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Does External Debt Stocks Have an Asymmetric Effect on Inflation Dynamics in Cameroon? An Application of Nonlinear ARDL

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ABSTRACT

External debt is indispensable, especially in developing countries which usually face budget deficits to cover up their saving-investment gap. However, the effect of external debt on inflation depends on whether it is increasing or decreasing. Hence, this study aims to examine the effect of external debt stocks on inflation using World Bank data from 1980 to 2020 in Cameroon. The study makes use of non-linear ARDL to examine the positive and negative changes in external debt stocks and their effects on inflation. The results indicate a long-run increasing and decreasing asymmetry effect of external debts on inflation. Only the coefficient of positive external debt stock on inflation is positive and significant in the long run while in the short run, positive and negative external debt stocks respectively have a negative and positive significant impact on inflation. The study recommends that the government should be mindful of increasing external debt as it will become inflationary in the long run.

INTRODUCTION

Most developing countries face the problem of mismanagement of resources due to corruption and embezzlement. This increased their budget deficit which result to external borrowing to cover up their savings-investment gap. Hence, external financing is primordial to facilitate investment in poor countries that usually face a budget deficit. The government borrows principal to increase welfare and stimulate growth which is either through taxation, seignorage, or debt (Ngangnchi & Joefendeh, 2021). However, failing to effectively utilize borrowed money increase the external debt stock of a country which results to inflationary pressure(Kwon et al., 2006a; Sims, 2016). Excessively borrowing by countries may also result in debt repayment difficulties which makes further borrowing difficult. The repayment of these debts is highly determined by exchange rate fluctuation in the forex market, which may increase the cost of paying the debt through inflation. This has made monetary authorities and policymakers increasingly worried over the effect of inflation pressure due to exchange rate appreciation and public debt (Philip and Oseni, 2012).

The nexus has been a subject of concern over time with heterogeneous conclusions among researchers(Aimola & Odhiambo, 2021). The monetarist believes inflation is a monetary phenomenon arguing that price level and real output may increase in the short run due to an expansionary monetary policy but only the price level may increase in the long run (Friedman, 1968). However, other studies have proven that inflation is no longer a monetary phenomenon but a fiscal policy problem (Lin & Chu, 2013; Nastansky & Strohe, 2015). In LDCs, high inflation, debt stocks, and poor economic performance are predominant due to fiscal deficit(Islam & Wetzel, 1991).

In Cameroon in particular, external debt has been growing at an alarming rate coupled with a very weak exchange rate currency. According to the magazine Business in Cameroon, Cameroon's public debt was estimated at CFA12,374 billion in September 2022, 11% higher than in the same period of 2021 which represents almost half the country's GDP (45.8%)(S.A, 2022). In addition, the appreciation of US dollar value makes Cameroon incur an extra cost of 3 billion CFA to finance its external debt in July 2022(Aboudi, 2022).

The World Bank data for Cameroon indicate that total external debt has been rising from 2011 onward (see Figure 1). Hence, Cameroon is at high risk of external and overall public debt distress as the value of public debt-to-GDP ratio is above the benchmark(Vivek et al., 2022). Even with the debt relief program of HIPC (heavily indebted poor countries) and MDRI (Multilateral Debt Relief Initiatives) to strip Cameroon off its debts, external debt has still been steadily rising (see figure 1). In fact, since 2010, total external plus domestic public debt augment to 35.2 % of GDP in 2016, doubling the median for SSA countries between 2009 to 2015 (Ngangnchi & Joefendeh, 2021). The World Bank statistics indicate that Cameroon's external debt as a percentage of GNI has increased from 24.4%, 27.8%, 33.1%, and 34.7% in 2017, 2018, 2019, and 2020 respectively.

This has also caused a continuous rise in inflation through rising prices (see Figure 2). These extreme levels of external debt hinders economies ability to invest as their limited income is used in debt servicing leading to a vicious cycle of debt and exposing the country to exchange rate risk. Atique & Kamran (2012) indicates that numerous poor countries become even more poorer after borrowing externally from World Bank, IMF, and Paris Club. This increasing deficit financing may worsen

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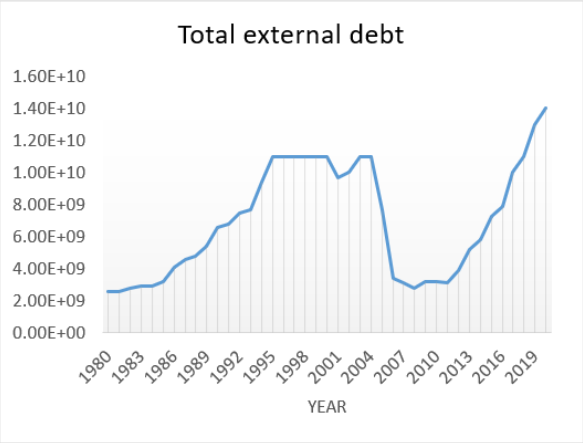

Figure 1: Cameroon total external debt
Source: Computed by authors from WDI

inflation leading to political pressure (Veronique & Jack, 2022). This excess debt further affects interest rates, which may crowd out private sector investments leading to lower productivity and low wages. External debt can have nonlinear impacts on inflation where a low level of indebtedness causes inflation to be low while a high level of indebtedness causes high inflation. Hence, the study aims to examine the positive and negative changes in external debt stocks and their effect on inflation in Cameroon. No study exists in Cameroon context that specifically examines the asymmetric relationship between external debt and inflation. Thus, this study fills the gap by providing answers on non-linearity in the external debt inflation nexus. The study is paramount as Cameroon is yet to establish a stable inflation rate.

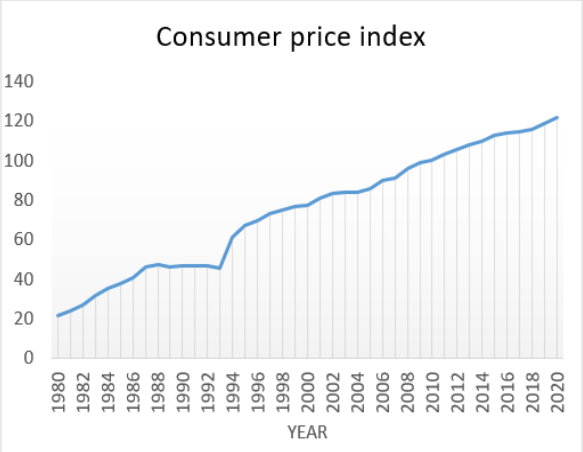

Figure 1: Consumer price index (CPI)
Source: Computed by authors from WDI, 2022

LITERATURE REVIEW

Theoretical literature

The most widely accepted theory of inflation is that inflation is a monetary phenomenon(Friedman, 1968). Friedman advocates that an expansionary monetary policy will increase both real output and the general price level in the short run but only the price level would increase in the long run (Aimola & Odhiambo, 2020). The theory argues that monetary authorities have control over price. Hence, for the government to contain its budget deficit, she must keep printing money and utilize the surplus budget to pay the debt.

The fiscal theory of price level (FTPL) which looks at the nexus between fiscal policy, public debt, and inflation also explains that it is not only money supply that determines inflation but inflation is influenced by other factors such as fiscal deficits and the debt(Farmer & Zabczyk, 2019). The theory claims that if the government has an unsustainable fiscal policy, then it will pay them off by inflating the debt away. The theory stipulates that the price level is determined by government debt. Hence, inflation breaks out when people don't expect the government to fully repay its debts(Bassetto, 2008). This theory is of relevance to developing countries like Cameroon as they lack the fiscal capacity to mobilize fiscal revenue giving rise to interest rates, higher taxes, and inflation. Keynes also argues that inflation is "a method of taxation" that the government uses to protect the use of real resources"(Keynes, 1971). Friedman proposed a fixed monetary rule where "the Fed should be required to target the growth rate of money to equal the growth rate of real GDP for price to remain unchanged" (Jahan & Papageorgiou, 2014).

Empirical literature review

Studies on the effect of external debt on inflation are inconclusive. The heterogeneity is based on case studies, estimation procedures, and the use of variables (Aimola & Odhiambo, 2021). However, many empirical studies have established a positive relationship between both terms. Mweni et al (2016) examine the effect of external debt on inflation in Kenya from 1972 to 2012. Regression results indicates that external debt have a positive and significant effect on inflation. Similarly, Baxter & Stockman (2011) indicates that an increase in the supply of money often leads to the upward price movement of goods and services. Likewise, Nguyen (2015) used PMG estimation and different GMM to investigate the effect of public debt on inflation in 15 less developed Asian countries for 22 years.

The study found public debt to have a positive and significant effect on inflation for GMM estimates while PMG estimation indicated that public debt is deflationary in the short run but inflationary in the long run. Equally, Heba (2021) found that external debt elevates prices both in the short and long runs in Egypt. His findings are consistent with that of Aisen, & Veiga (2006) who conclude that external finance deficit increases both inflation and interest rates. Also, Ekinci (2016) using simple linear regression conclude that a strong positive nexus exists between the consumer price index and external debt in Turkey from 2003 to 2015. Similarly, Mweni et al (2016) indicates that rising inflation rate increases the level of external debt in Kenya using OLS from 1972 to 2012. Their findings are contrary to that of Assibey-Yeboah & Mohsin (2014) who concluded that

external debt decrease when the inflation rate increase. Helmy (2021) using Egypt as a case study concludes that in the short run and long run, external debt deteriorates inflation. Similarly, Boshra (2023) indicates that in both the short and long run, inflation has a decreasing impact on external debt. Gathendu (2021) using the VECM in Kenya, Uganda, and Tanzania for 30 years found that external debt has a positive effect on inflation in the long run. He further indicates a unidirectional relationship between both terms. Lopes Da Veiga et al (2016) using 52 African from 1950 to 2012 reveals a positive link between high levels of public debt with inflation. Their finding is consistent with that of Afonso & Ibraimo (2018) who established a positive link between public debt and inflation in Mozambique using VAR. These findings are true with that of Lopes Da Veiga et al (2016) who further confirm that developing countries with high public debt witness a high rate of inflation.

In a related study, Reinhart & Rogoff (2010) revealed that rising public debt levels lead to higher inflation for emerging market economies. Romero & Marin (2017) using 52 countries from 1961 to 2015 indicates that for countries that have already experienced high public debt, a further increase in public debt will coincide with inflation. Kwon et al (2006) noted that rising public debt aggravates inflation for indebted developing countries but it weakly leads to inflation for non-indebted developing countries while it is absent in developed countries. Sunder-Plassmann (2020) investigate the link between sovereign debt, default, and inflation. The results reveal that increasing nominal foreign debt leads to inflation while domestic debt is less inflationary. In addition, Aimola & Odhiambo (2022) using a NARDL for 41 years, indicate that total public debt and inflation have an asymmetric relationship in the Gambia.

Other empirical investigations have found a negative relationship between external debt and inflation (Essien et al., 2016; Karakaplan, 2009; Taghavi, 2000; Wheeler, 1999). Karakaplan (2009) Support the hypothesis that for countries with well-developed financial market, external debt have less impact on inflation. Arisa (2020) using a SVAR method in Kenya from 1993 to 2018 indicates that changes in the external debt negatively affect inflation. El Aboundi & Khanchaoui (2021) reveals that low inflation makes debt repayment difficult in Morocco.

Other authors find evidence of threshold limit. Dumitrescu et al (2022) using 22 emerging nations examine the nonlinear effect of government debt on inflation. They conclude that shadow economy whose GDP exceeds 24.3% experience high costs of inflation while low shadow economy can accommodate increases in public debt without any cost associated with inflation. Reinhart & Rogoff (2009) indicates that when nations move from a lower debt ratio to a higher debt ratio, they suffer a median inflation rise from 6% to 16.5% per year. A study found an insignificant relationship between external debt and inflation. Aimola & Odhiambo (2021) found that the impact of public debt on inflation is statistically insignificant in both the short and long run in Nigeria from 1983–2018.

DATA AND METHODOLOGY

The study makes use of time series data from WDI spanning from 1980 to 2020. External debt, which is the dependent variable is measured in total external debt stock in dollars while inflation is measured by the consumer price index. Real exchange rate, trade openness, and domestic investment are control variables.

The study uses the nonlinear ARDL to explore the increasing and decreasing effect of external debt on inflations. The standard ARDL captures only the linear or symmetric relationship between variables but not nonlinear or asymmetric linkage (Shin et al., 2014). Hence, the standard ARDL is extended to incorporate the nonlinear dynamics amongst variables but maintain all the qualities of the conventional ARDL. The idea behind this model is to understand the effect of increasing or decreasing the regressors on the dependent variable. To investigate if external debt have a nonlinear relationship with inflations in Cameroon, the study adopts the NARDL of Shin et al (2014).

The general specification on NARDL is given as follows;

$$INFLA_t = b_0 + b_1 ED_T^{\pm} + b_2 ED_T^{-} + b_3 RER_t + b_4 TO_t + b_5 DI_t + \mu_{1t} \ldots\ldots 2$$

Where b_1 ED_T^{+} and b_2 ED_T^{-} are the partial sum of positive and negative changes in total external debt which is derived as follows

$$ED_T^{+} = \sum_{i=1}^{t} \Delta ED_j^{+} = \sum_{j=1}^{t} max\,(\Delta ED_J, O) \ldots\ldots 3$$

$$ED_T^{-} = \sum_{i=1}^{t} \Delta ED_j^{-} = \sum_{j=1}^{t} min\,(\Delta ED_J, O) \ldots\ldots 4$$

With the inclusion of all variables, the NARDL looks thus;

$$\Delta INFLA_t = b_{01} + \sum_{i=1}^{p} b_{1i} \nabla INFLA_{t-i} + \sum_{i=1}^{p} b_{2i}^{+} \Delta ED_{t-1}^{+} + \sum_{i=1}^{p} b_{3i}^{-} \Delta ED_{t-1}^{-} + \sum_{i=0}^{p} b_{4i} \Delta RER_{t-1} + \sum_{i=0}^{p} b_{5i} \Delta TO_{t-1} + \sum_{i=0}^{p} b_{6i} \Delta DI_{t-1} + b_7 INFLA_{t-1} + b_8^{+} ED_{t-1}^{+} + b_9^{-} ED_{t-1}^{-} + b_{10} RER_{t-1} + b_{11} TO_{t-1} + b_{12} DI_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots 5$$

Where; ED= external debt: RER= real exchange rate: TO= trade openness: DI= domestic investment, μ_{1t}=white noise error term; ∇ = The difference operator; b_1-b_6 are shortrun coefficient while b_7-b_{12} are longrun coefficient; p is the optimal lag length; b_0 is the constant; b_{2i}^{+} and b_{3i}^{-} are the short-run asymmetric coefficients while b_8^{+} and b_9^{-} capture the longrun asymmetric coefficient.

To ascertain the long run relationship in nonlinear or asymmetric ARDL, cointegration is primordial. Pesaran et al (2001) computed F-statistics is compared with the computed upper critical bound. The technic test the null hypothesis of no cointegration (Ho: $b_{7i}=b_8^{+}=b_9^{-}=b_{10i}=b_{10i}=b_{11i}=b_{12i}=0$ against the alternatives of cointegration (Ho:$b_{7i} \neq b_8^{+} \neq b_9^{-} \neq b_{10i} \neq b_{10i} \neq b_{11i} \neq b_{12i} \neq 0$). Once the computed F-statistic is greater than the critical values for the upper bound, cointegration is evidence.

To determine if long or short run asymmetry relationship

exists between inflation and external debt, the Walt test is used which tests the null hypothesis of short run or long-run symmetry against the alternative hypothesis of short run or long-run asymmetry(Aimola & Odhiambo, 2022). The long run representation of the ECM in the nonlinear equation 5 is given as follows;

$$\Delta INFLA_t = b_{01} + \sum_{i=1}^{p} b_{1i} \nabla INFLA_{t-i} + \sum_{i=1}^{P} b_{2i}^{+} \Delta ED_{t-1}^{+}$$
$$+\sum_{i=1}^{P} b_{3i}^{-} \Delta ED_{t-1}^{-} + \sum_{i=0}^{p} b_{4i} \Delta RER_{t-1} + \sum_{i=0}^{p} b_{5i} \Delta TO_{t-1}$$
$$+\sum_{i=0}^{p} b_{6i} \Delta DI_{t-1} + \lambda ECT_{t-1} + \mu_{1t} \ldots\ldots 6$$

Where ECT_{t-1} is the one-period lagged error correction term. The coefficient λ is the speed of adjustment and it must be significant and negative to show long run convergence.

RESULTS AND DISCUSSION

Unit root and cointegration test

Determining stationarity is vital to avoid spurious regression(Gujarati, 2004). This is also to make sure none of the variables are integrated of order two. The DFGLS of Elliott et al (1996) and Phillip Perron unit root test of Phillips & Perron (1988) are used to account for the presents of unit root. The results in Table 1 below reveals a mixed order of integration. However, these conventional unit root tests are usually weak in cases of structural breaks. Hence, the Zivot-Andrew unit root test which accounts for a single break point is also applied in this study(Andrews & Zivot, 1992). The results in Table 2 also reveals a mixed order of integration confirming the traditional unit root test. In all cases, the test statistics must be greater than the 5% critical value to affirm stationarity either at levels or first differences as indicated in both tables. This warrant the application of nonlinear ARDL applied in conditions of I(1) and I(0).

The results of the NARDL bounds test for cointegration in Table 3 indicates cointegration amongst the variables even at a 1% significant level. The calculated F-statistic of the NARDL bound test is greater than the upper bound at all critical values. Thus, the short and longrun relationship can be determined in the study.

Table 1: DFGLS and PP Unit root test

Test	Variables	Test statistics at levels		Test statistics at first difference		Decision
		With trend	With no trend	With trend	With no trend	
DFGLS	INFLA	-4.127	-2.89	----	----	I(0)
	logED	-1.648	-1.026	-2.661	-2.659	I(1)
	EXR	-2.131	-1.263	-4.353	-3.581	I(1)
	TO	-4.055	-2.29	----	----	I(0)
	logINV	-1.359	1.164	-4.234	-3.585	I(1)
PP	INFLA	-6.181	-5.768	----	----	I(0)
	logED	-1.588	-1.514	3.478	-3.528	I(1)
	EXR	-2.08	-1.579	-5.464	-5.543	I(1)
	TO	-6.184	-5.403	----	----	I(0)
	logINV	-2.414	-0.758	-7.22	-7.295	I(1)

Note: Test statistics @ 5% CV for no trend= -3.190 and -1.950 for trend for DFGLS
Test statistics @ 5% CV for no trend= -2.961 and -3.544 for trend for PP
Source: Computed by authors

Table 2: Zivot-Andrew unit root test

Variables	Test statistics at levels		Test statistics at first difference		Break date	Decision
	Break in trend	Break in intercept	Break in trend	Break in intercept		
INFLA	-6.202	-6.823	---	---	1987	I(0)
logED	-2.149	-4.609	-4.456	-4.68	2014	I(1)
EXR	-2.247	-5.269	---	---	1999	I(0)
TO	-6.272	-6.569	---	---	1987	I(0)
logINV	-2.149	-4.609	-4.456	-4.609	1997	I(1)

Note: Test statistics @ 5% CV for break in intercept= -4.80 and -4.42 for break in trend
Source: Computed by authors

The NARDL result presented in Table 4 above reveals the positive and negative short run and long run external debt stocks on inflations. The result of the positive external debt stocks on inflation is positive and significant in the longrun revealing that an increase in external debt stocks will increase inflations in the longrun. This finding is true with that of Mweni et al (2016) in Kenya. Also, positive and negative external debt stocks have a negative and positive impact on inflation in the shortrun respectively. Hence, an increase in external debt stocks will decrease inflation while a decrease will increase inflation in the shortrun. A negative exchange rate has a negative and significant effect on inflation in the longrun. That is a fall in the exchange rate will decrease inflations in the longrun but both the negative and positive exchange rates were insignificant in the shortrun. In addition, both positive and negative trade openness has a positive and significant effect on inflation in the longrun indicating

that an increase or decrease in trade openness increases inflation in the longrun while only positive trade openness has a positive and significant impact on inflation in the short run. Lastly, only negative domestic investment has a positive and significant impact on inflation in the longrun. However, it was significant but negative in the shortrun. The result further indicates that the cointegration equation is negative and significant as expected. It indicates that the rate of adjustment speed to long run equilibrium is 38.9%. The R-square value of 0.9689 indicates that about 96.9% of variation in inflation is explained in the model while 3.1% is explained by error term. The regression results are also of good fit as indicated by the adjusted R-square of 90.1%. The F-statistic value is significant at 1% suggesting the prediction of the overall model is a good fit.

Table 3: NARDL bounds test for cointegration results

F-statistics=61.938	Lower bound	Upper bound	**Conclusion**
1%	3.74	5.06	Cointegration even at 1% significant level
5%	2.86	4.01	
10%	2.45	3.52	

Source: Computed by authors

Table 4: Short and long run nonlinear ARDL estimates

variables	coefficient	Standard error	**p-values**
Longrun regression coefficient			
LogED_POS	0.077***	0.086	0.001
logED_NEG	-0.022	0.057	0.705
EXR_POS	0.002	0.007	0.73
Exr_NEG	-0.025**	0.009	0.02
TO _POS	0.399***	0.081	0
TO_NEG	0.404***	0.081	0
LogDI_POS	-0.101	0.166	0.556
LogDI_NEG	0.957*	0.521	0.091
constant	6.802***	1.307	0
Model statistics			
R-square			0.9689
Adj R-squared			0.9015
Prob (F-statistic)			0
F-statistic			14.37
Shortrun regression coefficient			
ΔlogED_POS	-9.297**	3.509	0.021
ΔlogED_NEG	4.041*	4.041	0.059
ΔEXR_POS	0.0031	0.003	0.764
ΔEXR_NEG	-0.002	0.004	0.634
ΔTO_POS	0.307*	0.171	0.097
ΔTO_NEG	0.293	0.171	0.113
ΔlogDI_POS	0.059	0.11	0.604
ΔlogDI_NEG	-0.447*	0.238	0.085
Cointegration. equation	-0.389***	0.074	0
Diagnostics Test			
Breusch-Godfrey LM test			0.3303
Portmanteau test			0.6204
Breusch/Pagan heteroskedasticity test			0.4011
ARCH test			0.7967
Ramsey RESET test			0.1747
Jarque-Bera test on normality			0.8267

*Note: *** denotes 1 % significant level, ** 5%, and * 10%, Source: Computed by authors*

The diagnostic tests in Table 4 reveals that all post estimation test are insignificant. Hence, there is no autocorrelation, heteroscedasticity, no ARCH effect, misspecification error, and non-normality respectively. The model is also stable as indicated in appendix 3.

The Walt test results in Table 5 indicate a long run increasing and decreasing asymmetry effect of external debts on inflation. The alternative hypothesis that the variables in the long run, are asymmetric is accepted. The positive and negative partial sums of squares support an asymmetric relationship in the model. When the external debt increases, it decreases inflation by 23.15% but when external debt decreases, it increases inflation by 11.97%. No short run asymmetry effect was found to exist in the study.

Table 5: Short-run and long-run asymmetry test

Walt test	F-test	p-values	Decision
Long run asymmetry(+)	23.152	0.000	Positive long run asymmetry nexus exist
Long run asymmetry(-)	11.973	0.046	negative long run asymmetry nexus exist
Short run asymmetry	0.006145	0.938	Short run asymmetry nexus does not exist

Source: Computed by authors

CONCLUSION AND RECOMMENDATION

External debt is an unavoidable condition for countries with low financial strength to boost growth and development. However, external debt if not properly managed can lead to budget deficit, inflationary pressure, and trap a country in the vicious circle of debt financing. This study was out to examine the effect of external debt stocks on inflations. To examine the increasing and decreasing impact of external debt stocks on inflation, the study adopts the nonlinear ARDL approach. The results indicate a long-run increasing and decreasing asymmetry effect of external debts on inflation. Only the coefficient of positive external debt stocks on inflation is positive and significant in the long run while in the short run, a positive and negative external debt stocks both have a negative and significant impact on inflation. Based on this conclusion, the study recommends that the Cameroon government should initiate strategies to reduce its external debt stocks such as reproductive debt strategy, increase accountability in the use of borrowed money, and debt refinancing. This will boost revenue with much lower taxes and decrease inflation.

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