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The Ivorian External Debt: Is there a threshold?

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Abstract: *The objective of this study was to determine the threshold level of public external debt to GDP ratio for Cote d'Ivoire and compare it to the current trend of public debt. The authors used an ARDL approach to test the hypothesis of long run dynamics. The data used ranged from 1980 to 2018. The results found that the null hypothesis of no cointegration was rejected. Thus external debt and economic growth together with other variables are cointegrated. In addition, the indebtedness variable had a significant nonlinear effects on economic growth and indicate an optimum external debt to GDP ratio set at 59.53%. Looking at the current level of external debt to GDP ratio which stood at 31.6%, it is clear that the country still has borrowing space.*
Keywords: External debt, Economic growth, ARDL, Cote d'Ivoire.

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I. Introduction

In an increasingly uncertain global context with the insufficiency of financial resources necessary for the implementation of States' development programmes, the issue of debt and its impact on growth is still a major concern for economic policy managers.Debates on debt and growth, which began several years ago, continue to oppose several economic scholars. These debates are stimulated by recent developments marked by the increase in public debt in some countries, particularly African countries that have benefited from the Heavily Indebted Poor Countries Initiative (HIPC), at a time when economic growth rates are struggling to reach fairly satisfactory levels capable of promoting wealth creation.

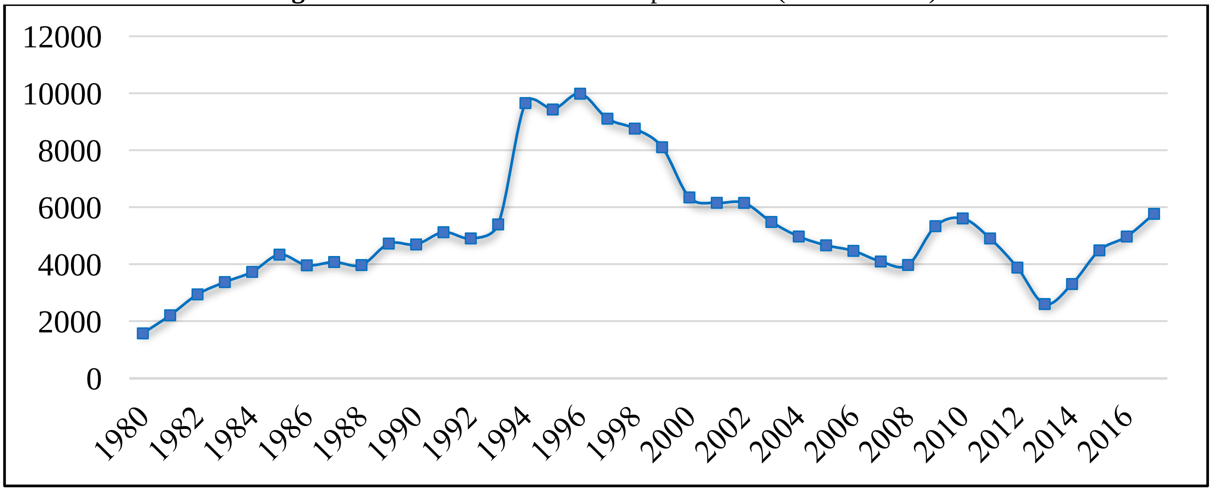
These debates are also helped by the controversies that have arisen from the work of Reinhart and Rogoff (2010), who argued that when public debt held by the rest of the world exceeds 60 per cent of GDP, growth falls by two percentage points and when it exceeds 90 per cent of GDP, growth rate turns negative. The above thresholds are not acceptable to all scholars. Indeed, Greenidge et al (2012) found that for debt levels below 30% of GDP, increases in the debt-to-GDP ratio associated with faster economic growth whereas when the above ratio reaches 55% of GDP its impact on economic growth turns from positive to negative. Baum et al. (2012) found that for high debt-to- GDP ratio, which is ratio above 95%, additional debt has negative impact on economic growth. Patillo et al. (2002 and 2011) found that for developing countries the impact of debt-to-GDP ratio on economic growth becomes negative when the ratio is between 35 to 40%. In a recent study on Cote d'Ivoire, N'Zué (2018) found that beyond external debt-to-GDP ratio of 42.9% additional external debt negatively affect economic growth.

Cote d'Ivoire is a small West African country that has experienced rising public debt like many African countries after the Heavily Indebted Poor Countries Initiatives (HIPC) in the 2000s. The country's public debt has been on the rise to the extent that the International Monetary Fund (2017) called the attention of the country's authorities on the potential risk of high debt distress. It is in view of the above that we would like to investigate the extent to which there is a threshold for public debt-to-GDP ratio beyond which additional public debt will negatively impact the country's economic performance. Thus, the main objective of this paper is to determine the threshold of public debt to GDP ratio for Cote d'Ivoire and compare it to the current trend of public debt. The specific objectives are 1) to determine the impact of the public debt-to-GDP ratio on the country's economic performance; 2) determine the threshold level of the public external debt-to-GDP ratio beyond which economic growth would turn negative.

II. Stylized facts.

Côte d'Ivoire's debt increased from a relatively low level in the early 1980s (see Figure 1), from CFAF 1,576.66 billion (21.73% of GDP) in 1980 to CFAF 5,400.16 billion (68.04% of GDP) in 1993. During this period, the debt/GDP ratio reached an average of 57%. The debt increased sharply between 1993 and 1999, by CFAF 5,400.16 billion and CFAF 8,761.85 billion (77.54% of GDP) respectively. This debt resumption is directly linked to the devaluation of the CFAF in 1994, when the debt amounted to CFAF 9,657.88 billion (119.20% of GDP), which was an increase of 78.88%.From the year 2000, a downward trend was observed until 2008, resulting essentially from the debt cancellation (HIPC) and the External Debt Relief Initiatives.

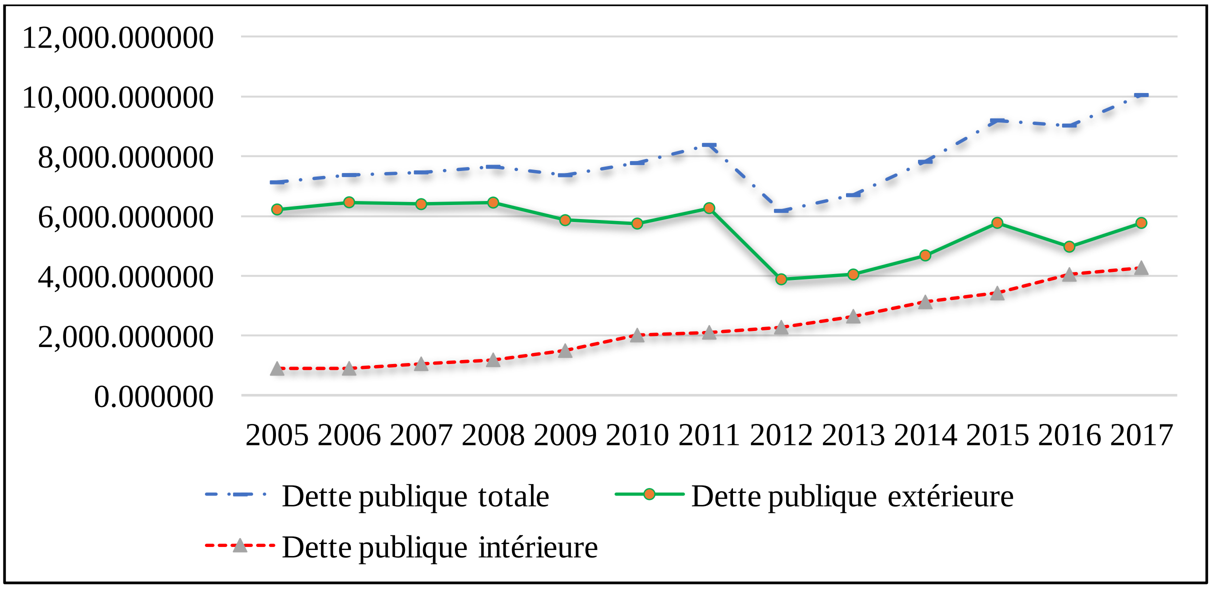
Figure 1 : Evolution of the stock of public debt (CFAF billion)



Source : BCEAO

When Figure 2 is considered, it is observed that from 2013 to 2016, Total outstanding debt increased from CFAF 6,627.57 billion to CFAF 9,023.23 billion, i.e. an increase of 34.73%. In 2017, it reached CFAF 10,045.08 billion, i.e. 45.3% of GDP. External debt represents the highest share of the country's total debt compared to domestic debt. Thus, its trend mirrors that of total public debt. . Unlike external debt, domestic debt has been on an upward sloping trend. Indeed, it has been increasing steadily from 2005 to 2017. This is an indication of the country's presence on the domestic and regional financial market.

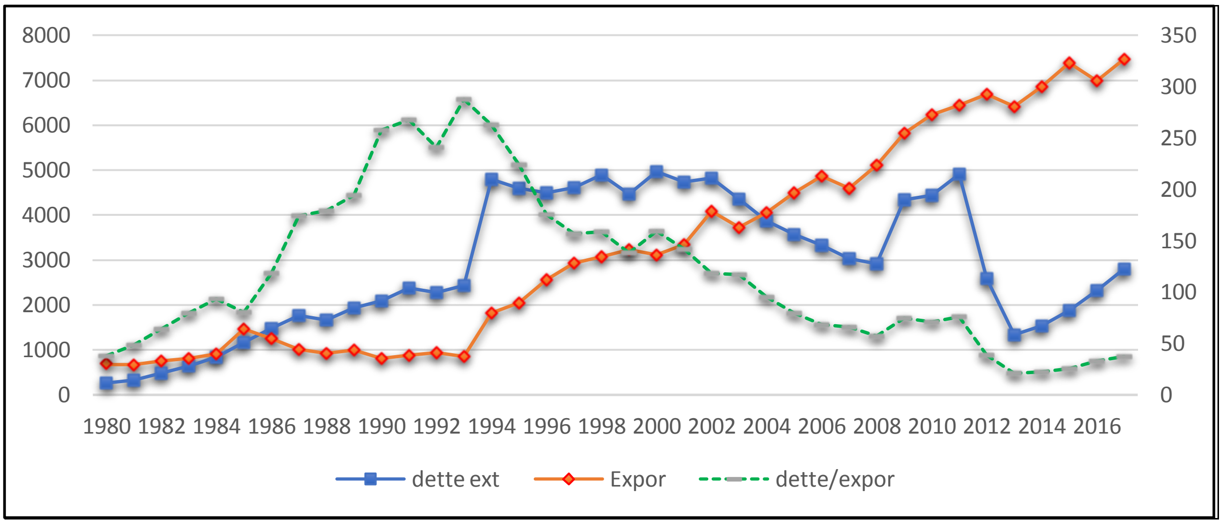
Figure 2 :Trend of total outstanding public debt, external and domestic debts from 2005 to 2017 in CFAF billion.



Source : Direction Générale de l'Economie

The trend of the ratio of external debt to exports of goods and services is considered in Figure 3. This indicator shows whether or not the Government can meet its commitments to the rest of the world given the trend of external debt's growth. This indicator is a useful barometer of a country's repayment capacity. If this ratio increases over time, it means that the external debt is increasing faster than the country's export earnings. It will suggest that the country may face difficulties in meeting its future obligations. It is observed that this indicator was upward sloping from 1980 to 1993 just before the devaluation of the country's currency in 1994. It stood at 287.57% its highest level ever. After the devaluation, external debt to GDP ratio declined steadily going from 262 % in 1994 (year of the devaluation) to 37.49% in 2017. This trend clearly indicates efforts undertaken by the country to meet with its commitments with the rest of the world. This trend of the external debt-to-exports ratio could be explained by the steady increase of the country's exports of goods and services over the period of analysis whereas at the same time registered an initial increase from 1980 to 1994, stabilized till 2002 before declining to 2008. After 2008 there was a sharp increase till 2011 the year of the country's social unrest that mutated into a civil war causing the external debt to drop from CFA F 4,907 billion to CFA F 1,342 billion in 2013 representing a decrease of 72%. From 2013 going forward external debt has been on the rise.

Figure 3 Trend of external debt, exports of goods and services and external debt-to-export ratio from 1980 to 2017



Source: BCEAO

III. Review Of Selected Literature

The debate between economic growth and indebtedness is relatively old, one of the pioneers being Cairnes (1874), and owes its revival to the theories of endogenous growth. Mainly since the 1980s, two schools of thought have been arguing over the nexus between growth and public debt, namely the Keynesians and the neoclassicals.For the Keynesians, the main idea is that debt does not cause burdens for present and future generations because of the investments it generates. Thus, debt boosts demand and the accelerating effect of increased investment leads to an increase in production. This argument is reinforced by Rina et al. (2004),who argued that external debt has the potential to stimulate economic growth, provided it is used to finance investment. For these authors, there is a threshold above which debt negatively influences economic growth. Indeed, when the return on capital is declining, the benefits of any new investment on economic growth may diminish as debt increases. It is this approach that gave rise to a "Laffer Curve" that illustrate the relationship between external debt and per capita income growth.

For the neoclassicals, debt is seen as a future tax. According to them, public debt has a negative effect on the accumulation of capital and consumption of future and present generations.Sargent and Wallace (1981) argued that sustainable debt leads to a higher growth rate than the real interest rate on bonds. Thus, government revenues grow faster than the interest rate on debt on the basis of the assumption of a unit elasticity between the budget balance and economic activity. Krugman (1988) andSachs (1989) predicted that high debt is detrimental to economic growth, since it discourages investment. According to these authors, when debt exceeds a country's internal resources, that country may no longer be able to repay past loans, which will act as a disincentive to creditors and potential investors. Another scholar in line with this approach is Barro (1990). According to him, debt is neither a source of wealth for the current generation nor a bridge between generations because of agents' anticipation of future taxes. Thus, part of the debt will be transferred to the future generation (tax debt) whereas the other part is offset by public securities and itexplains why substituting borrowing for taxation does not necessarily lead to growth.

On the empirical side, several studies have been undertaken to investigate the nexus between public debt and economic growth. Indeed, Pattillo and Poirson (2002) tested whether debt and growth were related in a panel data setting for a period ranging from 1969 to 1198 and covering 93 countries. They found that the relationship between public debt and growth is best captured by an inverted U-shaped curve (Laffer curve). They also found that the impact of external debt on GDP per capita growth starts to be negative when the net present value (NPV) of the debt exceeds 160-170% of exports and 35-40% of GDP. However, Clements, et al. (2003) found lower thresholds. Using both fixed-effects and system generalized method of moment methods, theyfound threshold values of about 50% of GDP for nominal value and 20-25% of GDP for its net present value of debt, external debt reduces economic growth.

Greenidge et al (2012) studied the threshold effects between public debt and economic growth in the Caribbean. Their study confirmed the existence of a debt threshold in relation to gross domestic product (GDP) of 55-56%. They also found that debt dynamics began to change long before this threshold was reached. Specifically, at debt levels below 30% of GDP, higher debt-to-GDP ratios are associated with fast economic growth. However, as the debt level rises above 30%, the effects on economic growth diminish rapidly and at debt levels reaching 55-56% of GDP, the impacts on growth shift from positive to negative. Thus, above this threshold, debt becomes a drag on growth.

Mencinger et al (2014) studied the direct effect of higher debt on economic growth for 25 European Union (EU) countries. Their sample of EU countries was divided into subgroups to distinguish between "old" Member States, covering the period 1980-2010, and "new" Member States, covering the period 1995-2010. Using a panel estimation method, they confirmed the existence of a non-linear relationship between public debt-to-GDP ratio and growth rate. They also found that the threshold for the debt-to-GDP ratio should be approximately between 80 and 90% for the "old" Member States. However, for the "new" Member States, the debt-to-GDP ratio threshold is lower and was between 53 and 54%.

Wade (2015), estimated the impact of total public debt as a percentage of GDP on the growth rate of GDP per capita using a PSTR (Panel Smooth Transition Regression Model) and the GMM method. The study included the eight (8) WAEMU countries and covered the period ranging from 1980 to 2011. The author found that with the GMM method an optimal public debt-to-GDP ratio that stood at 48.8%, while with the PSTR gives the threshold was at 49.8%.

N'Zué (2018),followingPatillo et al (2002)with data ranging from 1970 to 2015, studied the relationship between debt and growth in Côte d'Ivoire. He estimatedthe threshold beyond which debt accumulation will have a negative impact on growth to be 42.9%.

IV. Data and methods of analysis

Following past research work i.e. Patillo et al (2002) and N'Zué (2018), a production function à la Solow (1956). The theoretical framework is that of the neoclassical growth theory where output (Y) is a function of labour (L) and capital (K). The production function is represented by the following model:

$$Y_t = Af(L_t, K_t) \quad (1)$$

Where L and K are as previously defined and A is a parameter that captures the effect of other factors on output. By definition, A measures total factor productivity (TFP). It is through A that the effect of government debt on economic growth is captured.

Using the above formulation and referring to recent work, additional variables (control variables) are included in the model to help explain output. These variables include: government debt as a percentage of GDP. This variable enters the model in a linear and quadratic terms. The quadratic term enables us to determine the threshold if it exists. The other set of control variables include inflation, gross fixed capital formation, voting age population (used as a proxy for labor). It is important to recall that control variables are included in the initial model (equation 1) to improve model specification and determine the effects of these other variables on the dependent variable. Equation 1 is rewritten as follows:

$$Y_t = \alpha_t + \beta X_t + \gamma Det_t + \varepsilon_t \quad (2)$$

Where, Y_t: is the dependent variable;$X_t$is a set of control variables, $Det_t$is our variable of interest, α_t, β, γ are parameters to be estimated.t is the time period and rang from 1980 to 2018. ε_t isthe error term.

As indicated earlier, the control variables of the model include the capital variable which is proxied by gross fixed capital formation ($fbcf_t$).It measures the impact of physical capital in the production process; its coefficient is expected to be positive; the inflation rate ($Inflat_t$), captured through the consumer price index, the budget deficit ($Solde_t$) is included to capture the impact of fiscal policies on growth and its coefficient is expected tobe positive; the trade openness indicator **(**$Open_t$) is the ratio of the sum of exports and imports to GDP. It is introduce to capture the extent to which transfer of knowledge / technology through trade impacts economic growth.Thecoefficient associated with this variable is expected to be positive. The other variables are the public external debt-to-GDP ratio ($Debt_t$), the terms of trade **(**$Term_t$), and the working age population as a percentage of total population(Pop_t). The linear term of the public external debt-to-GDP ratio is expected to be associated with a positive coefficient whereas that of its quadratic term is expected to be negative. The terms of trade is obtained by taking the ratio of the unit value of exports index over the unit value of imports index. It captures the effects of external stocks on the Ivorian economy which is dependent on the exports of agricultural products (coffee, cocoa, cotton, and cashewnut etc.). It is expected to be associated with an ambiguous sign. A positive coefficient will be an indication that the terms of trade have been beneficial to the country's economic performance whereas a negative sign will indicate the extent to which the terms of trade have been harmful to the country's economy. The working age population is the population aged between 15 and 64 years taken as a percentage of the total population. It is worth indicating that the variables are transformed using their natural logarithm (*ln*).

The dataset used ranged from 1980 to 2018 and are mainly obtained from the World Development Indicator (WDI) database of the World Bank, the Directorate General of Economy (DGE) and the BCEAO database.

Given the time series nature of the data at hand, it is important to assess its characteristics. This include testing for stationarity given that regression of nonstationary variable on other nonstationary variables can lead to spurious regression. Once the assessment of the time series characteristics of the variables is completed the following step will be to investigate the long run dynamics of the model.This is done by conducting cointegration tests to assess the extent to which the variables in the model move together in the long run or not. This will be done using an *ARDL* approach and the Bounds test proposed by Pesaran, Shin and Smith. (2001 and 2004).To undertake the Bounds test it is important to reformulate the initial model in a way that captures both short and long run dynamics. The generalized *ARDL(p,q)*model is as follows :

$$Y_t = \alpha_t + \sum_{i=0}^{p} \delta_i Y_{t-i} + \sum_{i=0}^{q} \beta'_i X_{t-i} + \varepsilon_t \qquad (3)$$

Where Y_t is the endogenous variable, X_t represents the explanatory variables and are allowed to be *I(0)* or *I(1)*; α is a constant,δ and β are parameters to be estimated ; p and q are optimal lag orders determined using the Akaike information Criterion (AIC) ; ε_t is the error term. With the optimal lags at hand, the above model is rewritten as an unrestricted Error Correction Model (*ECM*) also called conditional *ECM* or conditional *ARDL(p,q)* which is presented below:

$$\Delta lnPibh_t = \alpha_t + \delta_1 lnpibh_{t-1} + \delta_2 lnTerm_{t-1} + \delta_3 lninfcbf_{t-1} + \delta_4 lnOpen_{t-1} + +\delta_5 Solde_{t-1} + \delta_6 lnDebt_{t-1} + \delta_7 lnDebtsq_{t-1} + \delta_8 lnInflat_{t-1} + \delta_9 lnpop_{t-1} + \sum_{i=0}^{q} \beta_{1i} \Delta lnpibh_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta lnTerm_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta ln\, Fcbf_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta lnopen_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta Solde_{t-i} + \sum_{i=0}^{q} \beta_{6i} \Delta lnDebt_{t-i} + \sum_{i=0}^{q} \beta_{7i} \Delta lnDebtsq_{t-i} + \sum_{i=0}^{q} \beta_{8i} \Delta lninflat_{t-i} + \sum_{i=0}^{q} \beta_{9i} \Delta lnpop_{t-i} + \varepsilon_t \qquad (4)$$

The coefficients β_1 to $\beta_9$represent the short-term dynamics whereas the coefficients $\delta_1$to $\delta_9$represent the long-term dynamics of the model. The Bounds test for cointegration is equivalent to testing the following hypotheses for the above equation:

$$\begin{cases} H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = 0 \\ H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq \delta_9 \neq 0 \end{cases} \qquad (5)$$

This test is currently a test of the hypothesis of nocointegration among the variables (H_0) against the alternative that the variables are cointegrated (H_1) as shown above. The statistics underlying this test is the F-statistics (Pesaran et al 1999). The calculated value of the Fisher statistic is used to decide whether or not the series are cointegrated. The asymptotic distribution of this test is non-standardized under the null hypothesis of no cointegration between variables. However, Pesaran et al (2001) have provided asymptotic critical values bounds for ll classifications of the regressors into I(1) and or I(0). Thus, if the calculated F statistics is greater than the upper bound, the null hypothesis is rejected and cointegration occurs. If it is lower than the lower bound then the null hypothesis cannot be rejected. The conclusion therefore that there is no cointegrating relationship among the variables. If the F-statistics are between the two bounds, the test is inconclusive. When a long-term relationship exists, the model can be rewritten to show the speed of adjustment after an exogenous shock. The model is presented below:

$$\Delta lnPibh_t = \alpha + \sum_{i=0}^{q} \beta_{1i} \Delta lnpibh_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta lnTerm_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta ln\, Fcbf_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta lnopen_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta Solde_{t-i} + \sum_{i=0}^{q} \beta_{6i} \Delta lnDebt_{t-i} + \sum_{i=0}^{q} \beta_{7i} \Delta lnDebtsq_{t-i} + \sum_{i=0}^{q} \beta_{8i} \Delta lninflat_{t-i} + \sum_{i=0}^{q} \beta_{9i} \Delta lnpop_{t-i} + \rho EC_{t-1} + \varepsilon_t \qquad (6)$$

Whereρ is the speed of adjustment, it is expected to be negative and significant and EC is the error correction variable i.e. the residuals obtained from the estimation of the cointegrated model equation.

After the estimation of equation 4, the threshold of public debt-to-GDP ratio is obtained by taking the first derivative of the dependent variable with respect to the debt variable and set to equal zero (equation 7 below).

$$\frac{\partial lnPibh_t}{\partial lnDebt_{t-1}} = \beta_6 + 2\beta_7 lnDebtsq_{t-1} \quad (7)$$

$$\Rightarrow \frac{\partial lnPibh_t}{\partial lnDebt_{t-1}} = 0 \quad (8)$$

$$\Rightarrow \beta_6 + 2\beta_7 lnDebtsq_{t-1} = 0 \quad (9)$$

$$\Rightarrow ln\widehat{Debtsq}_{t-1} = \frac{-\beta_6}{2\beta_7} \text{with } (\beta_7 < 0) \quad (10)$$

$$\Rightarrow \widehat{Debtsq}_{t-1} = e^{(-\beta_6/2\beta_7)} \quad (11)$$

Equation 11 enables the computation of the estimated threshold level of the public debt-to-GDP ratio.

V. Empirical results and discussions

This section presents and discuss the empirical results. It starts with the descriptive statistics presented in Table 1 below. It can be observed that on average gross fixed capital formation has been very low. Indeed, it stood at 13.2% below the ECOWAS regional threshold set at 20%. External debt to GDP ratio stood at 56.5% on average. The minimum debt to GDP ratio was 19.78% and was registered in 2013 after the country benefited from the Highly Indebted Poor Countries (HIPC) initiative. The highest debt to GDP ratio (147.67%) was registered in 1990.

Table 1: Results of the descriptive statistics of the variables of interest

Variables	Obs	Mean	Std. Dev.	Min	Max
$Term_t$	39	155.729	39.245	77.420	259.620
$Fbcf_t$	39	14-026	5.524	4.700	26.540
Pop_t	39	53.067	0.928	51.861	55.200
$Pibh_t$	39	1055.893	419.422	605.260	2303.610
Inflat	39	66.864	24.996	26.700	103.000
$Open_t$	39	69.167	13.312	43.510	90.320
$Debt_t$	39	99.695	51.035	23.870	209.240
$Solde_t$	39	-277.315	249.114	-998.412	98.219

Source: Author's calculations

The time series characteristics of the variables were analyzed (see Table 2). The results show that with the exception of the inflation variable that is integrated of order 0 i.e *I(0)*, all other variables are integrated of order 1 i.e. *I(1)*.

Table 2: Results of the Unit root tests using the Augmented Dickey Fuller and Philip Perron tests

Variables	ADF		PP		Decision
	Level	1st difference	Level	1st difference	
$lnpib_t$	0.254 (0.975)[a]	-4.240 (0.000)	-0.008 (0.958)	-5.294 (0.000)	*I(1)*
$solde_t$	-0.571 (0.877)	-4.356 (0.000)	-0.603 (0.870)	-4.179 (0.001)	*I(1)*
$lnterm_t$	-2.371 (0.150)	-7.797 (0.000)	-2.256 (0.186)	-8.145 (0.000)	*I(1)*
$lndebt_t$	-0.223 (0.936)	-6.208 (0.000)	-0.318 (0.978)	-6.188 (0.000)	*I(1)*
$lninfl_t$	-1.740 (0.411)	-4.420 (0.000)	-2.243 (0.191)	-4.303 (0.000)	*I(1)*

$lngfcf_t$	-3.043 (0.031)	-8.662 (0.000)	-3.022 (0.033)	-8.602 (0.000)	*I(0)*
$lnopen_t$	-0.678 (0.852)	-4.866 (0.000)	-1.203 (0.672)	-4.910 (0.000)	*I(1)*
$lndebtsqr_t$	-0.247 (0.932)	-6.161 (0.000)	0.123 (0.968)	-6.144 (0.000)	*I(1)*
$lnpop_t$	0.580 (0.987)	-2.867 (0.003)	0.801 (0.992)	-2.879 (0.048)	*I(1)*

Source : Author's calculations.[a]Numbers in parentheses are p-values

The above results i.e. mixture of *I(0)* and *I(1)* variables, confirm the use of the*ARDL(p,q)* approach to test for cointegration.The results of the Bounds tests are presented below in Table 3. The calculated Fisher statistic is compared to the critical bound test values tabulated by Pesaran et al (2001) without restriction on the constant and the trend. The null hypothesis of the test is that there is no cointegrating relationship against the alternative hypothesis that there is a cointegrating relationship. The value of the calculated Fisher statistic is **4.910**. It is higher than the all the critical values considered i.e. 1%, 5% and 10%. The null hypothesis of no cointegration cannot be accepted. It is therefore concluded that there is a cointegrating relationship among the variables meaning that they move together in the long run.

Table 3. Bounds Test for cointegration among variables of interest for *ARDL (1,8)*

***H_0*➔**	**No levels relationship**	
F-stat =	**F = 4.91**	
k=8	**[I(0)**	**I(1)]**
Critical value at 10%	[1.95	3.06]
Critical value at 5%	[2.22	3.39]
Critical value at 1%	[2.79	4.10]
Accept H_0 if F_{stat}< Critical Value for I(0)Regressors		
RejectH_0 if F_{stat}>Critical value for I(1)Regressors		

Author's calculation.

With the above result we move to estimate the short- and long-term dynamics. The results are presented in Table 4 below.

Table 4: Results of the estimated *ARDL*(1,8) model (1).

Variables	Dependent variable : Per Capita Gross Domestic Product	
	Coefficients	Probability Value
	Long run dynamics	
Detteq	**0.445***	**0.076**
LogDette	**-4.237***	**0.067**
Loginflat	**1.266****	**0.020**
Logfbcf	0.042	0.729
Logpop64	**-23.717****	**0.039**
Logtermes	0.693	0.106
Logopen	-0.270	0.491
Solde	-0.0001	0.805
CointEq (-1)	**-0.322****	**0.003**
	Short run dynamics	
Detteq	-0.324***	**0.003**
LogDette	2.648***	**0.005**
Logtermes	-0.170*	**0.075**
Logopen	-0.355***	**0.027**
Solde	0.0001	0.151
C	33.279**	**0.018**
R-square*➔*0.870	***Adjusted Rsquare*➔0.791**	
Autocorrelation test (Breusch – Godfrey)		
F-statistics =6.61	P-value F = **0.004**	
Heteroskedascticity Test (Breusch – Godfrey)		
F-statistics =8.30	P-value F = 0.**405**	
Normality Test (Jarque Bera)➔Pvalue = **0.493**		

Test de Ramsey		
F-statistics=0.91	P-value F(3.27)= **0.44**	

Source: Author, based on UNCTAD and WDI data (2018). Asterisks *, **, *** indicate significance at 10%, 5% and 1% respectively

Looking at the above table we observe that in the short run debt is positively related to growth and the coefficient associated with the squared variable is negative. This is an indication that in the short run there is an optimum level of debt beyond which it will negatively affect growth. It is also observed that the terms of trade and openness variables are negatively associated to growth in the short run. Their coefficients are -0.170 with p-value of 0.070 and -0.350 with p-value of 0.020 for Terms of trade and openness respectively. The adjustment coefficient is negative and statistically significant confirming the cointegrating relationship among the variables. When the long run dynamics are considered, it is observed that all the variables are significant with the exception of the investment, terms of trade, openness and fiscal balance variables. It is also observed that the coefficient associated with the debt variable is negative unlike that of the short run. The population variable is negatively associated with growth and statistically significant.

With the above results (short run dynamics) and using equations 10 and 11 it is possible to estimate the optimum level of debt beyond which additional debts will negatively affect the country's economic performance. Let's recall equations10 and 11.

$$ln\widehat{Debtsq}_{t-1} = \frac{-\beta_6}{2\beta_7}, \widehat{Debtsq}_{t-1} = e^{(-\beta_6/2\beta_7)}$$

β_6 is the coefficient associated with the debt variable in equation 6. It equals 2.648. $\beta_7$is the coefficient associated with debt squared variable in equation 6. It equals -0.324.

$$ln\widehat{Debtsq}_{t-1} = \frac{-2.648}{2*(-0.324)} = 0.08642 \rightarrow \widehat{Debtsq}_{t-1} = e^{(-\beta_6/2\beta_7)} = e^{0.08642} = 59.53$$

Thus, the optimal level of the Ivorian debt to GDP ratio is 59.53%. Beyond this point, additional debt will negatively impact the country's economic performance.

VI. Conclusions And Recommendations

The objective of this study was to determine the threshold level of public external debt to GDP ratio for Cote d'Ivoire and compare it to the current trend of public debt. More specifically, the study seeks to determine the impact of the public external debt-to-GDP ratio on the country's economic performance and determine the threshold level of the public external debt-to-GDP ratio beyond which economic growth would turn negative.Using an ARDL approach the hypothesis of long run dynamics could not be rejected. Thus external debt and economic growth together with other variables are cointegrated. In addition, the following results were obtained. In the long run,

- ❖ A 1% increase in the stock of public debt leads to a decrease in GDP per capita by-4.189% ;
- ❖ A 1% increase in the working-age population leads to a -23.59% decrease in GDP per capita ;

In the short run we have the following results:

- ❖ External debt has a positive impact on the country's economic performance up to a threshold level set at 59.53%. Looking at the current level of external debt to GDP ratio which stood at 31.6%, it is clear that the country still has borrowing space.

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