

Full Length Research Paper

The Ivorian Debt: Should we worry?

N'Zue Felix Fofana

Economic Policy Analysis Unit, Economic Commission of West African States (ECOWAS), Cote D'ivoire.

Received 27 October, 2017; Accepted 23 January, 2018

The objective of this paper is to shed light on Cote d'Ivoire's indebtedness and see to what extent, the country's current level of debt is worrisome. This research is parametric using a time series data spanning from 1970 to 2015 to investigate the debt and growth nexus. After investigating the time series characteristics of the data, it was found that the variables were I(1) and co-integrated. Findings show evidence of a nonlinear relationship between debt and growth and more importantly found a threshold point of 42.9% beyond which debt accumulation will negatively affect economic growth. Thus, given the current level of the country's debt level which stood at 48.3%, one should be worried and call on the attention of the authorities for more prudential economic governance.

Key words: Debt to Gross domestic product (GDP) ratio, economic growth, nonlinearity, threshold, Cote d'ivoire, indebtedness.

INTRODUCTION

In a seminal paper, Reinhart and Rogoff (2010) argued that the relationship between growth and debt depends on the levels of debt to Gross domestic product (GDP) ratio. Indeed, they found the relationship to be weak at what they categorized as "normal" debt levels. However, when gross external debt reaches 60% of GDP, annual growth declines by about 2%. For external debt which is in excess of 90% of GDP, growth rates are cut in half. This is a serious concern especially for developing countries where sustained growth at about 7% is needed to ensure a developmental impact. Developing countries cannot therefore afford that their growth efforts be annihilated or severed by excessive external debt. But how may one define excessive external Debt? One can easily argue that following Reinhart and Rogoff (2010), "Excessive External Debt" could mean Debt to GDP ratio of above 60%. Is this threshold of 60% applicable to any country regardless of economic patronage? Is it

possible for some countries to have a threshold lower or higher than the 60%?

In the Economic Community of West Africa States (ECOWAS), it is agreed that the ratio of total public debt to GDP should be less than or equal to 70% as part of the convergence criteria (Decision A/DEC/17/12/01 and modified in 2012 by an Additional Act A/SA.3/06/12 of the ECOWAS Commission) adopted which shall lead the region to a unique and single currency zone. It is trivial that borrowing is not bad and should not be proscribed in decision making. What is of primary importance is the utilization of resources borrowed. If resources borrowed are used for final consumption expenditures, it is clear that it will not add much to wealth creation and hence the reimbursement of borrowed funds becomes a heavy burden for present and future generations.

However, if the resources borrowed are utilized for

E-mail: felix.nzue@gmail.com.

Authors agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

productive investments with high returns, it is clear that not only the invested resources will generate enough returns to pay off the capital and interest but also guaranteed reinvestment in needed sector *ceteris paribus*. In that sense, when borrowed money is utilized for productive investments, debt can stimulate economic growth and its multiplicative effect could trigger development. This is in line with Stiglitz (2017) when he argued that “Even if you have to borrow, if the value of your investments- in people, technology and infrastructure increases, then the economy is in a stronger position for the future” (Stiglitz, 2017).

Problem statement

In recent past, rising public sector debt has become a concern for African countries in general and to some extent for Cote d'Ivoire. Indeed, the International Monetary Fund (IMF) shared with policy makers, its concerns on the rising of public sector debt (IMF, 2017). This resulted from the finding that on average, the ratio of public debt to GDP has increased by some 10% points since 2014 to an average of 42% of GDP in 2016 and a median of 51%. According to the IMF, this was the highest value since many countries received debt relief in the 2000s under the Heavily Indebted Poor Countries (HIPC) Initiative. Cote d'Ivoire is among the countries identified as having registered rapid increase in the level of debt to GDP ratio. Indeed, over the past four years (2013 to 2016), the level of Government Debt to GDP ratio rose from 43.1 to 48.3% representing a 12% increase on average, higher than observed above. In light of the above, the IMF in its April 2017 report calls the attention of the authorities on the potential risk of high debt distress (IMF, 2017).

Despite the aforementioned concerns, the Director General of the Ivorian Treasury and Public Account (Fraternité, 2017), during a public speech, asserted that the country does not face any risk of excessive debt. For him, excessive debt arises when a country is unable to honor its debt service. Additionally, he argued that within the West African Economic and Monetary Union (WAEMU), a country's debt is excessive when Public Debt to GDP ratio reaches 70%, that indicator being 49% at the international level. He then argued that the above indicator stands at 41.9% in Cote d'Ivoire and hence no need to worry. It is clear that the figures voiced by the Director General underestimate the actual level of the country's debt as presented by the IMF and indicated earlier, which stood at 48.3% in 2016 close to the international threshold he mentioned. Knowing the possible impacts of excessive debt on a country's economic performance, debt-overhang¹ and crowding

¹Debt-overhang theory suggests that heavy debt burden create a disincentive for private investment because of the fear which will lead to new taxation (Krugman, 1987).

out², this paper investigates whether one should worry about the country's current trend of borrowing or not.

Objective

The main objective of this paper is to determine the Debt-to-GDP ratio threshold for Cote d'Ivoire and determine the extent to which this threshold has been met with the current trend of borrowing.

Stylized facts

Economic performance of Cote d'Ivoire has not been smooth over time. Indeed, from a growth rate averaging 7% per annum in the early 60's and late 70's (Kouadio, 1993; Nshimyumuremyi, 1997), the 80's and 90's were characterized by a volatile growth rate alternating ups and downs and sometime negative growth rates. The 80's represented the beginning of the adoption of economic reforms under the auspices of the Bretton Woods institutions, that is, the World Bank and the IMF, as a result of the severe economic recession the country was undergoing. The economic recession was attributed mainly to the deterioration of the terms of trade and several external shocks, that is, the severe drought of 1982 to 1984 and the second oil shock that increased the interest rate on the national debt. In addition to the above trivial factors, internal shocks³, including ill-governance, budgetary delinquency, inadequate structural institutions, etc, could have contributed to exacerbate the economic crisis. This is illustrated by a sharp decline of GDP per capita starting from 1980 to 1985 (Figure 1). The economic reforms implemented during the early eighties cushioned the declining trend of GDP per capita but was not enough to keep the economy moving forward. It was in 2000 that the country resumed with an upward sloping per capita GDP trend.

The country's currency has to be devaluated in 1994 where GDP per capita reached its lowest level since 1975 at US\$595.8. It was a period also where debt to GDP ratio which had been on an upward sloping trend reached its peak at 209.24% (Figure 2). This was way beyond the 90% indicated in Reinhart and Rogoff (2010) as being a threshold at which growth rates are cut in half. After the devaluation, the debt to GDP ratio started a sharp decline indicating efforts to significantly reduce the country's debt. These efforts included the negotiation and conclusion of the HIPC initiative in June 2012 which led

²Crowding out occurs when the debt-servicing cost of the public debt reduces total investment directly and also indirectly by reducing complementary private expenditure (Diaz-Alejandro, 1981).

³Internal shocks have not been given adequate attention in analysis of the economic crisis of the country.

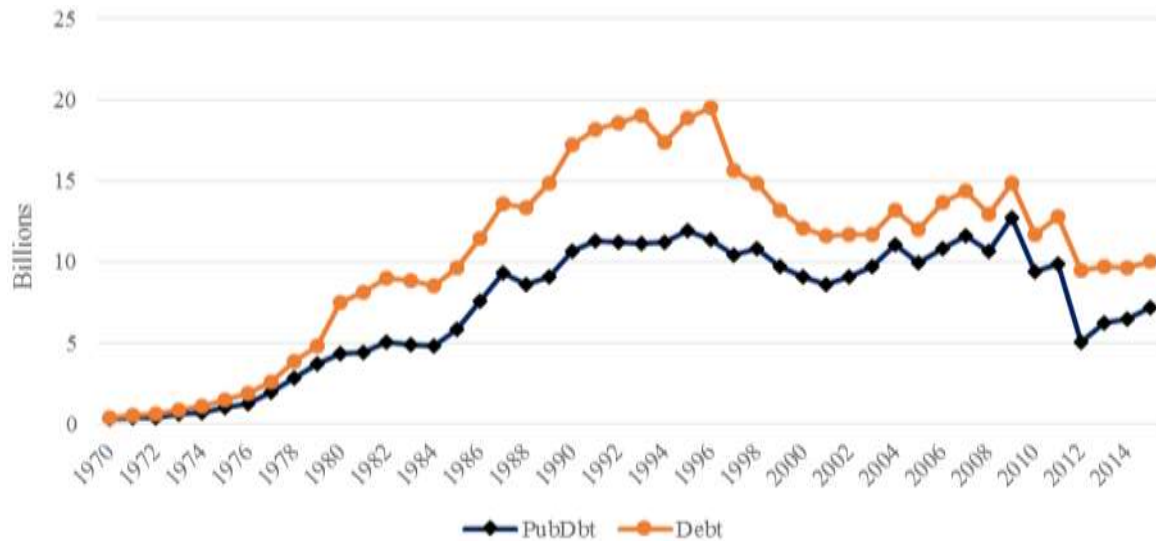


Figure 1. Trend of the Ivorian Total External Debts from 1970 to 2015. Source: World Development Indicators (2017).

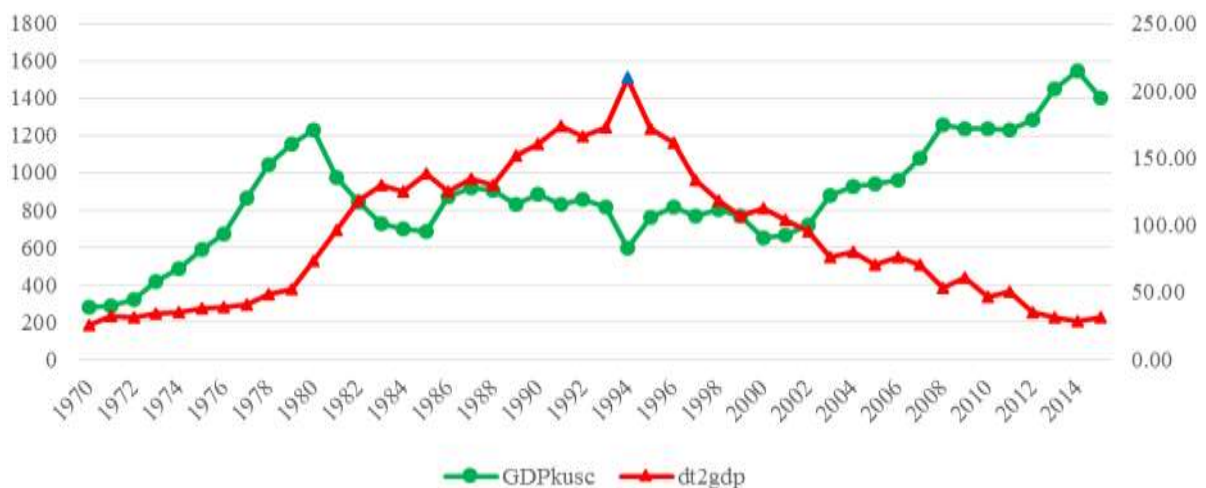


Figure 2. Trend of GDP per capita and Debt to GDP ratio from 1970 to 2015. Source: World Development Indicators (2017).

to the cancellation of 2/3 of the country's external debt (4.09 billion CFA out of 6.373 billion CFA). At the point of cancellation, debt to GDP ratio stood at 35.14%.

The declining trend of the debt to GDP ratio from 1994 could be traced back to the trend of total external debts in Figure 1. Indeed, Total External Debts dropped from US\$ 19.5 billion in 1994 to US\$ 11.7 billion in 2003, representing a 40% decrease. From 2004, the trend of External Debts was not steady, it was rather alternating from up to down mainly due to the socio political unrest that led to a civil war in 2011. From 2012 onward, Total External Debts stood at an average of US\$ 9.7 billion.

It is also good to note that the period of increasing

Total External Debts and Debt to GDP ratio coincided with declining investment captured through Gross Fixed Capital Formation (GFCF) as a percentage of GDP (Figure 3). Indeed, it is good to note that the country's investment reached its peak in 1978 at 29.7% of GDP and declined afterward till 1992 where it reached its lowest level at 8.5% of GDP and Debt to GDP ratio stood at 166.3%. The question that comes to mind is the utilization of the Debt that was being contracted. From the data available, one cannot assert that it was for investment if one considers its low level and its declining trend during that period. It was not for consumption expenditures either. Indeed, as shown in Figure 3,

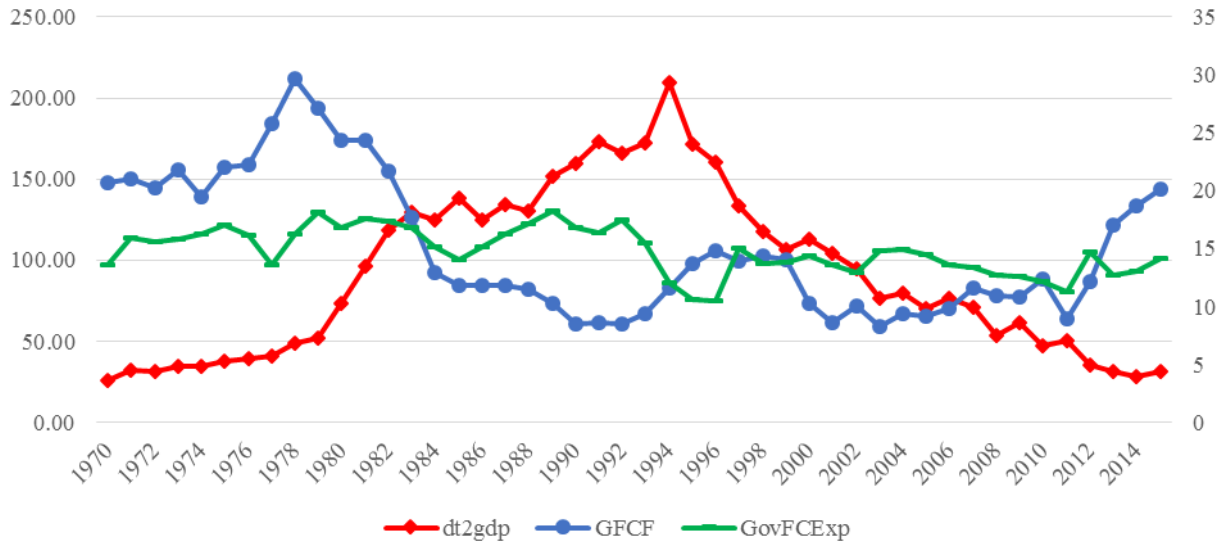


Figure 3. Trend of selected variables (Debt to GDP ratio, Investment and Government Consumption Expenditures) from 1970 to 2015. Source: World Development Indicators (2017).

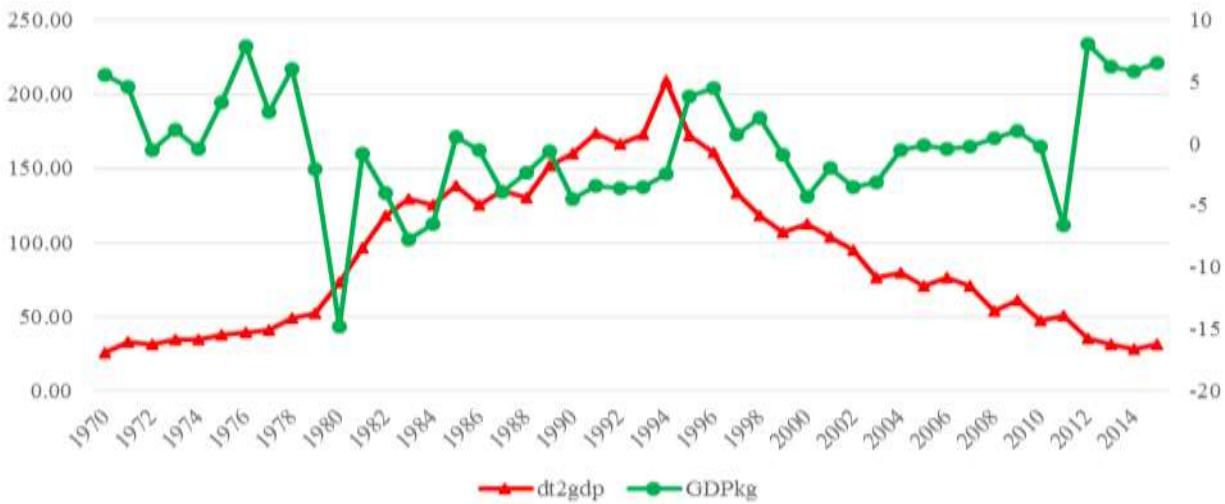


Figure 4. Trend of debt to GDP ratio and per capita GDP growth from 1970 to 2015. Source: World Development Indicators (2017).

Government Final Consumption Expenditures (GovFCexp) also declined moving from a high 18% of GDP in 1979 to 14% of GDP in 2015. It was only in 2012 that the level of investment resumed with an upward sloping trend at 12.11% to reach 20.19% of GDP in 2015 which is still low as compared to emerging economies (for instance investment in countries like Sri Lanka and Morocco stood at 30% of GDP (World Bank 2016), hence the need to direct borrowed resources towards investment.

The country's per capita GDP growth rate turned negative when debt to GDP ratio reached 52% in 1979

(Figure 4). The growth rate stood at -2% falling from 6% the previous year where Debt to GDP ratio was at 48.5%. One can recall that it was the period when the country called the Bretton Woods' institutions for help to navigate out of the economic recession. By 1981, the debt to GDP ratio had passed the 90% threshold and stood at 96.54%, growth rate was still negative and will be so for over ten years despite the drastic measures imposed on the country to reform its economy. By 2008, maybe as a result of the drastic economic measures imposed as preconditions for the cancellation of the country's debt

(HIPC initiative), the debt to GDP ratio has fallen to 53.49% below the 60% threshold. At that level, growth rate of per capita GDP stood in positive neighborhood (0.42%) after nine years of negative growth rate. The efforts that led to this performance were annihilated by a socio economic and political turmoil in the country. Growth rate of GDP per capita plunged again to -6% in 2011 despite the continuous decrease of the debt to GDP ratio which stood at 50.35%. As the country exited from conflict, growth rate of GDP per capita rose to 8.09% in 2012, its highest level over 40 years with a debt to GDP ratio at 35.14%. The debt to GDP ratio reached 28.08% in 2014 before rising to 31.58% in 2015. It is this recent rise in the debt to GDP ratio that has brought concerns over the country's fiscal stance.

Brief review of the debt-growth nexus

The debt and growth nexus has been investigated by many scholars (Reinhart and Rogoff, 2010; Herndon et al., 2013; Irina and Ihnatov, 2015; Cai, 2017) and so far no consensus has been reached whether on its optimal level or the direction of causality. In the next few lines, we will therefore not try to do an exhaustive review of past work. Rather, we will provide empirical evidence based on a brief review of selected literature. As indicated earlier, Reinhart and Rogoff (2010) argued that the relationship between growth and debt depends on the levels of the debt to GDP ratio and that for external debt that is in excess of 90% of GDP, growth rates are cut in half. Although, scholars like Herndon et al. (2013) refutes the above conclusion, Reinhart and Rogoff's paper opened the way to several empirical investigations of the debt and growth nexus. In the following brief review of selected literature, the nonlinear relationship and the optimal threshold effect as well as the causality between debt and growth will be addressed successively.

Nonlinear relationship and optimal threshold effect

Many scholars have confirmed the nonlinear relationship between debt and economic growth. Indeed, Cai (2017) empirically analyzed the nonlinear relationship between per capita real GDP growth and public debt in China by employing augmented distributed lag (ADL) test for threshold co-integration. His empirical results confirmed a nonlinear relationship through the existence of a threshold co-integration relationship between public debt and real GDP growth per capital.

Irina and Ihnatov (2015), in their study on the relationship between public debt and economic growth for a panel of 33 European countries over the period 1990-2011, investigated the evidence of a non-linear (quadratic) relationship. They found an inverted "U"

relationship with a maximum debt threshold of about 94% of GDP after which public debt negatively affected the economic growth rate.

Mencinger et al. (2015) determined the turning point of debt-to-GDP ratio and evaluated the impact of levels of indebtedness in public sector on current economic growth for a panel dataset of 36 countries (31 OECD member states and 5 non-OECD EU member countries). The sample was divided into subgroups to distinguish between developed economies, covering the period of 1980 to 2010, and emerging economies, covering the period 1995 to 2010. Using a panel estimation, their results confirmed the general theoretical assumption that at low levels of public debt, the impact on growth is positive, whereas beyond a certain debt turning point, there is a negative effect on growth. They found that the debt-to-GDP turning point, where the positive effect of accumulated public debt inverts into a negative effect, is roughly between 90 and 94% for developed economies. Yet, for emerging countries, the debt-to-GDP turning point is lower: between 44 and 45%.

Mencinger et al. (2014) investigated the direct effect of higher indebtedness on economic growth for 25 EU countries. Their sample of EU countries was divided into subgroups to distinguish between 'old' member states, over the period of 1980 - 2010, and 'new' member states, covering the period of 1995 to 2010. Using a panel estimation method, they found confirmation of a nonlinear relationship between public debt-ratio on per capita GDP growth rates. They also found the debt-to-GDP threshold to be roughly between 80 and 90% for the 'old' member states. Yet for the 'new' member states, the debt-to-GDP threshold is lower and stood between 53 and 54%.

Greenidge et al. (2012) investigated threshold effects between public debt and economic growth in the Caribbean. Their study confirmed the existence of a threshold debt to gross domestic product (GDP) ratio of 55 to 56%. They also found that the debt dynamics began changing well before this threshold is reached. Specifically, at debt levels lower than 30% of GDP, increases in the debt-to-GDP ratio are associated with faster economic growth. However, as debt rises beyond 30%, the effects on economic growth diminishes rapidly and at debt levels reaching 55 to 56% of GDP, the growth impacts switch from positive to negative. Thus, beyond this threshold, debt becomes a drag on growth.

Baum et al. (2012) investigated the relationship between public debt and economic growth in 12 euro area countries for the period of 1990 - 2010. Using a dynamic threshold panel methodology to analyze the non-linear impact of public debt on GDP growth, they found that the short-run impact of debt on GDP growth is positive and highly statistically significant, but decreases to about zero and loses significance beyond public debt-to-GDP ratios of about 67%. Moreover, for high debt-to-GDP ratios (above 95%), additional debt has a negative

impact on economic activity.

Égert (2012) using nonlinear threshold models and part of Reinhart and Rogoff dataset, found evidence of a negative nonlinear relationship between debt and growth. They argued that their results were very sensitive to the time dimension and country coverage considered, data frequency (annual data vs. multi-year averages) and assumptions on the minimum number of observations required in each nonlinear regime. They showed that when non-linearity is detected, the negative nonlinear effect kicks in at much lower levels of public debt (between 20 and 60% of GDP). Results, confirmed on a shorter dataset (1960-2010) when they used a multivariate growth framework, accounts for traditional drivers of long-term economic growth and model uncertainty.

Antonakakis (2014) examined the role of theory-driven (non-) sustainable debt-ratios in combination with debt-ratio thresholds on economic growth. Using both dynamic and non-dynamic panel data analyses for 12 countries in the Euro zone over the period 1970-2013, non-sustainable debt-ratios above and below the 60% threshold was found to have a detrimental effect on short-run economic growth, while sustainable debt-ratios below the 90% threshold exerted a positive influence on short-run economic growth. In the long-run, both non-sustainable and sustainable debt-ratios above the 90% threshold, as well as non-sustainable debt-ratios below the 60% compromised economic growth.

Patillo et al. (2002; 2011) assessed the nonlinear impact of external debt on growth using a large panel dataset of 93 developing countries over the time period of 1969 to 1998. They found not only a support for a nonlinear relationship between debt and growth but also, the average impact of debt on growth became negative at about 35 to 40% of GDP.

Checherita and Rother (2010) investigated the average impact of government debt on per-capita GDP growth in twelve (12) euro area countries over a period of about 40 years starting from 1970. They found a non-linear impact of debt on growth with a turning point at about 90 to 100% of GDP, beyond which the government debt-to-GDP ratio has a deleterious impact on long-term growth. In addition, they indicated that the negative growth effect of high debt may even start earlier from levels of about 70 to 80% of GDP.

Kumar and Woo (2010) explored the impact of high public debt on long-run economic growth using a panel of advanced and emerging economies over almost four decades. They also investigated threshold effects as well as nonlinearities. They found an inverse relationship between initial debt and subsequent growth. They also found some evidence of nonlinearity with higher levels of initial debt having a proportionately larger negative effect on subsequent growth.

Smith and Hsing (1995) investigated the existence of an optimal debt ratio that will maximize economic growth.

They modeled growth rate of real GDP as a function of the debt ratio, the debt ratio squared (to capture the nonlinearities), and other control variables on a sample ranging from 1960 to 1991. They found a long run stable relationship between economic growth and its determinants, including the debt ratio. Their results indicated that the optimal debt ratio was 38.4% for debt held by the public and 48.9% for total debt.

Unlike the above studies which are in favor of a nonlinear relationship between debt and growth and the existence of a threshold debt level, scholars including Pescatori et al. (2014) and Ash et al. (2017), are not supportive of such findings. Indeed, Pescatori et al. (2014) found no evidence of any particular debt threshold above which medium-term growth prospects are dramatically compromised. Furthermore, they found that the debt trajectory can be as important as the debt level in understanding future growth prospects, since countries with high but declining debt appear to grow equally as fast as countries with lower debt. Ash et al. (2017) on the other hand provided a comprehensive assessment of the relationship between public debt and GDP growth in the postwar advanced economies in their paper on Public Debt and Growth. Their results did not provide any support for threshold effect.

Causality between debt and growth

Zouhaier and Mrad (2014) analyzed the effect of debt on economic growth of 19 developing countries over the period 1990-2011 using a dynamic panel data model. They found a negative effect of total external debt to GDP and external debt as a percentage of Gross National Income (GNI) ratio on economic growth. Similar negative relationship between Debt and growth was found by Panizza and Presbitero (2012), Balassone et al. (2011), Malik et al. (2010), Clements et al. (2003), Šimić and Vinko (2012), Babuet al. (2014) and Kasidi and Said (2013). Indeed, Panizza and Presbitero (2012) found a negative correlation between debt and growth. They used an instrumental variable approach and a sample of OECD countries. Šimić and Vinko (2012) explored the debt levels in Central, East and Southeast Europe and investigated their relation with growth. Using annual data on debts and growth on 18 countries and employing econometric analysis in the form of dynamic panel data analysis, they found support for the dangers of high indebtedness in the studied region. Similar study was done for Italy by Balassone et al. (2011), who investigated the link between government debt-to-GDP ratio and real per capita income growth over 1861-2009. Using regression analysis on a standard production function, they found a negative relationship between public debt and growth.

Studies were also conducted in Asia to assess the Debt

and Growth nexus. These include those of Malik et al. (2010), Mohanty and Mishra (2016) and Lau and Thian-Ling (2014). Malik et al. (2010) explored the relationship between external debt and economic growth in Pakistan for the period of 1972- 2005 using time series econometric technique. They found that External Debt has a negative impact on Economic Growth. Mohanty and Mishra (2016) examined the impact of public debt on economic growth from Indian States. They used a panel data of 14 major States in India for the period 1980-81 to 2013-14. Their results confirmed the existence of bidirectional causality between public debt and economic growth; Lau and Thian-Ling (2014) examined the nexus between external debt and economic growth, covering seventeen Asian countries and using panel data investigation. They found that external debt works through two channels: a direct channel in which the causality runs from external debt to GDP and indirectly, in which it positively enhances exports through GDP.

Developing countries including African countries also had their share of such studies among which are: Clements et al. (2003), Babu et al. (2014), Kasidi and Said (2013), Ogunmuyiwa (2011) and Owusu-Nantwi and Erickson (2016). Clements et al. (2003) in their paper on "External Debt, Public Investment and Growth in Low-Income Countries" examined the channels through which external debt affects growth in low-income countries. They found that substantial reduction in the stock of external debt in Highly Indebted Poor Countries (HIPCs) would directly increase per capita income growth by about 1% point per annum. This was part of the argument that led to the HIPC initiative. Babu et al. (2014) using data from 1970 to 2010 and panel fixed-effects estimation, investigated the relationship between external debt as a share of GDP on economic growth in East Africa Community. They found a negative and significant relationship.

Unlike the above studies that found a negative relationship between Debt and Growth, the works by Kasidi and Said (2013), Ogunmuyiwa (2011), Owusu-Nantwi and Erickson (2016) and Uzun et al. (2012) are not in support of such findings. Indeed, Kasidi and Said (2013) investigated the impact of external debt on economic growth in Tanzania for the period of 1990-2010 using time series data on external debt and economic performance, and found that External Debt stock has a positive effect of about 0.369. Owusu-Nantwi and Erickson (2016), examined the long-term and causal relationship between public debt and economic growth in Ghana using Johansen co-integration and the vector error correction model on annual time series data from 1970 to 2012, and found a positive long run relationship between public debt and economic growth and in the short run a bidirectional Granger causality link between public debt and economic growth. Uzun et al. (2012) analyzed the relationship between GDP per

capita growth rate and external debt to GNI between 1991 and 2009 in the transition countries using panel autoregressive distributed lag model (ARDL) and found a positive relationship between debt and growth rate. Ogunmuyiwa (2011) on the other hand, examined whether external debt promotes economic growth in Nigeria and found no evidence of causality between external debt and economic growth. They used time series data from 1970-2007 to fit a regression equation and run several econometric tests including Granger causality and Johansen co-integration.

It is clear from the above brief review of selected literature that there is no consensus on the optimal level of debt to GDP ratio beyond which accumulated debts negatively affect a country's growth performance.

METHOD OF ANALYSIS AND DATA

Taking stock of past work, a conventional growth model was used in which the variable of interest, i.e. Debt to GDP ratio was captured in a linear and quadratic form. This is to enable the investigation of a debt to GDP threshold. Other control variables were also included. These are: inflation ($linflt$), terms of trade ($ltotdt$), life expectancy ($llifet$), openness ($lopen_t$), growth rate of economically active population ($\Delta lpop64_t$), education ($leduc_t$) and fiscal balance ($fsblcet$). The final model to be estimated is presented as:

$$\Delta lgdpk_t = \beta_0 + \alpha lgdpk_{t-1} + \beta_1 ldt2gdp_t + \beta_2 ldt2gdpsq_t + \beta_3 linflt_t + \beta_4 linvt_t + \beta_5 ltotdt_t + \beta_6 llifet_t + \beta_7 lopen_t + \beta_8 \Delta lpop64_t + \beta_9 leduc_t + \beta_{10} fsblcet_t + \epsilon_t \quad (1)$$

Where, $\Delta lgdpk_t$ is the growth rate of per capita gross domestic product at current U.S dollars; $ldt2gdp_t$ is the natural logarithm of Debt to GDP ratio, measure in percentage; $linflt_t$ is natural logarithm of inflation captured through the Consumer Price Index (CPI); $linvt_t$ is Investment captured through the Gross Fixed Capital Formation (GFCF) as percentage of GDP; $ltotdt_t$ is the natural logarithm of the Terms of Trade measured by the ratio of Export index value to Import index value; $llifet_t$ is the natural logarithm of life expectancy used as a proxy for human capital development; $lopen_t$ is the natural logarithm of Merchandise Import used to capture country's openness measured as a percentage of GDP; $\Delta lpop64_t$ is the growth rate of the economically active population that is, population aged between 15 to 64 years measured as a percentage of total population; $leduc_t$ is the natural logarithm of primary school enrollment rate another proxy for human capital development; $fsblcet_t$ stands for overall fiscal balance in percentage of GDP.

Given the quadratic form of the model, it is possible to determine the optimum level of the debt to GDP ratio, at which the impact of Debt on growth switches from positive to negative. This optimum level is determined by taking the first derivative of the above equation with respect to the variable $ldt2gdp_t$. To ensure that the optimum level obtained is either a maximum or minimum, the second derivative was taken with respect to the debt to GDP ratio variable. The optimum level is maximum if the second derivative above is negative. Therefore, this will be obtained:

$$\frac{\partial \Delta lgdpk_t}{\partial ldt2gdp_t} = \beta_1 + 2\beta_2 ldt2gdp_t^* = 0 \quad (2)$$

$$\text{With } \frac{\partial^2 \Delta \lg dpk_t}{\partial^2 \lg dt2gdp_t} < 0. \quad (3)$$

The threshold level of the Debt to GDP ratio is given by:

$$\lg dt2gdp_t^* = \frac{-\beta_1}{2\beta_2} \quad (4)$$

Since the variables are in natural logarithm, we can derive the actual optimal debt to GDP ratio by taking the exponential of the above result, that is,

$$dt2gdp_t^* = e^{\lg dt2gdp_t^*}$$

The data used for this research work was obtained mainly from the World Bank's World Development Indicators 2017 and covers a time period spanning from 1970 to 2015. The statistical software STATA 14 was used for the estimation.

EMPIRICAL RESULTS

This section presents the empirical findings. Table 1 gives the basic descriptive statistics. Results show that the country's per capita GDP ($GDPk_t$) reached a maximum of US\$ 1,544.320 in 2014. Its lowest level over the period of analysis stood at US\$ 277.6 (in 1970). The debt to GDP ratio stood at an average of 91.18% over the period with a minimum of 25.66% in 1970 (the period of the Ivorian "miracle") and a maximum of 209.24% in 1994 at the time of the devaluation of the Ivorian currency (the CFA franc). Investment as % of GDP has not been high. Indeed, it stood at an average of 15% over the period of analysis with a maximum at 29.6% in 1978 (almost at the end of the Ivorian miracle). Openness is captured through merchandise imports as well as imports of goods and services. Merchandise import as % of GDP stood at an average of 26.65% over the study period with a maximum of 39.9% in 2013, whereas imports of goods and services stood at an average of 34.9% with a maximum of 44.3% in 2012.

Table 2 presents results of the unit root tests conducted. Both the Augmented Dickey Fuller (ADF) and Philip Perron (PP) tests were conducted and gave similar results. All the variables of interest are integrated of order one, that is, they are $I(1)$. Following the results of the unit root tests which is an indication of the possibility of co-integration, the author proceeded to investigate the number of lags to be used for assessing the number of co-integrating equations if any (Table 3). Using Equation 1, the author proceeded with the lag selection test, the HQIC⁴ statistics which in our case provide support for one lag. Indeed, the HQIC statistic (-1.889) is significant

⁴Hannan and Quinn information criterion (HQIC) lag-order selection statistics for a series of vector autoregressions of order 1 through a requested maximum lag. A sequence of likelihood-ratio test statistics for all the full VARs of order less than or equal to the highest lag order is also reported. The Stata Command used is *varsoc*.

as shown in Table 2.

Using the aforementioned result, the number of co-integrating equations (rank order) was investigated with the Johansen tests for co-integration with a trend, constant and lag(1)⁵. The test results, based on the trace statistics 24.209 which is less than the critical value at the 5% probability level indicate the existence of eight (08) co-integrating equations (Table 4). That is, the variables in Equation 1 are co-integrated which is an indication of a long run relationship among the variables.

In light of the above co-integration test results, our model can be estimated without the fear of spurious regression. Equation 1 is therefore estimated using least squares with robust standard errors. The estimation results are provided in Table 5 where three versions of Equation 1 are considered. The first version (Model 1) is the full model (with all the variables in Equation 1). In model 2, the fiscal balance variable ($Fscblce_t$) which appears not to be statistically significant was removed and in model 3, in addition to the fiscal balance variable, the population growth variable was removed. The removal of these two variables did not alter the quality of the estimation results and the estimated coefficients were almost identical.

Consider model 1 in the analysis. As expected, the coefficient of the lagged dependent variable ($\ln gdpk_{t-1}$) is negative and statistically significant indicating convergence of the model to a steady state. The inflation variable ($\ln inf_t$) which is measured by the Consumer Price Index (CPI) has a positive and significant coefficient indicating that the level of inflation in the country has a positive impact on the country's economic performance. The investment variable ($\ln inv_t$) which is captured through the Gross Fixed Capital Formation, is positive and statistically significant. Thus, increasing the country's physical capital formation positively impacts economic growth. The terms of trade ($\ln totdt_t$) and Merchandise imports ($\ln opent_t$) variables were introduced in the model to capture the effects of external shock on the economy ($\ln totdt_t$) as well as the importance of external penetration ($\ln opent_t$). These two variables have negatively affected the country's economic performance. Indeed the terms of trade have not been favorable to the country throughout the study period. It stood on average at about 85% (Table 1). Two other variables were introduced in the model to capture the extent of human capital development. The variables are life expectancy ($\ln life_t$) and primary school enrolment rate ($\ln educt_t$). The life expectancy variable is positively linked to economic growth. Indeed, life expectancy increases as a result of improvement in health which, *ceteris paribus*, will have a positive impact on growth hence the positive coefficient. The other human capital development variable does not directly

⁵The Stata Command for this test is *Vecrank*.

Table 1. Descriptive statistics of selected variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
$GDPk_t$ (current 2010 US\$)	46	873.141	293.588	277.660	1544.320
$Debt/GDP_t$ (%)	46	91.177	51.055	25.660	209.240
Inf_t (%)	46	55.569	33.826	8.060	110.870
Inv_t (%)	46	15.076	5.921	8.250	29.660
$Totdt$ (%)	46	85.836	15.943	40.890	129.580
$Life_t$ (%)	46	49.499	2.443	43.740	52.920
$Opent$ (%)	46	26.647	4.768	19.150	39.930
M_t (%)	46	34.921	5.068	25.910	44.330
$Pop64_t$ (%)	46	52.916	0.683	51.840	54.500
$Educt$ (%)	46	72.129	6.864	60.360	92.670
$Fscblcet$	46	-4.627	4.953	-16.638	2.871

Author's estimation.

Table 2. Unit root test of selected variables.

	ADF		P. Perron	
	Levels	First-Difference	Levels	First-Difference
$IGDPkusc_t$	-2.658 (0.082)	-4.607* (0.000)	-2.590 (0.095)	-4.638* (0.000)
$ldt2gdpt$	-1.873 (0.345)	-5.694* (0.000)	-1.601 (0.483)	-5.675* (0.000)
$linf_t$	-3.288 (0.015)	-3.619* (0.005)	-3.221 (0.0189)	-3.678* (0.004)
$linvt_t$	-2.709 (0.072)	-5.557* (0.000)	-1.583 (0.492)	-5.390* (0.000)
$ltotdt$	-3.262 (0.016)	-3.694* (0.004)	-3.289 (0.015)	-8.756* (0.000)
$llife_t$	-3.217 (0.019)	-4.667* (0.000)	-2.813 (0.056)	-4.107** (0.000)
$lopent$	-2.143 (0.228)	-7.572* (0.000)	-2.084 (0.251)	-7.761* (0.000)
$lpop64_t$	0.118 (0.967)	-2.631* (0.006)	-0.638 (0.862)	-2.631* (0.087)
$leduc_t$	-0.527 (0.887)	-4.012* (0.001)	-0.265 (0.930)	-4.072* (0.001)
$Fscblcet$	-2.842 (0.052)	-4.512* (0.000)	-2.447 (0.129)	-5.439* (0.000)

Author's estimation. Asterisk (*) indicate significance at the 1% probability level.

impact productivity. That is, unless other developmental conditions are in place, an increase in primary school enrolment negatively impacts the country's economic performance.

The key variable of interest, that is, the debt to GDP ratio variable has a positive and significant coefficient, which is an indication that debt as such is not bad for economic growth. The quadratic term of this variable is negative and also statistically significant, indicating nonlinearity of the debt and growth relationship and the existence of a threshold level of debt. Using the estimated coefficients, a threshold:

$$ldt2gdpt^* = \frac{-1.752}{2 \times (-0.233)} = 3.759$$

was obtained. Taking the exponential of this value gives: $dt2gdp^* = e^{ldt2gdpt^*} = e^{3.759} = 42.9$. Thus, the optimal level of the Ivorian Debt to GDP ratio is

42.9%. Beyond this point, additional debt will negatively affect the country's economic performance.

CONCLUSION AND RECOMMENDATIONS

The objective of this paper is to shed light on Cote d'Ivoire's indebtedness and see to what extent the country's current level of debt is worrisome. A time series data spanning from 1970 to 2015 was used to investigate the debt and growth nexus. The time series characteristics of the data to be used were investigated. All the variables considered for this study were I(1). The extent to which these variables will be co-integrated given their non-stationary nature was also tested. It was found that the variables were co-integrated and the coefficients of the proposed equation 1 were estimated using robust least squared method.

Table 3. Test results for identifying the number of lag.

Lag no.	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	53.981				0.008	-2.047	-1.879	-1.592*
1	55.484	3.007	1	0.083	0.008*	-2.071	-1.889*	-1.574
2	55.935	0.902	1	0.342	0.008	-2.044	-1.847	-1.507
3	57.503	3.137	1	0.077	0.008	-2.072*	-1.859	-1.492
4	57.520	0.033	1	0.855	0.008	-2.025	-1.797	-1.404

Author's estimation.

Table 4. Results for Johansen tests for cointegration with a trend, constant and lag(1) to identify the number of cointegrating equations.

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% Critical value
0	11	808.893	.	556.119	277.710
1	32	909.358	0.988	355.190	233.130
2	51	950.079	0.836	273.747	192.890
3	68	983.073	0.769	207.759	156.000
4	83	1009.219	0.687	155.467	124.240
5	96	1030.862	0.618	112.181	94.150
6	107	1049.309	0.559	75.288	68.520
7	116	1062.533	0.444	48.838	47.210
8	123	1074.848	0.421	24.209*	29.680
9	128	1082.744	0.296	8.417	15.410
10	131	1086.901	0.169	0.103	3.760
11	132	1086.953	0.002		

Author's estimation.

Table 5. Robust least squared estimates of the relationship between debt to GDP ratio and economic growth in Cote d'Ivoire.

<i>Δlgdpkusct</i>	Model 1	Model 2	Model 3
<i>lgdpkusct-1</i>	-0.661* (0.000)	-0.669* (0.000)	-0.670* (0.000)
<i>ldt2gdpt</i>	1.752*	1.762*	1.798
<i>ldt2gdpsqt</i>	-0.233* (0.006)	-0.234* (0.005)	-0.239* (0.005)
<i>linft</i>	0.386* (0.002)	0.392* (0.002)	0.391* (0.002)
<i>linvt</i>	0.259* (0.000)	0.264* (0.000)	0.265* (0.000)
<i>ltotdt</i>	-0.230(0.006)	-0.219* (0.002)	-0.219** (0.008)
<i>llifet</i>	3.703* (0.080)	3.715* (0.048)	3.694* (0.031)
<i>lopent</i>	-0.341** (0.000)	-0.334** (0.000)	-0.337** (0.000)
<i>Δlpop64t</i>	-1.063(0.025)	-0.951(0.021)	(0.036)
<i>leduct</i>	-1.315* (0.910)	-1.325* (0.918)	-1.325*
<i>Fscblcet</i>	0.081(0.000)	(0.000)	(0.001)
<i>Const</i>	-7.502* (0.877)	-7.569*	-7.546**
<i>F-stat</i>	(0.005) 5.590*	(0.004) 6.110*	(0.014) 6.950*
<i>R-squared</i>	0.659(0.000)	0.659(0.000)	0.659(0.000)

Author's estimation.

The empirical results are supportive of the idea that External Debt is good for growth (positive coefficient) but caution should be taken so as to limit its level. There was evidence of a nonlinear relationship between external debt and growth and more importantly a threshold point of 42.9% was found beyond which external debt accumulation will negatively affect economic growth. Thus, given the current level of the country's External Debt level which stood at 48.3% (International Monetary Fund, 2017) one should be worried and call on the authorities for more prudent economic governance. This includes ensuring that borrowed monies are allocated to their intended uses and not diverted and that a system of monitoring and evaluation is set up to ensure value for money in programme implementation and accountability.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

- Antonakakis N (2014). Sovereign Debt and Economic Growth Revisited: The Role of (Non-) Sustainable Debt Thresholds. WU, Department of Economics Working P 187.
- Ash M, Basu D, Dube A (2017). Public Debt and Growth: An Assessment of Key Findings on Causality and Thresholds, Political Economy Research Institute, University of Massachusetts Amherst Working P 433.
- Babu JO, Kyprop S, Kalio AM, Gisore M (2014). External Debt and Economic Growth in the East African Community, *Afr. J. Bus. Manage.* 8(21):1011-1018.
- Balassone F, Francese M, Pace A (2011). Public debt and economic growth in Italy, *Economic History Working P. 11*, Banca d'Italia.
- Cai Y (2017). Nonlinear Analysis of Economic Growth, Public Debt and Policy Tools. *Asian Econ. Financ. Rev.* 7(1): 99-108.
- Égert B (2012). Public debt, Economic Growth and Nonlinear Effects: Myth or Reality? *Econ. Department Working P. 993*.
- Checherita C, Rother P (2010). The impact of high and growing government debt on economic growth. An empirical investigation for the euro area, *ECB Working P 1327*.
- Chowdhury AR (2001). External Debt and Growth in Developing Countries: A Sensitivity and Causal Analysis, Discussion P. 2001/95, United Nations University, WIDER.
- Clements B, Bhattacharya R, Nguyen TQ (2003). External Debt, Public Investment, and Growth in Low-Income Countries *IMF Working P 03/249*.
- Diaz-Alejandro C (1981). 'Southern Cone Stabilization Plans', in W. Cline and S. Weintraub (eds), *Economic Stabilization in Developing Countries*. Washington, DC: The Brookings Institution.
- Fraternité M (2017). on s'endette bien et l'endettement est bien orienté, Assahouré Konan Jacques. <https://www.fratmat.info/index.php/nos-unes/endettement-de-la-cote-d-ivoire-le-dg-du-tresor>
- Greenidge K, Craigwell R, Chrystal T, Drakes L (2012). Threshold effects of sovereign debt: Evidence from the Caribbean, *IMF Working P. 157*, Washington, D.C.
- Herndon T, Ash M, Pollin R (2013). Does high public debt consistently stifle economic growth? A critique of Reinhart and Rogoff, *Camb. J. Econ.* 1(23).
- International Monetary Fund (2017). *West African Economic and Monetary Union, Country Report 17/99*.
- Irina B, Iulian I (2015). Public debt and economic growth: a two-sided story, *Int. J. Econ. Sc.* 4(2): 24-39.
- Kasidi F, Said AM (2013). Impact of External Debt on Economic Growth: A Case Study of Tanzania, *Adv. Manag. Appl. Econ.* 3(4): 59-82.
- Kouadio Y (1993). *Rétrospective Economique de la Cote d'Ivoire: Etude Nationale Prospective*, (unpublished paper)
- Krugman P (1987). Prospects for International Debt Reform, in *International Financial Issues for the Developing Countries*. Geneva: UNCTAD.
- Kumar MS, Woo J (2010). Public debt and growth, *IMF Working, Washington, D.C.* P 174.
- Lau E, Thian-Ling K (2014). External Debt, Export and Growth in Asian Countries: 1988-2006, *J. Appl. Sc.* 14(18): 2170-76.
- Malik S, Muhammad KH, Muhammad UH (2010). External Debt and Economic Growth: Empirical Evidence from Pakistan, *Int. Res. J. Financ. Econ. ISSN 1450-2887 Issue 44*.
- Mencinger J, Aristovnik A, Miroslav V (2015). Revisiting the Role of Public Debt in Economic Growth: the Case of OECD Countries, *Indzinerine Ekonomika- Eng. Econ.* 26(1):61-66.
- Mencinger J, Aristovnik A, Miroslav V (2014). The Impact of Growing Public Debt on Economic Growth in the European Union. *Amf. Econ.* 16(35):403-414.
- Mohanty AR, Mishra BR (2016). Impact of Public Debt on Economic Growth: Evidence from Indian States. <https://www.researchgate.net/publication/317233262>
- Nshimyumuremyi A (1997). *National Poverty Reduction Strategies: A Case Study of Cote d'Ivoire*. (unpublished paper).
- Owusu-Nantwi V, Erickson C (2016). Public Debt and Economic Growth in Ghana, *Afr. Dev. Rev.* 28(1):116-126.
- Ogunmuyiwa MS. Does external debt promote economic growth in Nigeria?. *Curr. Res. J. Econ. Theory* 3(1):29-35.
- Patillo C, Poirson H, Ricci LA (2011). External Debt and Growth, *Rev. Econ. Inst.* 2(3). retrieved from <http://www.rei.unipg.it/rei/article/view/45>.
- Panizza U, Presbitero AF (2012). Public Debt and Economic Growth: Is There a Causal Effect? *POLIS Working P 198*.
- Pescatori A, Sandri D, Simon J (2014). Debt and Growth: Is There a Magic Threshold? *IMF Working, Washington, D.C.* P. 34.
- Reinhart CM, Rogoff KS (2010). Growth in a Time of Debt, *Amer. Econ. Rev.: Papers & Proceedings* 100: 573-578.
- Smith DJ, Hsing Y (1995). In Search of an Optimal Debt Ratio for Economic Growth, *Cont. Econ. Pol.* 13(4):51-59.
- Šimić V, Vinko M (2012). Debts (Public and External) and Growth – Link or No Link? *Croatian Oper. Res. Rev.* 3:91.
- Stiglitz J (2017). Austerity has strangled Britain. Only Labour will consign it to history, <https://www.theguardian.com/commentisfree/2017/jun/07/austerity-britain-labour-neoliberalism-reagan-thatcher>
- Uzun A, Karakoy C, Kabadayi B, Emsen OS (2012). The Impacts of External Debt on Economic Growth in Transition Economies, *Chin. Bus. Rev.* 11(5):491-499.
- Zouhaier H, Mrad F (2014). Debt and economic growth, *Int. J. Econ. Financ.* 4(2):440-448.