

## **TOGOLESE ECONOMY: WHAT TEACHING ON THE THRESHOLD OF INDEBTEDNESS?**

### **ECONOMIE TOGOLAISE: QUEL ENSEIGNEMENT AU SEUIL DE L'ENDETTEMENT?**

**Dr. Franck Essosinam KARABOU**

Doctor in Economics/ Lecturer at University of Kara

Faculty of Economics Sciences and Management (FASEG)

University of Kara/Togo

E-mail : [kfranck2008@gmail.com](mailto:kfranck2008@gmail.com)

[kfranck2013@yahoo.fr](mailto:kfranck2013@yahoo.fr)

#### **Abstract:**

If it has been empirically demonstrated that public debt has a positive impact on investment and growth as long as it remains below a given optimal threshold, beyond that threshold, the debt becomes unsustainable. Thus, the purpose of this paper is to assess the optimal debt threshold and the contribution of the quality of institutions to the country's economic growth. The results of the estimates show that in the short and long run, the quality of institutions and inflation negatively affect economic growth, while external debt, government spending and trade openness have a positive and significant effect on economic growth. Note, however, that in the long run the negative effect of the quality of institutions is not significant.

The optimal debt threshold corresponds to the marginal impact of the debt, identified by the quadratic method. After evaluation, this threshold is approximately 83% (82.66%). This rate represents the level of debt beyond which the marginal impact of debt on economic growth becomes negative.

**Keywords:** Debt threshold, institutional quality, economic growth.

**JEL Classification :** H68, O43, F34.

## **1. Introduction**

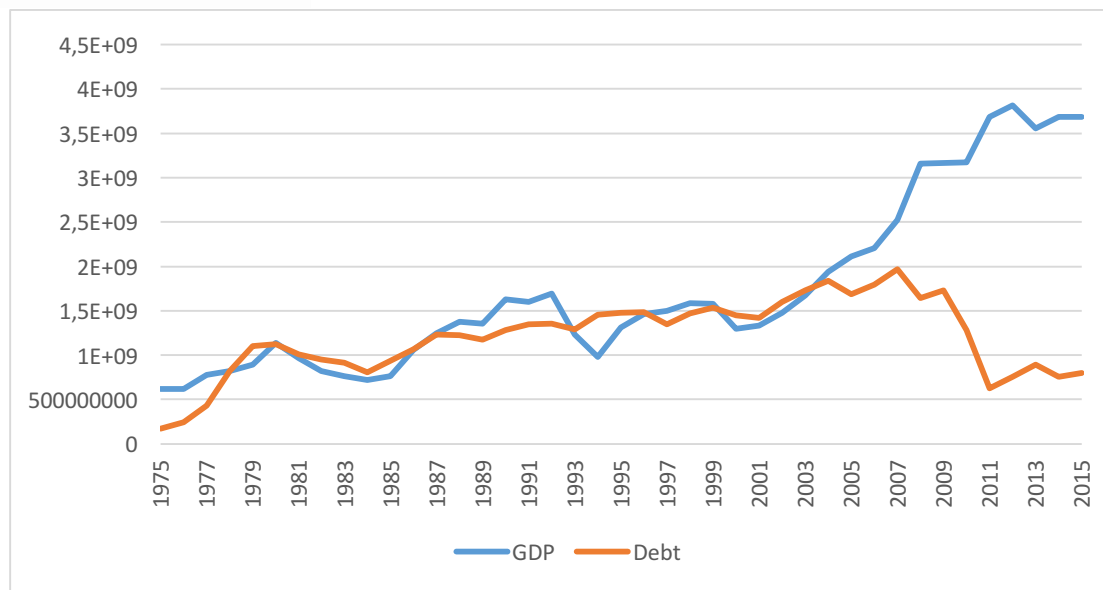
Started at the United States towards the end of 2007, the subprime crisis that turned into a financial crisis then widespread in economic crisis caused a very strong deterioration of the budgetary positions of the Western countries and specifically those of the euro zone Greece, Spain, Italy and Portugal, both with high budget deficits and increased public debt. This has brought to light an evil that is eating away at many countries around the world, the debt crisis. Debt has long been a major problem for both the individual and the state in general. Today, the weight of the public debt has returned to the center of the concerns of politicians and citizens (Mansour, 2012).

Thus, ensuring a debt ratio that is not detrimental to a nation's economy has become a primary goal or almost a golden rule for all states. It should be noted that several research projects have been conducted around the issue but without unanimity (Maghyereh et al., 2002, Abbas et al., 2007 and 2010, Bolle et al., 2006, Ghost et al. Tapalov et al., 2010; Rankin et al., 2003; Reinhart et al., 2003).

If it has been empirically demonstrated that public debt has a positive impact on investment and growth as long as it remains below an optimal threshold, beyond this threshold, the debt becomes unsustainable; ie the debtor State is no longer able to provide regular service and will be forced to do so, to resort to exceptional financing (accumulation of arrears, restructuring or debt relief, etc.). or to make a drastic adjustment to its public finances or current account (Idlemounden and Raffinot 2005, Clements et al 2003, Patillo and Ricci and Poirson 2002, Pattillo et al., 2004, Hansen 2001; Collier and Dollar, 2001, 2002, Schclarek, 2004, Checherita and Rother 2010).

With regard to the specific case of Togo, the interest of this paper is to show that the strong and legitimate temptation of the authorities to allocate resources to several objectives at the same time taking into account the extent of the evils, but without prioritization can be counterproductive in the long run and is not an appropriate response to the question of the sustainability of public finances. Looking closely at debt-for-infrastructure borrowing after debt relief, the question that comes to mind is how much of the country's GDP can it still get into debt for not be detrimental to the national economy?

**Figure 1: Graph of GDP evolution in relation to external debt**



**Source:** Author from MEF data, 2015.

With regard to the institutional context of the country, at the August 2006 Global Political Agreement (GPA), Togolese politicians and civil society had realized the extent of the ills suffered by the country and agreed on a number of reforms to be implemented in order to reinvigorate the institutional apparatus which for a long time no longer adapts to the socio-economic realities of the country. Being also a major handicap to the country's economic growth, it is a major obstacle to improving the living conditions of the Togolese people.

For Gogu   and Evlo (2006), the economic performance of Togo during the last forty years cannot be due to a single variable. According to them, the accumulation of physical capital and human capital are not the only determinants of the country's economic performance. On the other hand, the defective quality of the institutions played a leading role in the country's economic counter-performance.

In line with the work of Gogu   and Evlo (2006), Kalife (2008) supports his arguments by saying that corruption is the main harmful source that constitutes a dynamic of economic counter-performance in Togo. It diverts investment, damages economic initiative and ruins the economy by indebtedness. Thus, special attention should be paid to the change in the real GDP growth rate compared to the aggregate indicator of good governance.

As an illustration, based on the evolution of the growth rate of real GDP per capita between 1993 - 2008 and the aggregate measure of the quality of institutions in Togo according to data from the World Development Indicators (WDI, 2012) and the Africa Development Indicators (ADI, 2010), we note that the growth rate in 1993 was -17.11% when the measure of the quality institutions was close to -4. In 1995, the rate which knew a great improvement, from -17.11%

in 1993 to 5.25% in 1995. In this year, the measure of institutional quality has improved considerably from -4 in 1993 to -1.8 in 1995.

In 1996, the measure of the quality of the institutions was close to -0.5 as for the economic growth it is of 6.16%. This remark tells us that an improvement in the quality of institutions induces that of the economic growth of the country. On the other hand, when in 2000 the situation had deteriorated further, giving a measure of the quality of institutions close to -1.5, the measure of the growth rate dropped to -3.30%. This situation remains similar from 2002 to 2010 with variations in the growth rate between 0 and -1 and the measurement of the quality of institutions between -1 and -2.

In light of these data, it is imperative to note that when the measure of the quality of the institutions is close to zero, it constitutes a considerable impulse to the increase of the economic growth, from where our questioning on the role the quality of the institutions in explaining the country's indebtedness.

Therefore, this article aims to answer the questions mentioned above that are currently facing the Togolese authorities and more specifically to answer the questions of arbitration policies giving priority to those who are likely to place the finances public on a sustainable path. Thus the general objective of this paper is to assess the optimal debt threshold and the contribution of the quality of the institutions to the economic growth of the country. Specifically, beyond the urgent concerns of the government on debt management, it focuses on long-term economic policies aimed at sustainably consolidating public finances and increasing the growth potential of the economy. . The assumptions used in our study are two orders, namely, in the first place, below a given threshold of indebtedness, the debt positively impacts economic growth. Second, good institutional quality has a positive impact on growth.

The rest of the paper is organized as follows: (i) the theoretical framework, (ii) the methodology, (iii) the results and discussions, and (iv) the conclusion.

## **2. Theoretical framework**

Traditionally, the “burden of debt” has been analyzed in a medium to long-term framework first constructed by Domar (1944). It serves as background for the study of the conjuncture that is the focus of this paper.

Following Domar's work, other work has been published on the same issue (Pasinetti, 1997).

To the question of whether a state can live beyond its means, the answer given by economists to this question is the distinction between productive investment and non-productive

investment. From the moment the investment resulting from the debt makes it possible to have a return on investment and indirectly the repayment of the acquired debt, the debt would not constitute a problem. On the other hand, the acquisition of a debt for non-productive investments as evidenced by the case of several African countries would not be a good thing and can quickly lead to a problem of over-indebtedness. The problem of over-indebtedness can quickly arise when the debt acquired impedes growth and the country is unable to service the debt.

The literature teaches that external borrowing has a positive impact on investment and therefore economic growth if it does not exceed a certain level, beyond this level, its effect becomes negative, giving rise to a relationship of the curve of Laffer between external debt, investment and economic growth.

It should be noted that the increase or decrease in the GDP of a country depends on the wealth creation capacity (endogenous growth theory), that is to say production which itself depends on the stock of the country capital, labor and factor productivity. Production, in turn, depends on technological progress, cumulative efforts of public investments. The problem with capital arising from indebtedness is in terms of its efficient affection and therefore its productivity.

While some studies have highlighted the positive link between debt and economic growth, some studies have resulted in the negative relationship between debt and economic growth. Referred to in the external debt relationship as a factor of economic growth, the higher the debt stock, the lower the capacity for repayment. A study by Reinhart C. and Rogoff K. (2010) suggests that public debt above 90% of GDP tends to hinder the growth of an economy. Continuing in the same direction, Minea and Villieu (2009) worked on a relationship between deficits and public investment. After a review of a panel of 22 OECD countries for the period 1978-2006, they found that beyond a public debt ratio of 120% deficits do not benefit public investment. According to them, the lower the debt, the more the State can offset the interest charges by a reduction in consumer spending, and the more the investment expenditure is preserved. And conversely, the higher the debt, the more it is not possible to reduce consumer spending, and the more the state is forced to make adjustments by capital expenditures. Thus, beyond a certain level of debt, the relationship between deficit and public investment becomes negative. However, Herndon et al. (2014), replicate Reinhart and Rogoff (2010a and 2010b) and find that coding errors, selective exclusion of available data, and unconventional weighting of summary statistics lead to serious errors that inaccurately represent the relationship between public debt and GDP growth among 20 advanced economies in the post-war period. Their finding is that

when properly calculated, the average real GDP growth rate for countries carrying a public-debt-to-GDP ratio of over 90 percent is actually 2.2 percent, not -0.1 percent as published in Reinhart and Rogoff. That is, contrary to RR, average GDP growth at public debt/GDP ratios over 90 percent is not dramatically different than when debt/GDP ratios are lower. They also show how the relationship between public debt and GDP growth varies significantly by time period and country. Overall, the evidence they review contradicts Reinhart and Rogoff's claim to have identified an important stylized fact, that public debt loads greater than 90 percent of GDP consistently reduce GDP growth.

Working on the problem, Boukhatem et al. (2012), finds that the estimation of the growth model in the absence of investment shows that the debt service ratio remains insignificant, which means that its negative effect does not directly affect economic growth, but goes through the crowding out effect of the investment. High debt therefore does not cause a significant decrease in the level of investment, but reduces its quality and efficiency.

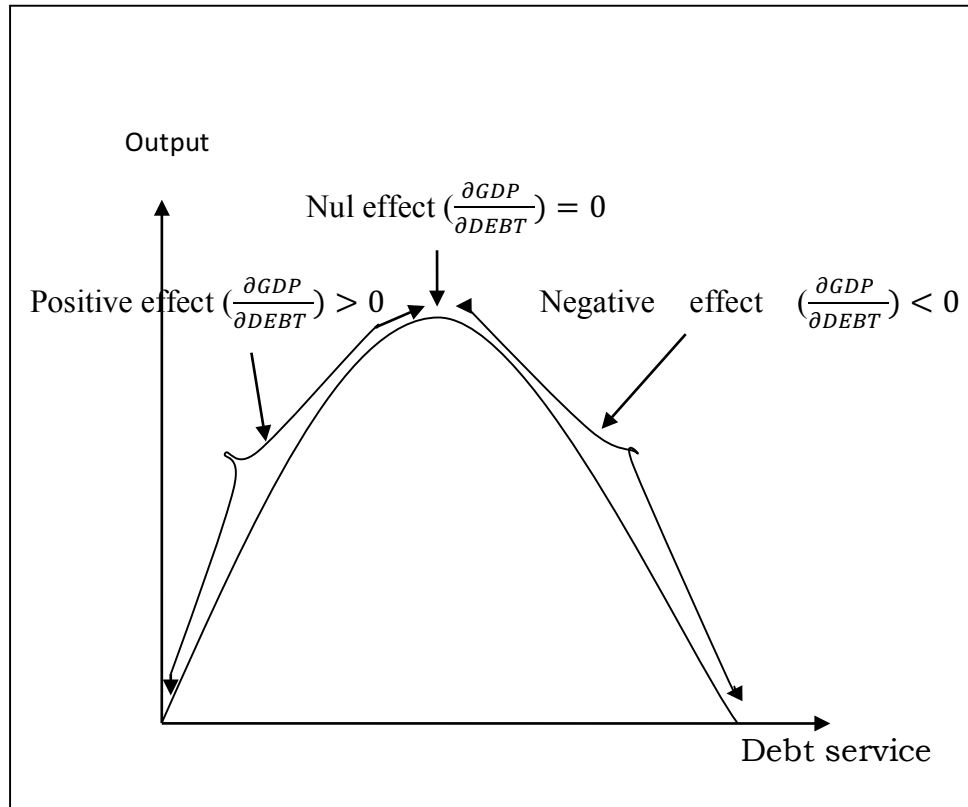
According to the working paper of the International Monetary Fund (IMF), it can be said that the accumulation of debt slows economic expansion by curbing investment. But even a low level of debt also tends to reduce the expected gains from reforms, ie trade liberalization and fiscal consolidation, which are supposed to enhance efficiency and growth; therefore, the authorities will be less likely to incur expenses if they believe that the expected production gains will go in part to their external creditors.

Thus, up to a reasonable threshold of debt, debt has a positive effect on economic growth, but beyond this threshold, this debt becomes a handicap to the expansion of economic growth and later causes the problem over-indebtedness.

Theoretically, a country is said to be over-indebted when the service of its external debt is so heavy that a large part of current production is used to repay foreign lenders. The over-indebtedness hypothesis suggests that if there is a future probability that the external debt will be greater than the country's repayment capacity, the projected costs of debt servicing further discourage domestic and foreign investment and undermine economic growth (Pattillo et al., 2002).

This situation was developed in the literature on the Laffer curve after the name of its author Arthur Laffer (1970), who explained that too much tax kills taxes, the operation of over-indebtedness being described as a tax on investment.

**Figure 2: Graph of the Laffer Curve on Debt**



**Source:** Tuffor (2010), "external debt, investment and economic growth in Ghana"

According to this curve, the over indebtedness theory presents three scenarios:

- ✓ The case of positive effect of external debt on the stimulating effect of production
- ✓ The case of the neutral effect of external debt on the stimulating effect of production
- ✓ The case of negative effect of external debt on the stimulating effect of production

According to this theory of over-indebtedness, high debt leads to a high interest rate, reduces investment, reduces fixed capital formation and finally lowers the rate of economic growth.

According to the definition of the International Monetary Fund (IMF) and the World Bank (WB), indebtedness can have a negative impact on economic growth when the debt is between 160 and 170% of exports, and 35 to 40 % of GDP (NPV) or 50% of GDP (nominal value). It is worth recalling that over-indebtedness can dampen growth by increasing uncertainty about the government's debt-servicing actions and policies as developed in the debt overhang theory, by



Krugman (1988). Sachs (1989) and Cohen (1992). They find that a given threshold of external debt discourages consumption and investment, and therefore reduces economic growth.

Remember that many other important studies have also focused on the problem of debt (Devarajan et al. 1996; Grauwe and Ji, 2013).

### 3. Methodology

To empirically evaluate the optimal debt threshold of the Togolese economy, we start from studies already carried out on the subject, notably those of Brini and Boukhatem (2012) in the case of some developing countries. However, certain variables are, depending on the case, abandoned or added to take into account the specificities of the country in question. This model is inspired by the works of Brini and Boukhatem (2012).

According to Brini et al. (2012), generally the empirical works that opt for the nonlinear hypothesis use, in econometric estimation, either a quadratic function or a spline function.

The quadratic approach of introducing the square of the debt ratio into the group of exogenous variables and generally takes the following form:

$$Y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 D_t + \alpha_3 D_t^2 + \mu_t$$

With  $Y_t$  Gross Domestic Product per capita,  $X_t$  a vector of the control variables,  $D_t$  different indicators of external debt,  $\mu_t$  the error term and  $t$  the time index. The variables of interest are related to the debt stock and its service. These variables make it possible to test the two working hypotheses.

Based on the Laffer curve theory, this method is based on the idea that the effect of external debt on economic growth is not always negative. Indeed, a moderate debt can have a positive effect but, beyond a certain level, it becomes harmful to investment and economic growth.

The spline specification makes it possible to show the difference in impact of the external debt below and above the threshold. It takes the following form:

$$Y_t = \beta_0 + \beta_1 X_t + \beta_2 D_t + \beta_3 (D_t - D_t^*)T + \mu_t$$

With  $Y_t$  Gross Domestic Product per capita,  $X_t$  a vector of the control variables,  $D_t$  different indicators of external debt,  $\mu_t$  the error term and  $t$  the time index.  $D^*$  represents the debt threshold,  $T$  a dummy variable equal to 1 if the debt is below the threshold and 0 otherwise. We can estimate the spline function equation until the effect of debt on growth changes sign. In this



case, the determination of the debt threshold  $D^*$  is done by estimating the equation for different thresholds and the threshold chosen corresponds to the highest coefficient of determination  $R^2$ .

### 3.1. Model to estimate

In order to detect the existence of a non-linear relationship between external debt and economic growth, to determine the optimal debt threshold and to capture the effect of institutional quality variables, we will adopt the changed quadratic specification.

The specificity of our methodology based on the existing methodology is that it has been modified to take into account the reality of the context of the country of application. This includes the introduction of the trade opening and institutional quality variable in order to take into account the interaction of institutions on the country's indebtedness.

According to the literature, our model is specified as follows:

$$\begin{aligned} Y_t = & \alpha_0 + \alpha_1 D_t \\ & + \alpha_2 D_t^2 + \alpha_3 QINST_t + \alpha_6 OUV_t + \alpha_7 Deppub_t \\ & + \alpha_8 INF_t + \mu_t \end{aligned} \quad (1)$$

With  $Y_t$  gross domestic product (in growth rate);  $D_t$  the debt variable;  $D_t^2$  the debt variable squared;  $QINST_t$  the quality variable of the institutions. The quality of institutions is an important variable for developing countries and even more so for Togo. In our research the indicator of corruption will allow the quality of institutions in Togo to be approached. Its presence in the growth model is relevant in explaining Togo's economic performance.  $OUV_t$  Commercial opening. The degree of trade openness generally affects, in a positive and meaningful way, economic growth. Indeed, it allows the economy to benefit not only from technological transfers but also, and above all, from its different forms of positive externalities and the effects of external demand drives.  $Deppub_t$  Public expenditure. According to the work of Al-Yousif (1997), and Jonhson (2006), public expenditures are not an argument of the production function, but their considerations are important for a better specification of the model.  $INF_t$  Inflation. The inflation rate describes the macroeconomic environment. It is introduced into the model to reveal the crowding out effect of debt service. Agénor and Montiel

(1999) have shown that high debt service can lead governments to adopt inflationary policies that can negatively affect investment and hence economic growth.

### **3.2.Econometric Treatment**

#### **Data source:**

The data used for the estimates are annual. They come from the databases of the World Bank (World Development Indicators 2015) and the Directorate of the Economy (DE, 2015). The period covered is from 1985 to 2015.

For the governance data and the democratic indicator we use the Freedom House database (2011) and Kauffman, kraay and Mastruzzi's data research working paper "Governance Matters VIII". 1996 to 2008.

#### **Estimation technique:**

Given that the series are temporal, we first proceed to stationarity tests on the different variables to detect the presence or absence of unit root before making the estimates. We also used the Johansen co-integration test as well as an error-correction model to check short and long run relationships with Eviews software.

#### **Stationarity test (Appendix 1):**

Since our research uses variables whose data are in the form of time series, it is necessary to ensure their stationarity, hence the need to perform stationarity tests to determine the degree of integration of the variables. A series is stationary if its characteristics (mean, variance and covariance) are time independent. Variables, among the various tests of verification of stationarity that exist. Our analysis retains the Dickey-Fuller Augmented (ADF) unit root tests (Dickey and Fuller, 1981) and Phillips-Perron (PP) (Phillips and Perron, 1988).

According to the test, the variables, external debt (DETEX), the quality of institutions (QINST), trade opening (OUVERCOM) and public expenditure (DEPPUB) are stationary series in first difference, that is to say integrated order 1. On the other hand, inflation is a stationary series at level, that is to say, integrated of order 0. To enable us to verify whether there is a long-term relationship, we use the cointegration test of Johansen in possible use of the Error Correction Model (ECM).

### **Johansen co-integration test (Appendix 2):**

The advantage of this test lies in the fact that it can be used in all cases of figures (same order of integration of series or different integration orders). Unlike Johansen, the co-integration test of Engle and Granger requires that all variables be of the same order of integration, hence the choice of the Johansen co-integration test. In this test, the null hypothesis designates the absence of a co-integration relationship. In case this null hypothesis is rejected, we test the null hypothesis of the presence of at most a co-integrating relation and so on. As soon as we accept the null hypothesis, the process stops.

According to this test, there is at most five (05) co-integration relationship. This leads us to write an error-correction model.

### **Error correction model:**

Given the possibility of having a co-integration relationship, we will use the Hendry error-correction model which is written as follows:

$$Y_t = \alpha_0 + \alpha_1 dD_t + \alpha_2 dD_t^2 + \alpha_3 dQINST_t + \alpha_4 dOUV_t + \alpha_5 dDeppub_t + \alpha_6 dINF_t + \alpha_7 Y_{t-1} + \alpha_8 D_{t-1} + \alpha_9 D_{t-1}^2 + \alpha_{10} QINST_{t-1} + \alpha_{11} OUV_{t-1} + \alpha_{12} Deppub_{t-1} + \alpha_{13} INF_{t-1} + \mu_t \quad (2)$$

$d$  : represents the first difference operator defined by:

$$D(X_t) = X_t - X_{t-1}$$

The coefficients  $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ , represent the short-run dynamics and the coefficients  $\alpha_8, \alpha_9, \alpha_{10}, \alpha_{11}, \alpha_{12}, \alpha_{13}$ , characterize the long-run equilibrium. The coefficient  $\alpha_7$  is the error correction coefficient, it must be less than unity and negative and above all significant. The error correction coefficient indicates the rate of adjustment of the endogenous variable  $Y_t$  to return to the long-run equilibrium following a shock. The coefficient  $\alpha_0$  represents the constant of the model.

$Y_{t-1}$  : represents the GDP per capita growth rate lagged by one period.

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$  : Represent short-run elasticities.

$-\alpha_8 / \alpha_7, -\alpha_9 / \alpha_7, -\alpha_{10} / \alpha_7, -\alpha_{11} / \alpha_7, -\alpha_{12} / \alpha_7, -\alpha_{13} / \alpha_7$  : represent the long-run elasticities.

The estimation of the error correction model (2) gives the table in appendix 3, the results of which will be used to analyze the overall significance of the model, the autocorrelation of the errors, and then follow the economic interpretation of the coefficients.

#### 4. Results and interpretation

According to the results, the value of  $R^2$  is 0.944446, which means that the growth rate of GDP per capita is explained to more than 94% by the model. The Fisher statistic has a zero probability which means that the model is globally significant. As for the Durbin-Watson statistic, it is substantially equal to two (2.03), so we can conclude that there is no autocorrelation of the errors, however, being in the case of a dynamic model, the test of Durbin-Watson is not fully adapted to conclude on a lack of autocorrelation errors, too, the adapted test is the Durbin-Watson h test noted the h test that is written:

$$h = \left(1 - \frac{DW}{2}\right) \sqrt{\frac{N}{1 - N\sigma_y^2}}$$

With: N the number of observations, the Durbin-Watson statistic and  $\sigma_y^2$  the estimated variance of the coefficient of the endogenous variable shifted in the estimation of the model with the OLS method. The statistic h is distributed according to a normal distribution if it is less than 1.645 (for a risk of 5%) the null hypothesis of no autocorrelation is retained.

So by applying the h-test formula we come to  $h = \left(1 - \frac{2,037293}{2}\right) \sqrt{\frac{30}{1 - 30 (0,177783)^2}} =$

$|-0,44875492| < 1,96$ . We can conclude that there is no autocorrelation of errors.

On the other hand, for the test of white (Appendix 4), the probability values being greater than 5%, we accept  $H_0$ , ie the homoscedasticity of the errors. As for the stability test of Cusum and Cusum Carré, the graphs (Appendix 5) did not leave the corridor, so the coefficients are stable over time.

For the Ramsey test (Appendix 6), since the probability values are greater than 5%, the model is globally well specified.

The return force is less than unity, negative and significant (-0.911455), which justifies the use of the error correction model. It measures the rate of adjustment of the per capita economic growth rate to return to long-run equilibrium following a shock.

In the short run, changes in external debt, quality of institutions, trade openness and public spending have positive and significant coefficients at the 5% level. These results confirm the work of Brini and Boukhatem (2012) and Collier and Gunning (1997).

Also, in the short term, the variations in the square of the debt and inflation have negative and significant coefficients at the threshold of 5%. These results contradict the work of Brini and Boukhatem (2012), working on highly indebted poor countries, they find that the impact of inflation rate on growth is not significant.

In the long run, external debt variables, trade openness and public spending have positive and significant coefficients at the 5% level. However, in the long run, the square of debt has a negative and significant coefficient at the 10% level. These previous results are confirmed by Nyuito's work in 2010, working on the sources of economic growth in Togo, he finds that the opening rate positively influences economic growth by pulling it upwards. However, he finds that the insignificant effect of this variable may be due to the small share of exports in trade.

On the other hand, always in the long run, institutional quality and inflation rate variables have negative coefficients but only that of inflation is significant at the 1% level which confirm the work of Brini and Boukhatem (2012). Indeed, according to Combey and Nubukpo (2008), the effect of inflation on GDP becomes negative only beyond a threshold of 7.9%.

As a result of this empirical assessment, the findings show a positive and significant short-term impact of external debt, quality of institutions, trade openness and public spending on economic growth in Togo. Our work confirms the results of Hansen (2001). In the short and long term, the external debt has a positive and significant impact on economic growth.

The rest of the estimates consisted of determining the optimal debt threshold, ie the threshold beyond which the debt negatively affects economic growth in Togo.

Thus the estimates were made to determine the optimal debt threshold. This threshold corresponds to the marginal impact of the debt, identified by the quadratic method. Remember that this threshold corresponds to the optimal debt level that maximizes economic growth. According to the work of Brini and Boukhatem carried out in 2012, the determination of the optimal debt threshold is solved by the formula  $e^{-\alpha_D / 2\alpha_{D^2}}$ . By applying the method we arrive at the results according to which the debt threshold of Togo is substantially equal to 83% (82.66%). This rate represents the level of debt beyond which the marginal impact of debt on economic growth becomes negative.

The major contribution of this paper is twofold. On the one hand, this paper enriches the existing empirical literature on the indebtedness of states and their manifestations. On the other hand, the paper highlights the effect of institutional aspects that contribute negatively to Togo's economic performance.

Also, The results we have reached confirm the results to which many studies have come in the field. This is a lesson learned to improve the country's position in terms of not exceeding the critical debt threshold at the risk that it will negatively impact the country's growth.

Moreover, the empirical results find confirm the theoretical developments established namely the basic work Domar (1944) and Pasinetti (1991) on the ratio debt / GDP that can be influenced by the structural deficit governmental.

## **5. Conclusion**

The objective of this paper is to situate the optimal debt threshold of the country and the effect of the quality of the institutions through an econometric model of linear and non-linear (quadratic) type.

Results after estimates show that the quality of institutions, trade openness and public spending have positive and significant effects on the country's economic growth. Also, economic policy makers need to put a special focus on these elements in order to boost the level of growth.

With regard to the optimal debt threshold, this threshold corresponds to the optimal level of debt that maximizes economic growth. After evaluation, this threshold is approximately 83% (82.66%). This rate represents the level of debt beyond which the marginal impact of debt on economic growth becomes negative.

The implications of economic policies following the results indicate that the authorities must adopt a prudential behavior in terms of indebtedness and especially not to exceed the critical threshold of 83% so that the latter does not negatively impact the country's growth.

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## 7. Appendices :

### Appendix 1: Stationarity test of Dickey Fuller and Phillips Perron

Series	Dickey Fuller Test						Phillips Perron Test					
	Level			First Difference	Number of delays	Conclusion	Level			First Difference	Number of delays	Conclusion
	TS	DS with drift	DS without drift				TS	DS with drift	DS without drift			
LDETEX	-0.994991 (-3.5614)	-1.674053 (-2.9591)	0.087992 (-1.9521)	-3.936871 (-1.9526)	1	I(1)	-1.303437 (-3.5562)	-1.905509 (-2.9558)	0.214562 (-1.9517)	-5.672918 (-1.9521)	3	I(1)
LSDEX	-1.512168 (-3.5614)	-0.510687 (-2.9591)	-0.975647 (-1.9521)	-3.267445 (-1.9526)	1	I(1)	-1.398589 (-3.5562)	-0.224991 (-2.9558)	-0.903560 (-1.9517)	-4.340345 (-1.9521)	3	I(1)
LBFPB	-2.158993 (-3.5614)	-2.231332 (-2.9591)	-1.845140 (-1.9521)	-4.078849 (-1.9526)	1	I(1)	-2.672374 (-3.5562)	-2.720393 (-2.9558)	-2.263657 (-1.9517)	-6.927173 (-1.9521)	3	I(1)
QINST	-2.221155 (-3.5614)	-0.324122 (-2.9591)	1.180409 (-1.9521)	-3.661193 (-1.9526)	1	I(1)	-2.175236 (-3.5562)	-0.239985 (-2.9558)	1.396390 (-1.9517)	-5.226652 (-1.9521)	3	I(1)
OUVERC OM	-2.295014 (-3.5614)	-2.334522 (-2.9591)	-0.294775 (-1.9521)	-4.718821 (-1.9526)	1	I(1)	-2.755262 (-3.5562)	-2.766907 (-2.9558)	-0.413221 (-1.9517)	-6.942511 (-1.9521)	3	I(1)
INF	-3.633135 (-3.5614)	-3.758272 (-2.9591)	-3.177871 (-1.9521)	-	1	I(0)	-3.996759 (-3.5562)	-4.020054 (-2.9558)	-3.370406 (-1.9517)	-	3	I(0)
DEPPUB	-2.400923 (-3.5614)	-0.906459 (-2.9591)	2.468376 (-1.9521)	-2.678995 (-1.9526)	1	I(1)	-2.507604 (-3.5562)	-1.013847 (-2.9558)	3.144832 (-1.9517)	-4.363481 (-1.9521)	3	I(1)
TCPIB	-4.037418 (-3.5614)	-3.960222 (-2.9591)	-3.429114 (-1.9521)	-	1	I(0)	-5.174305 (-3.5562)	-5.058216 (-2.9558)	-4.700262 (-1.9517)	-	3	I(0)

**(0): Critical values at the 5% level**

### **Appendix 2: Result of the cointegration test on model 2**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
0.940145	311.6406	175.77	187.31	None **
0.874211	224.3497	141.20	152.32	At most 1 **
0.849284	160.0822	109.99	119.80	At most 2 **
0.733492	101.4191	82.49	90.45	At most 3 **
0.589520	60.42624	59.46	66.52	At most 4 *
0.369078	32.82294	39.89	45.58	At most 5
0.300579	18.54516	24.31	29.75	At most 6
0.213690	7.462600	12.53	16.31	At most 7
0.000325	0.010063	3.84	6.51	At most 8

\* means the existence of at most one cointegrating relationship (1%)

### **Appendix 3: Estimation of the hendry Error Correction Model**

Dependent Variable: DTCPIB

Method: Least Squares

Date: 02/01/16 Time: 13:33

Sample(adjusted): 1985 2015

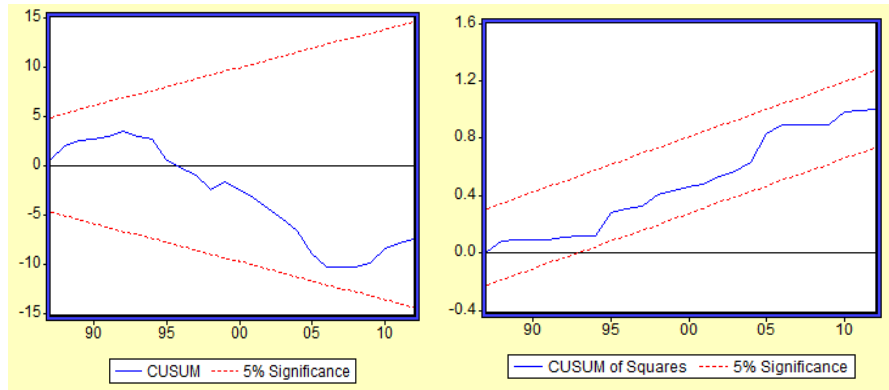
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLDETEX	9.678413	24.67997	1.103521	0.0081
DDEXCARRE	- 7.203296	46.67546	-1.078087	0.0243
DQINST	5.527700	0.177783	-5.345593	0.0120
DOUVERCOM	27.98673	8.431572	2.880419	0.0046
DDEPENPUB	62.83700	24.48274	3.416609	0.0089
DINF	-41.70465	14.31361	-1.263143	0.0303
TCPIB (-1)	-0.911455	0.177783	-5.345593	0.0005
LDETEX (-1)	14.79904	21.35261	1.690989	0.0108
DEXCARRE (-1)	-11.36782	39.66600	-1.733823	0.1000
QINST (-1)	-0.025484	3.493633	0.472662	0.5269
OUVERCOM (-1)	14.89400	8.170175	0.787465	0.0163
DEPENPUB (-1)	10.07856	4.205416	2.745128	0.0133
INF (-1)	-19.75407	14.41779	-1.370117	0.0030
C	-123.9618	315.8116	-1.953117	0.2222
R-squared	0.944446	Mean dependent var		0.225000
Adjusted R-squared	0.876987	S.D. dependent var		7.621828
S.E. of regression	3.473273	Akaike info criterion		5.627707
Sum squared resid	217.1452	Schwarz criterion		6.268967
Log likelihood	-76.04332	F-statistic		14.00030
Durbin-Watson stat	2.037293	Prob(F-statistic)		0.000005

### **ANNEXE 4 : Test de White**

F-statistic	0.731564	Probability	0.725922
Obs*R-squared	12.94527	Probability	0.606525

### **ANNEXE 5 : Test de Cusum et de Cusum Carré**



### **ANNEXE 6: Test de Ramsey**

F-statistic	1.684545	Probability	0.207188
Log likelihood ratio	2.332543	Probability	0.126695