



# Assessing the internal factors-led-growth hypothesis in cameroon. An ardl bound test approach

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## ABSTRACT

This study assesses the internal-Factors-Led Growth Hypothesis in Cameroon. To this effect, internal factors were captured through inflation, gross capital formation, domestic credit, and educational expenditure. Data was sourced from world development indicators spanning from 1986 to 2021. The ARDL and ECM model was used to estimate the model base on the conclusion of the unit root and bound test. The findings indicate that inflation, domestic credit, and educational expenditure has as positive short-run effects on GDP while gross capital formation has a negative short-run effect. In the long run, educational expenditure has a significant positive impact on GDP while inflation and domestic credit have a significant negative effect. Gross capital formation was found to be positive but insignificant in the long run. The adjustment term(-0.4645) is statistically significant at a 1% level suggesting that previous years' errors are corrected for within the current year at a convergent speed of 46.5%. The paper, therefore recommends that policies in favor of educational expenditure and gross capital formation should be encouraged as they drive economic growth stronger.

**Keywords:** Internal factors, Economic Growth, Domestic credit, Gross capital formation, Inflation, Educational expenditure.

## 1) Introduction

Achieving Economic growth is the ultimate objective of all economies, as it constitutes a vital indicator of economic development. Thus, all economies are striving to achieve a substantial level of growth to meet up with their development agenda. However, bounding the reliable factors that ignite growth is challenging. In general, growth is realized based on certain key factors, which are often divided into two types; external (exogenous) factors and internal (endogenous) factors. The performance of internal indicators can exercise a positive influence on the performance of external factors. Thus, internal factors can be more instrumental factors to growth than external factors (Li & Zhou, 2010). Many empirical works have analyzed the nexus between internal factors and economic growth with different types of indicators consider to be the engine of internal growth factors across the world. Sieng (2018) consider internal factors to be; education, inflation rate, physical capital, and consumption expenditure while ( Li, 2011) consider internal factors to incorporate human capital and several domestic and institutional factors, such as the level of corruption and property rights protection. Other researchers consider internal factors to be investment (Raza et al., 2011); institution, geography, and migration (Osang, 2004); and consumption expenditure(Tan et al., 2015). Adopting the (Sieng, 2018) internal factor led-growth, This study will modify the factors to be as follows; inflation, gross capital formation, access to credit, and educational expenditure.

Inflation has a key role to play concerning domestic consumption, which in turn affects economic growth. The inflation-growth nexus debate has remained paramount and has attracted substantial theoretical and empirical attempts in literature. For instance, the monetarists consider inflation harmful to economic growth while the structuralists believe inflation is crucial for economic growth. High, stable, and sustained output growth in conjunction with a low inflation rate is however the prime goal of macroeconomic policy all over the world (Doguwa, 2005). This is however not the case in Cameroon as the inflation rate has been on the rise in recent times perceive to be harmful to economic growth. According to a world bank report, Cameroon's inflation rate has been rising in recent times as it reached 2.9% in 2022, up from 2.4% in 2020 and 2.5% in 2021. When inflation exceeds a particular threshold, it becomes instantly detrimental to economic growth, which requires a call for immediate policy changes. With empirical justification from the work of (Onwubuariri et al., 2021), this study seeks to find out if this rise in inflation rate in recent times is detrimental to the economy of Cameroon.

Capital formation is considered an important internal factor of economic growth. It is often suggested as a means for LDC to increase its long-term growth rates(Ajose & Oyedokun, 2018). Countries must adapt to frequently replacing their worn-out capital if they must continue to grow. If a country cannot accumulate capital and replace its capital goods, production will likely fall. Generally, the more the domestic investment of an economy, the more an economy is likely to grow its total output. To increase capital accumulation, therefore, it is important to increase savings ratios, avoid corruption and maintain good loan policies. Cameroon's gross capital formation has not been growing and has declined in recent times. According to the World Bank collection, the Gross capital formation of Cameroon sank from 8.5 % in 2019 to -8.3 % in 2020.

The stability of the financial sector plays a crucial role in the growth of any economy(Duican & Pop, 2015). Businesses hardly operate without the use of the financial sector. Thus, access to credit becomes a key internal factor of growth. With better loan policies and the financial market, enterprises can easily get loans from banks to ignite investment, which will cause economic growth. Access to credit is therefore a key driver of productivity, innovation, and local growth(Diallo & Al-Titi, 2017). Cameroon's loan policy has not been the best. With over 840 microfinance in Cameroon, loan performance has worsened due to the number of uninformed loans given to consumers(Savage, 2019). Loan interest is also very high which discourages investors. This variable is therefore used in this study to ascertain if access to credit is paramount to growth.

Education is the backbone of all economies. Without education, no economy can survive in the long run. Thus investing in education is the prime objective of all economies. Being an economic good, Education raises productivity and creativity and stimulates entrepreneurship and technological breakthroughs. Education is a critical factor in a country's human capital as it steps up the efficiency of each worker(Emediegwu & Clement, 2015). Cameroon government has invested enormously in different educational sectors making educational fees almost completely free. World Bank reports indicate Educational expenditure in Cameroon increased from 3.08 % in 2019 to 3.17 % in 2020. This variable is used in this study to validate if this increase in educational expenditure has a positive impact on growth.

The internal factors led growth nexus has limited empirical work in the world and none that specifically looks into these four key internal factors variables in Cameroon. Motivated by the intense poverty, high

unemployment rate, and slow economic growth, investigating the internal factors led-growth hypothesis becomes of paramount importance. This research, therefore, targets the main internal drivers of economic growth. The rest of the paper will focus on literature review, data and methodology, presentation and discussion of results, diagnostics test, conclusion, and recommendations.

## 2) Literature Review.

The link between internal factors and economic growth has been examined by different authors across the world with different conclusions. Li(2011) using data from the world economy and the principal component method show that endogenous factors will produce a more growth rate than exogenous factors. He further states that it is important to increase the performance of the internal factors to boost the performance of the economy. Andrew(2021) further shows that there is a positive and significant relationship between the various sources of internal resources and economic growth in Cameroon.

Starting with capital formation as internal factor used in this study, Ajose & Oyedokun(2018) research the influence of capital accumulation on economic growth in Nigeria using trend analysis and advanced econometrics tests from 1980-2016. The results show that there is a long-run significant relationship between capital formation and economic growth. Ongo & Vukenkeng(2014) with a case study of the CEMAC sub-region used the Generalized Least Square estimation technique to show technical progress and infrastructural development ignite growth. Other authors find a positive but insignificant relationship between capital formation and economic growth (Onyinye et al., 2017).

Researchers have also expressed different views on domestic credit-growth nexus. Some have proven domestic credit is growth-enhancing (Duican & Pop, 2015; Ganiyu et al., 2020). In Cameroon, many authors have their own opinion concerning the two concepts. Ntsama et al(2022), assess the effect of bank credit granted to the private sector and gross domestic savings on economic growth using OLS from 1980 to 2019. They concluded that credit granted to the private sector by banks and gross domestic savings have a positive and significant effect on economic growth. Satia et al(2020) on their part assessed the impact of financial innovation on the economic growth prospects of Cameroon. After using the ARDL model, the estimated result shows a positive correlation between financial innovation and economic growth in the long run.

Contrary, Simpao & Tegha (2021) with a case study in Cameroon assess the role of domestic loans given by financial institutions on economic growth from 1990-2019 using simple linear regression. They revealed that domestic loans have a negative correlation with economic growth (GDP) of Cameroon. Tieguhong & Mandiefe(2017) had the same conclusion in the short run on the relationship between bank deposits, private investment, and economic growth in Cameroon. However, in the long run, all indicators of financial development show a positive and significant impact on economic growth.

For educational expenditure and economic growth, Omojimate(2010) revealed that public expenditures on education Granger cause economic growth but the reverse is not the case in Nigeria. Tayo & Olivier(2016) conducted a similar study in Cameroon from 1980-2012 using a vector error correction model. The estimated results show that educational expenditure has a significant positive impact on economic growth both in the short and long run. To them, Education spending thus appears as one of the main driving forces of the economic growth process in Cameroon. In opposite direction, Kouton (2018) investigate the relationship between the two concepts in Côte d'Ivoire for the period from 1970 to 2015 using the ARDL model. The study provides evidence of the existence of a negative and significant long-term effect of government educational expenditure on economic growth. The results show a unidirectional causality relationship exists between the two variables, running from education expenditure to economic growth.

The nexus between inflation and economic growth has usually been regarded to be negative (Jibrilla & Buba, 2018). The belief that inflation harms economic growth by having a negative effect is connected by researchers such as (Jibrilla & Buba, 2018; Kasidi & Mwakanemela, 2013; Mandeya & Ho,2021;Olamide et al., 2022; Onwubuariri et al., 2021). Many other scholars have established a positive relationship. Kryeziu & Durguti (2019) investigate the inflation rate and its impact on the growth rate for Eurozone countries, using panel data for the period 1997-2017. Results indicate that the Inflation rate has a positive impact on the economic growth rate for the euro area. Mallik et al(2001) with a case study of four South Asian countries, find evidence of a long-run positive relationship between GDP growth rate and inflation for all four countries. Tabi & Ondo(2011) analyze the relationship between economic growth, inflation, and money in circulation using a VAR model for the period 1960-2007. It shows that an increase in money supply increases growth and that growth causes inflation. However, an increase in the money supply does not necessarily increase inflation in Cameroon. Aydın et al(2016) with a case study for five Turkish

Republics used a dynamic panel data analysis based on the threshold. The results indicate a nonlinear relationship exists between inflation and growth rate. The threshold for growth is 7.97%, and an inflation rate above this threshold has a negative influence on economic growth and vice versa.

### 3) Data and methodology.

Data from world development indicators are used to conduct the study spanning over 36 years from 1986-2021. Data on the variables of interest; GDP which is used to capture economic growth is the dependent variable while inflation (consumer prices annual percentage), domestic credit to private sectors by banks (% GDP), gross capital formation in dollars, and expenditure on education (adjusted saving) are explanatory variables. Inflation has been rescaled by adding a constant of one to the highest negative values to render the few negative values positive to apply the log. That is  $x=(y+a)$  where “a” is the constant. It has been shown that when a constant is added to a variable, the estimate of the slope is unaffected (Okereke, 2011). The minimum value for Inflation will therefore be zero. The theoretical underpinning of this study is the endogenous neoclassical growth theory led by (Lucas, 1988; Romer, 1986) who explained that the determinants of economic growth are a factor in the economic system itself rather than outside the economic system. They believe that when the private sector and government invest in human capital, knowledge through research and development, and innovation, the nation’s productivity is enhanced. Though this study makes use of factors different from that of Romer or Lucas, The prime objective is to ascertain if the factors influence internal growth.

The study adopts the (Pesaran et al., 2001) ARDL bound test approach which is applied when variables have a mixed order of integration. That is having a combination of  $I(0)$  and  $I(1)$  series. The null hypothesis is given as;  $H_0: b_{1i}=b_{2i}=b_{3i}=b_{4i}=b_{5i}=0$ , implying no co-integration against the alternatives;  $H_1: b_{1i} \neq b_{2i} \neq b_{3i} \neq b_{4i} \neq b_{5i} \neq 0$ , signifying co-integration. The decision criteria is to reject the null hypothesis if the calculated  $F$ -statistic is greater than the critical value for the upper bound  $I(1)$  confirming integration. To perform the bounds test for co-integration, the conditional ARDL( $p, q_1, q_2, q_3, q_4$ ) model with five variables have to be specified. Adopting (Pesaran et al., 2001), the ARDL( $p, q_1, q_2, q_3, q_4$ ) model can be modified as follows:

$$y_t = \gamma_{0j} + \sum_{j=1}^p \alpha_j y_{t-1} + \sum_{j=0}^q \beta_j x_{t-1} + \epsilon_{jt} \dots \dots \dots 1.1.$$

From the equation,  $y_t$  is a vector;  $x_t$  are the regressors allowed to be I(0) or I(1) or co-integration;  $\alpha$  and  $\beta$  are the coefficients,  $j$  represent the number of variables and can range from 1,.....k;  $\epsilon_{jt}$  indicate vector of error terms;  $pq$  represent the optimal lag and  $\gamma$  is the intercept.

If the ARDL bound test proves co-integration, the ECM representation is specified as follows;

$$\Delta \log gdp_t = a_{01} + \sum_{i=1}^p a_{1i} \nabla \log gdp_{t-i} + \sum_{i=1}^p a_{2i} \nabla \log infla_{t-i} + \sum_{i=1}^{q1} a_{3i} \nabla \log gkft_{t-i} + \sum_{i=1}^{q2} a_{4i} \nabla \log atc_{t-i} + \sum_{i=1}^{q3} a_{5i} \Delta \log ee_{t-1} + \lambda ECT_{t-1} + \epsilon_{1t} \dots\dots\dots 1.2$$

If there is no co-integration, the equation looks thus;

$$\Delta \log gdp_t = a_{01} + \sum_{i=1}^p a_{1i} \nabla \log gdp_{t-i} + \sum_{i=1}^p a_{2i} \nabla \log infla_{t-i} + \sum_{i=1}^{q1} a_{3i} \nabla \log gkft_{t-i} + \sum_{i=1}^{q2} a_{4i} \nabla \log atc_{t-i} + \sum_{i=1}^{q3} a_{5i} \Delta \log ee_{t-1} + \epsilon_{1t} \dots\dots\dots 1.3$$

Where; GDP=growth domestic product, INFLA=inflation, GKF= gross capital formation, ATC=access to credit, EE=educational expenditure,  $E_{1t}$ =error term,  $\lambda$  is the speed of adjustment which must be negative,  $\lambda$  is the error correction term,  $a_{2i}$   $a_{3i}$   $a_{4i}$   $a_{5i}$  are the short-run coefficient, ( $\nabla$ ) is the difference operator. The major advantage of the ARDL approach is that it can bypass unit root tests. In addition, the ARDL test is more efficient in the case of small and finite sample data sizes. Finally, the ARDL yields unbiased long-run estimates of the model (Harris, R., & Sollis, 2003; Kripfganz & Schneider, 2016; Pesaran & Shin, 1999).

It should be noted that the short-run causal effects are indicated by the significance of the short-run coefficient as indicated by the t-statistics. That is if the coefficients are significant you can know the causality of the regressors on the dependent variable in the short run while the significance of the error correction term shows causality in the long run.

**Table 1.1: Summary statistics and correlation matrix**

variable	logGDP	logINFLA	logGKF	logDC	logEE
mean	23.66689	1.702044	21.97419	2.429699	19.97029
Std.dev	.5212408	.6050914	.5480052	.4550983	.5998681
min	22.9096	0	21.1145	1.70986	18.98883
max	24.5352	3.64548	22.8125	3.27407	20.81767
logGDP	1.0000				
logINFLA	-0.1673	1.0000			
logGKF	0.9798	-0.0704	1.0000		
logDC	0.1557	-0.1605	0.2261	1.0000	
logEE	0.9847	-0.1797	0.5653	0.2148	1.0000

**Computed by author, 2022**

Table 1.1 shows the descriptive statistics of each variable used in the model and their correlation matrix tables. The correlation matrix table reveals there is no exact linear relationship among explanatory variables.

#### **4) Unit root test.**

The assumption of time series is that the statistical properties such as the mean, variance, and covariance are time-invariant. In other words, the data generating function fluctuates around zero. But this is not the case as most macroeconomic variables exhibit random walk. Thus before conducting any analysis of time series data, it is always of paramount interest to conduct a stationarity test before conducting any econometric analysis for the use of non-stationary time series data has been proven to generate spurious regression results (Shrestha & Bhatta, 2018). This study employs well-known tests (Dickey & Fuller, 1981; Phillips & Perron, 1988). The null hypothesis is that the variable under investigation has a unit root, which is rejected if the ADF or PP statistic value exceeds the critical value at a chosen level of significance (in absolute terms).



**Table 1.2: unit root test**

Test types	variables	Test statistics at level		Test statistic at first difference		decision
		constant	Constant and trend	constant	Constant and trend	
ADF	logGDP	0.339	-2.198	-4.988***	-5.207***	I(1)
	logINFLA	-4.860***	-4.759 ***	-----	-----	I(0)
	logGKF	0.212	-3.210***	-4.546***	-4.873	I(1)
	logATC	-2.382	-2.246	-3.191 ***	-3.470***	I(1)
	logEE	0.564	-1.830	-4.036***	-4.296***	I(1)
pp	logGDP	0.164	-2.234	-7.996***	-8.323***	I(1)
	logINFLA	-5.378***	-5.273 ***	-----	-----	I(0)
	logGKF	0.008	-2.957	-7.073 ***	-7.570***	I(1)
	logATC	-1.862	-1.613	-3.691***	-3.902 ***	I(1)
	logEE	-0.453	-2.055	-6.791	-6.800	I(1)

\*\*\* indicate 1% significance levels.

**Source: computed by author, from WDI.**

The unit root results in table 1.2 conclude the series has a mixed order of integration. That is order I(1) and I(0). To ascertain long-run convergence, the bound test proposed by (pesaran et al., 2001) will be used. First, the optimal lag of the model has to be determined.

**Table 1.2: Selection-order criteria**

Sample: 1990 - 2021

Number of obs = 32

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	14.3244				3.8e-07	-.582775	-.506861	-.353754
1	140.371	252.09	25	0.000	7.1e-10	-6.8982	-6.44271	-5.52407*
2	169.024	57.305	25	0.000	6.4e-10	-7.12647	-6.29142	-4.60724
3	197.754	57.461	25	0.000	7.2e-10	-7.35961	-6.14499	-3.69527
4	241.527	87.546*	25	0.000	5.0e-10*	-8.53294*	-6.93874*	-3.72349

In order to estimate the ARDL model, its length has to be decided accurately because if too many lags are used, one may lose many degrees of freedom, incur statistically insignificant coefficients, and multicollinearity while if few lags are used, the model may suffer from specification error. However, the information criterion with the smallest criterion value evidences the most ideal lag length to employ because that ensures the model will be stable. From the selection order criteria, a maximum lag of one will be used to conduct the study using BIC criteria since it has the lowest minimized values.

**Table 1.3: ARDL Bounds test for co-integration**

CV	Lower bound I(0)	Upper bound I(1)
1	3.74	5.06
5	2.86	4.01
10	-2.57	-3.66
F = 9.886      T = -5.733		

**Source: computed by author, 2022**

The bound test results in table 1.3 reveal the value of the F-statistic (9.886) exceeds the upper bounds at all critical values. This evidence the presence of a long-run dynamic relationship existing among the variables. It is also an indication that the series are related and can be combined in a linear fashion. That is, even if there are shocks in the short run which affect movement in the individual series, they will converge with time in the long run. The conclusion, therefore, requires two estimates; the short-run ARDL and ECM which capture long-run convergence.

**Table 1.4: Short run ARDL estimates**

VARIABLES	(1)	
	Loggdp	std.error
L.loggdp	0.535***	(0.0811)
loginf	-0.0605***	(0.00949)
L.loginf	0.0219**	(0.0105)
loggkf	0.654***	(0.0599)
L.loggkf	-0.334***	(0.0801)
logdocredit	-0.145***	(0.0392)
L.logdocredit	0.122***	(0.0352)
logeduexp	0.126**	(0.0462)
Constant	1.592***	(0.392)
Observations	35	
R-squared	0.998	
DW statistics	2.174194	

Source: computed by author, 2022 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 1.5: Long Run ECM with GDP as the target variable**

variables	coefficient	Std. error
Adj. coeff	-0.4645 ***	0.081
logINFLA	-0.083***	0.285
logGKF	0.688 ***	0.955
logATC	-0.049	0.030
logEE	0.270 ***	0.088

Source: computed by author, 2022 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5) Discussion of results

The short-run estimates result indicates that the lag of GDP (0.535) has a strong influence on itself. This means the past realization of GDP is associated with a 53.5% point increase in current GDP on average *ceteris paribus* at a 1% significant level. The result further reveals that a percentage point increase in the lag of inflation is associated with a 2.2% point increase in GDP on average *ceteris paribus* at a 5% significant level in the short run. This is contrary in the long run as inflation affects economic growth negatively by 8.3% *ceteris paribus* at a 1% significant level. The long-run conclusion of this finding is consistent with that of (Jibrilla & Buba, 2018; Mandeya & Ho, 2021; Olamide et al., 2022).

Gross capital formation hurts GDP negatively in the short run. A percentage point increase in capital formation reduces GDP by 33.4% *ceteris paribus* at a 1% significant level. This is opposite in the long as a percentage point increase in capital formation increases GDP by 68.8% at a 1% significant level *ceteris paribus*. Capital formation takes time to mature reason of the short run relationship. The conclusion is true with the work of (Ajose & Oyedokun, 2018; Ongo & Vukenkeng, 2014). The lag of domestic credit also has a positive impact on GDP as it increases GDP by 12.2% *ceteris paribus* at a 1% significant level. It however has a negative but insignificant impact in the long run. Domestic credit if poorly managed may result in long-run effects as interest rate accrued. This short-run relationship is similar to that of Ntsama et al(2022)

The results further indicate that a percentage point increase in educational expenditure increases GDP by 12.6% *ceteris paribus* at a 5% significant level in the short run. In the long run, the effect is even greater at 27% *ceteris paribus* at a 1% significant level. This conclusion validates the findings of Tayo & Olivier(2016) but is opposite to that of Kouton (2018).

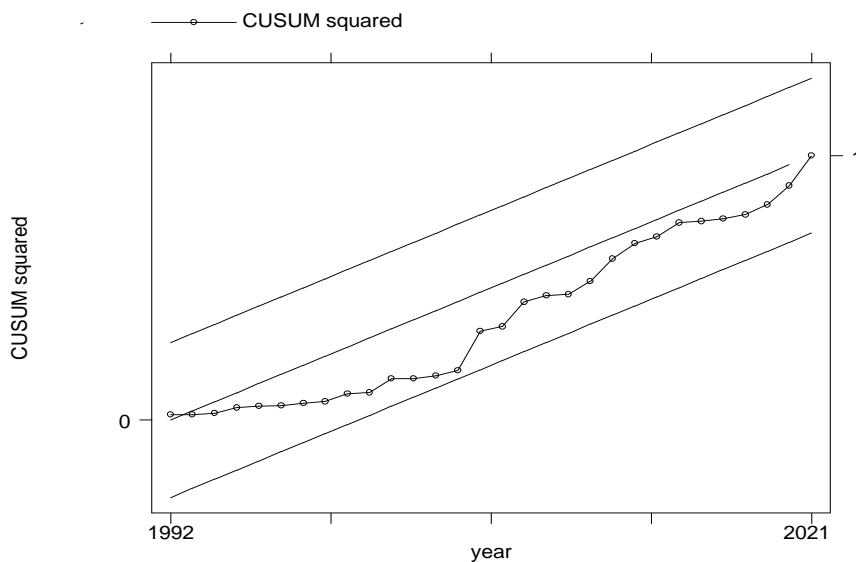
The adjustment term(-0.4645) is statistically significant at 1% level suggesting that previous years' errors or deviations from the long-run equilibrium are corrected for within the current year at a convergent speed of 46.5%. This implies that about 44.5% percent of the errors in the current period would be corrected in subsequent periods at a convergent speed of 44.5%. The R-square of 0.998 show about 99% of the variation in economic growth is explained by variation in internal factors while 1% is explained by the error term.

The significance of the error correction model indicates that there is a steady long-run equilibrium state between GDP and the independent variables as well as causality at a 1% level in the long run. This means over all the independent variables have a causal effect on GDP in the long run except domestic credit which is not significant. In addition, the t-statistic of the short run variables also evidence causality between the regressant and the regressors in the short run as all the independent variables have a significant effect on the dependent variables. Based on the magnitude of the coefficient, gross capital formation has more impact on the growth of Cameroon both in the short and long run compared to the rest of the variables.

**Table 1.7: Results of diagnostic tests**

specification	p-values	conclusion
White Test(heteroscedasticity)	0.420	No conditional heteroscedasticity
Breusch-Godfrey LM test(autocorrelation)	0.441	No higher-order autocorrelation
Jarque-Bera (JB) test (normality)	0.727	There is normality in residuals
Ramsey RESET Test (omitted variable)	0.436	The model is correctly specified

**Source: Computed by Author, 2022**



**Source: computed by author, 2022**

Figure 1: Plot of CUSUMSQ for Model Stability at 5% level of Significance.

## 6) Conclusion and Recommendations.

This study was aimed at assessing the internal factors-led-growth hypothesis in Cameroon over the period 1986 to 2021. The study employed the ARDL procedure where the bound test was used to determine the long-run relationship. The cointegration test result shows the presence of cointegration relation which suggests using the ARDL and ECM model. The findings indicate that inflation, domestic credit, and educational expenditure has as positive short-run effects on GDP while gross capital formation has a negative short-run effect. In the long run, educational expenditure has a significant positive impact on GDP while inflation and domestic credit have a significant negative effect. Gross capital formation was found to be positive but insignificant in the long run.

Based on the conclusion, the study recommends the following.

- The Cameroon government should not relent in her effort in educational expenditure.
- They should be continuous capital formation to increase domestic investment.
- The government should monitor her inflation rate in order not to go above the estimated threshold.
- Investors in private sectors should be cautious with the use of domestic credit as Interest always accrued.

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