & Abonongi 2022). The diagnostic results in Table 1.7 confirmed there is no autocorrelation and heteroscedasticity. There is also normality in the residuals and the specification of the model is correct. The cusum and cusum square graph also stay within the critical limit of 5% indicating stability in the model.

Table 1.8: Results of diagnostic tests

Specification	*Null hypothesis(Ho)*	*p-values*	*Decision*
White Test	No conditional heteroscedasticity	0.3168	Accept Ho
Breusch-Godfrey LM test	No autocorrelation	0.9816	Accept Ho
Jarque-Bera (JB) test	There is normality in residuals	0.713	Accept Ho
Ramsey RESET Test	The model is correctly specified	0.2018	Accept Ho

Source: Computed by Author.

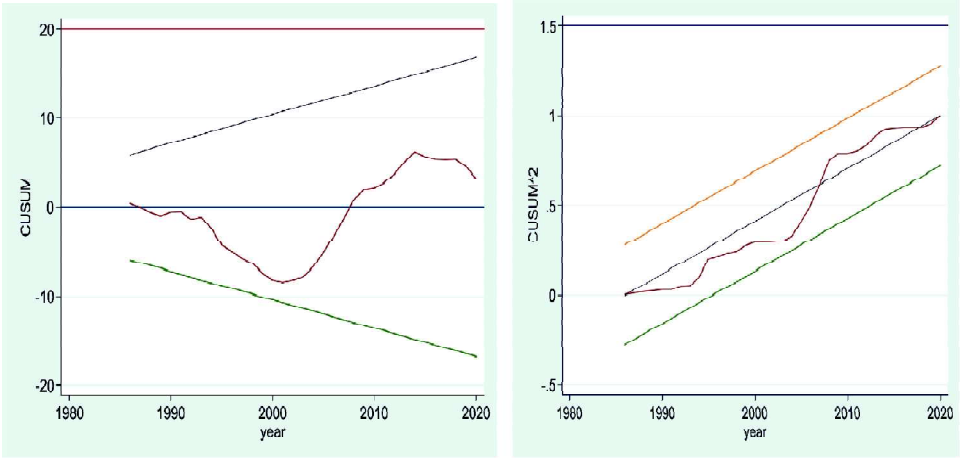

Figure 2: Cusum and cusum square graph

Source: Author's computation

7. Conclusion and recommendations

The objective of this study was to examine the effects of financial system development on the economic growth of Cameroon from 1980 to 2020. The Dickey Fuller, Phillip Perron, and Zivot Andrew unit root tests were used to determine stationarity and level of integration of the variables. To obtain the short run and long run estimates, the study makes use of different techniques of estimation in time series analysis like ARDL bound test, multivariate Granger causality test, and VECM. The findings indicate that the financial development index and liquid liabilities have short and long-

run significant effects on economic growth but the magnitude of the stabilising effect is more when the financial system development is proxy by the financial development index. The result of the study further indicates that in the short run, there is bidirectional causality between GDP and liquid liabilities and a unidirectional causality running from financial development index to GDP and from financial development index to liquid liabilities while in the long run, financial development has a causal impact on economic growth. This implies that by increasing access to financial institutions in these countries, economic growth is guaranteed.

Based on this conclusion, the study recommends that the government should improve on its financial system in the domain of increasing the size of financial institutions while monitoring the financial system to create an efficient, competitive, and a stable financial sector that can contribute significantly to boosting economic growth.

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