Does external debt promote economic growth in Côte d'Ivoire?

By

TOAMA, Boke Aime Arnauld

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC POLICY

2019

Does external debt promote economic growth in Côte d'Ivoire?

By

TOAMA, Boke Aime Arnauld

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC POLICY

2019

Professor Liu, Cheol

Does external debt promote economic growth in Côte d'Ivoire?

By

TOAMA, Boke Aime Arnauld

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC POLICY

Committee in charge:

Professor Liu, Cheol, Supervisor

Professor Lee, Jongyearn

Approval as of December, 2019

ABSTRACT

DOES EXTERNAL DEBT PROMOTE ECONOMIC GROWTH IN CÔTE D'IVOIRE?

By

Toama Boke Aime Arnauld

The paper calls attention to the increasing external debt in Côte d'Ivoire. The primary goal of this paper was to cast light on the nature of the correlation between external debt and economic growth. I also attempted to identify the optimal level of debt stock that the country should hold for growth. The Autoregressive Distributive Lag (ARDL) bound test was performed to test for the presence of a cointegrating relationship between external debt and economic growth. I also employed the Hansen (2000) threshold test so as to confirm the presence of a threshold effect in external debt. The results suggest that external debt and economic growth are cointegrated. External debt significantly promoted growth in the long-run. The threshold test confirmed the presence of a threshold effect of external debt on economic growth, meaning that the Ivorian external debt and growth display a non-linear relationship. However, the number of observations did not allow the estimation of the threshold.

Acknowledgements

This thesis would have not been possible without the support of my sponsor, the National Institute for International Education (NIIED). I am grateful for your financial support through my entire studies at KDI School of Public Policy and Management. I also want to thank my academic supervisor, Professor Liu Cheol for his support and guidance during the research period. To the staff of KDI School, I appreciate you for your unwavering support from the application period to the end of my studies in this prestigious institution. Last but not least, I am grateful to all the students of KDI School for the time spent together and all the unforgettable memories. I wish you success in your future endeavors.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

In recent years, researchers have become increasingly interested in the nexus between debt accumulation and economic growth due to a sharp increase in public debt around the globe (Greenidge, Craigwell, Drakes, & Thomas, 2014;Woo & Kumar, 2015).

Debt levels are on the rise across the world, calling the attention of policy makers and governments. In fact, many countries have accumulated debts beyond the recommended thresholds, meaning that their debt stocks are beyond levels compatible with economic performance. According to the International Monetary Fund (IMF), global debt has reached a high of US$164 trillion in 2016, which accounts for 225 percent of the global GDP. This peak is 12 percent of GDP below the previous peak in 2009(International Monetary Fund, 2018).

The rising level of debt around the world has been experienced by all countries- developed, newly industrializing, as well as developing nations. The IMF estimated the debt at 105 percent of debt-to-GDP ratio for advanced economies between 2012 and 2015, a record high not reached since World War II. For emerging markets and middle-income economies' debt-to-GDP ratio reached a record high, 50 percent in 2017, the same level observed during the debt distress of 1980. The same upward trend is observed in low-income countries: in particular between 2012 to 2017, the average debt-to-GDP ratio increased by 10 percent, going beyond 40 percent in 2017 (International Monetary Fund, 2018). As a result, the number of countries with debt exceeding the critical values have significantly increased. For instance, in 2017, the number of advanced economies with levels of debt beyond 85 percent of GDP were three times higher than in 2000; 20 percent of emerging markets and middle-income countries exceeded 70 percent of debt-to-GDP ratio, a situation similar to the 2000 post-Asian financial crisis. For the low-income developing countries, 20 percent have exceeded 60 percent of the same ratio,

although none of them had reached this level in 2012. Therefore, rising debt levels appears to be a serious global issue.

A number of the low-income countries (Afghanistan, Cameroon, Ghana, Honduras, Nicaragua, Senegal, Tanzania, etc.) were beneficiaries of the debt relief under the Highly Indebted Poor Countries (HIPC) initiative. This initiative is a debt reduction strategy jointly undertaken by the IMF and the World Bank to make sure no low-income country faces a debt level that threatens its development prospects. Although the initiative was supposed to improve the situation of these countries, several of them have debt stocks not much different from the debt levels they had before the moment when the debt reduction was granted. Countries such as Chad, the Republic of Congo, Mozambique, and Sudan are even in a worst situation, meaning that they are in default or restructuring their debt.

Cote d'Ivoire is part of the countries that benefited from the debt reduction under the HIPC initiative. The country was hit by a severe debt crisis in 1980-1990, which led to the country's official declaration of insolvency, and the suspension of the debt service in May 1987. In fact, in 1979, the balance of payment and the public sector recorded severe deficits. From 1981 to 1986, the country went through three structural adjustment plans (SAPs) to deal with its structural imbalances (Ngalaiijo, Bernard, Kunvaly, & Mamadou, 1992). In the face of a high debt burden and a heavy debt service, the World Bank and the IMF jointly admitted Cote d'Ivoire to the debt reduction initiative aforementioned. In April 2009, the country attained the decision point, and three years later, it satisfied the requirements to attain the completion point. Therefore a debt relief was granted.[1]

[1] The HIPC initiative is a two-step process that leads to the full debt forgiveness. The decision point is the first step and the completion point is the second one. For each step there are criteria to be met.

Although the current level of debt is still under control, the rapid growth observed lately in debt indicators- external debt-to-GNI ratio rose from 28 to 34 percent between 2014 and 2017- calls for a more prudent debt policy in order to avoid the occurrence of another crisis (world development indicators). Moreover, the debt stock in 2017 of US$ 13.4 billion is above the level reached before the debt relief in 2012, that is, US$ 9.54 billion in 2009 (International debt statistics).

The way debt affects economic growth varies across countries and regions. Some scholars argue that debt stimulates growth (Faraji & Said, 2013;Ogunmuyiwa M.S, 2011). In contrast, Greene and Villanueva (1991), Deshpande (1997) and Chowdhury (2001), showed that debt negatively affects economic growth. Moreover, there are some authors who investigated the presence of a threshold effect. This means that the effect of debt on growth switches from positive to negative or vice versa after reaching a certain critical value (Bhattacharya, Nguyen, & Clements, 2014; Pattillo & Ricci, 2011).

While the linkage between debt and economic growth has been extensively investigated by researchers, most of the studies have been done using panel data (Clemens, Bhattacharya, and Nguyen, 2003; Pattillo & Ricci, 2011; Greenidge et al., 2014). This means that the uniqueness of each country has been neglected. This research focuses on a single country and aims at analyzing the nexus between the Ivorian external debt and economic growth. To the best of my knowledge, very few studies have investigated the debt-growth nexus in Cote d'Ivoire. This research tries to capture the uniqueness of the country and provide more specific policy recommendations for a sound debt management capable of overcoming the challenge of balancing debt accumulation with development needs.

This paper will be of interest to researchers, policy makers, and government officers in Côte d'Ivoire and other developing countries in formulating debt policies, and other stakeholders

including, taxpayers, the civil society, international lenders, multilateral and bilateral institutions in monitoring the government debt policies and in negotiating with the government. The following research questions will guide our study:

- Is there a linkage between external debt and economic growth in Côte d'Ivoire?
- What is the magnitude of this relationship if it exists?
- Is there a threshold effect in the external debt-growth nexus?
- What is the external debt threshold?

I formulated the following hypotheses:

- There is a long-run relationship between external debt and growth
- External debt has a positive impact on growth
- There is a threshold effect of external debt on growth

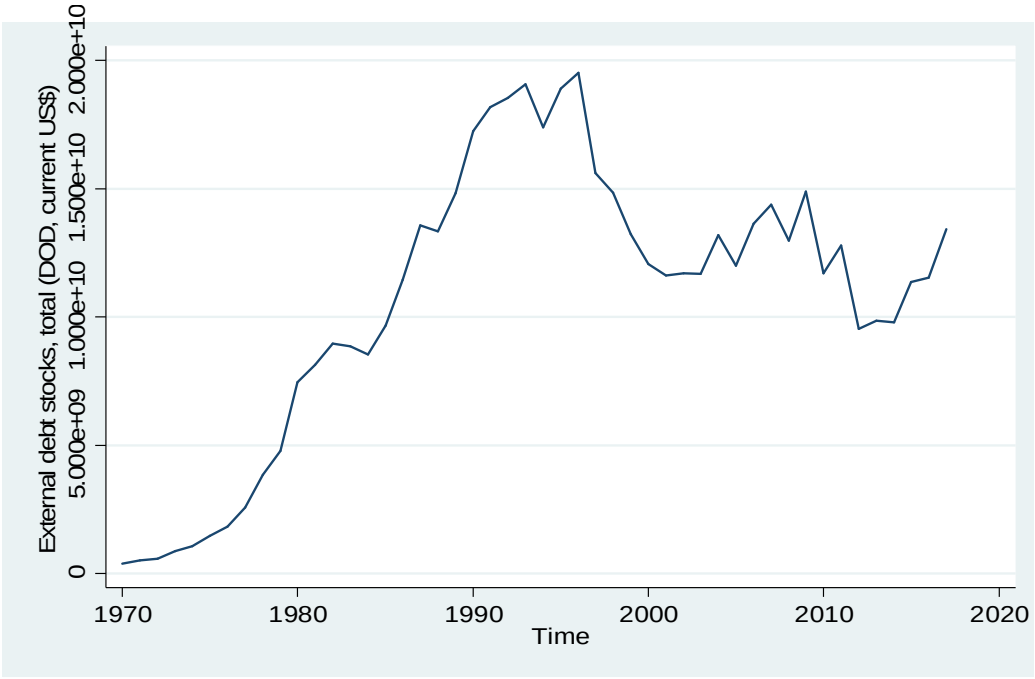
The remainder of this thesis is organized as follows: chapter 2 presents an overview of debt and growth in Cote d'Ivoire, chapter 3 presents the literature review, chapter 4 presents the research method, chapter 5 presents the results and discussion of the results, and chapter 6 is the conclusion.

We will now turn to an overview of the evolution of Ivoirian debt and growth.

CHAPTER 2: OVERVIEW OF DEBT AND GROWTH IN COTE D'IVOIRE

The evolution of the Ivorian external debt-to-GNI ratio shows different patterns on these sub-periods: 1970-1979, 1980-2002, 2002- 2013, and 2014-2017.

Figure 1: Evolution of Côte d'Ivoire's External Debt Stock in $US 1970-2017



THE PERIOD 1970-1979

External debt-to-GNI ratio increased from 26.3 in 1970, to 54.9 in 1979, and total debt service-to-GNI ratio increased from 3 to 7.6 during the same period. These debt stock and debt service levels were associated with a high and positive GDP growth. For instance, in 1970, 1971, 1976 and 1978, Côte d'Ivoire respectively recorded high GDP growth rates of 13.3, 9.4, 13 and 11 percent. The average GDP growth rate from 1970 to 1979 was 7.6

percent. This could be explained by a sound macroeconomic management and the development of agricultural exports namely cocoa beans, coffee and timber, which entailed the accumulation of important financial surpluses over two decades. However, in 1980, the GDP growth rate dropped significantly and reached -11 percent, while external debt increased by 22 percent from 1979 to 1980, and debt service rose sharply from 7.6 to 14.5 percent.

THE PERIOD 1980-2002

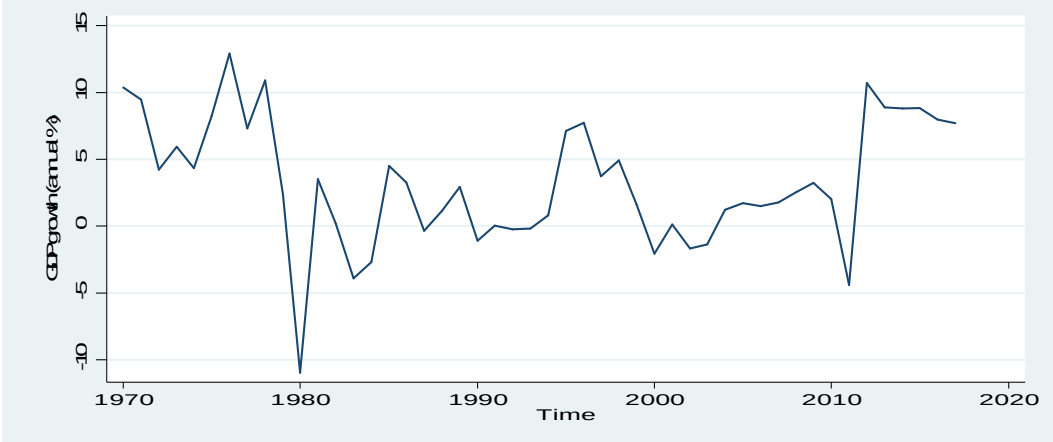
From 1981 to 2002, external debt to GNI ratios remained above 100 percent of GNI, with a peak of 230 percent in 1994. It is worth noting that in 1987, Côte d'Ivoire officially declared its insolvency, meaning it was unable to repay the creditors of the Paris club. In 1994, the peak year in external debt stock, the country went through a devaluation of the domestic currency (franc CFA), which consequently doubled the value of the debt service in local currency. Following the devaluation, Côte d'Ivoire was granted a debt relief by some members of the Paris club, namely France and Netherland, in order to help the country reduce its debt burden. In 1994, the Paris club rescheduled the debt of Côte d'Ivoire based on the London club criteria. This measure accounted approximately for the equivalent of a US$ 1.9 billion grant, spanned through the period 1994-1996. From 1980 to 1990, external debt increased from $US 7.4 million to $17 million, and reached $US 11.7 million in 2002. Relatively substantial resources were allocated to debt service: for instance in 1981, 1982 and 1983, debt service was respectively 19.37, 22 and 21 percent. These high levels of debt service drained resources from the national income, and were associated with low GDP growth rates.

GDP growth rate was very volatile from 1980 to 1994, switching from negative to positive with a record low of -11 percent in 1980. It became positive in 1995-1999 after the devaluation of the domestic currency, but remained low before falling again below zero in 2000-2003.

THE PERIOD 2002- 2013

From 2003, the external debt-to-GNI falls below 100 percent and steadily decreases until 2013. It went from 89.72 in 2003, down to 32.99 percent of GNI in 2013. During the same period, debt service is also brought down to reasonable proportions. In contrast to the period 1981-2002, fewer resources were dedicated to debt service during the period 2003-2013. The

Figure 2: Evolution of GDP Growth rate of Côte d'Ivoire 1970-2017



maximum level of debt service on this timespan is 4.85 percent, whereas it reached 22 percent in 1982. The government made substantial efforts to curb the debt level in order to satisfy the requirements for a debt reduction as part of the debt relief initiative (HIPC initiative).

From 2004 to 2010, the country enjoyed a positive but relatively low growth rate, which became negative in 2011 because of the post-electoral violence of 2011. After this episode of

negative economic growth rate, due to the reunification of the country, and the political stability, the growth rate soared and remained high.

THE PERIOD 2014-2017

From 2014 to 2017, the debt to GNI ratio remains relatively low, that is below 36 percent. The debt service to GNI ratio is also low, below 4 percent, and the GDP growth rate is above 7 percent throughout this period. The lowest growth rate the country had recorded in 2012-2017 was 7.7 percent in 2017. Côte d'Ivoire was considered as one of the best-performing countries in the world in terms of economic growth over this period.

Figure 3: Evolution of GDP growth and External Debt (% of GNI) in Côte d'Ivoire 1970-2017

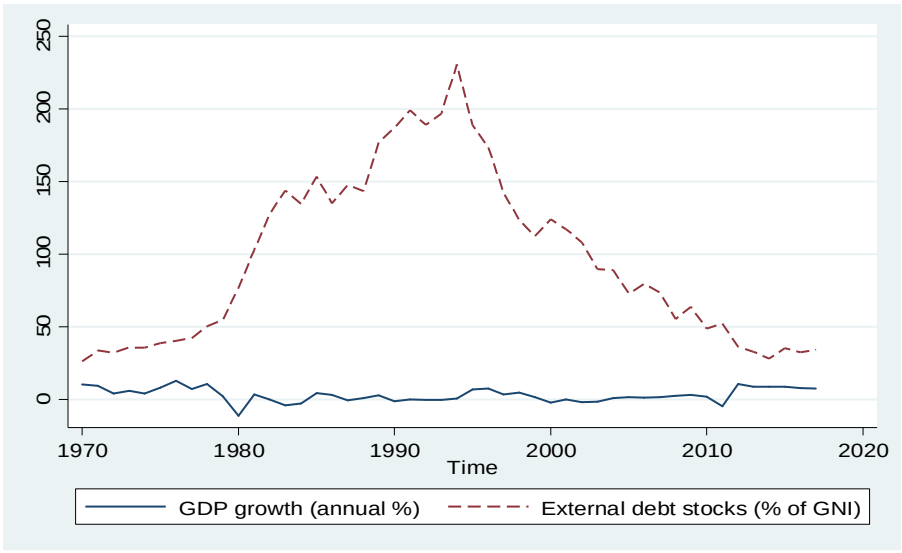
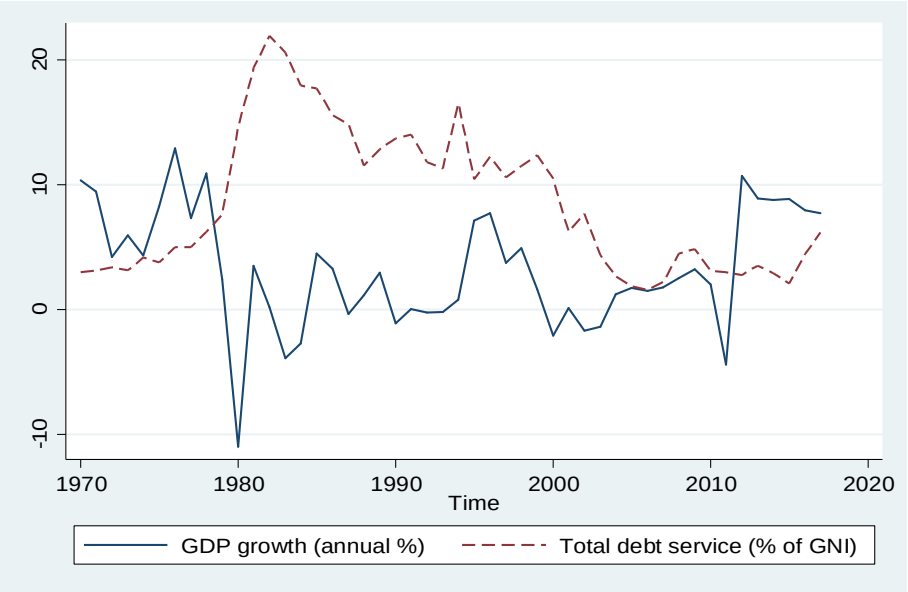


Figure 4: Evolution of Debt Service (percent of GNI) and GDP growth in Côte d'Ivoire 1970-2017



CHAPTER 3: LITERATURE REVIEW

DEBT OVERHANG

Debt overhang is the principal channel used by researchers to explain the external debt-growth nexus. Debt overhang refers to the case where the anticipated reimbursement on foreign borrowings are below the value of the contracted debt (Krugman, 1988). A country is likely to dedicate a greater share of the national resources to debt servicing as its ability to reimburse is expected to decline. Consequently, both local and international investments are negatively affected, which in turn reduces growth. This is explained by the fact that returns on investments are picked up by international creditors.

The debt overhang approach stipulates that investment in physical capital is negatively affected by external debt. This idea is the core of the theory. However, the theory is not limited to this aspect since it highlights the perverse incentives brought about by a heavy external debt burden. Highly indebted governments are less likely to undertake fiscal and structural reforms so as to improve their fiscal position, since a strengthened fiscal position will revive pressure for external debt repayment.

DIRECT EFFECT

Many scholars advocate for a threshold effect of debt on growth, meaning that debt contributes to accelerate growth up to a certain point, then the adverse effect begins. Debt/growth nexus in this case, thus, demonstrate, the Arthur Laffer's curve. Cohen states that when debt surpasses a certain value, the expected

reimbursement begins to decrease due to the adverse impact aforementioned (Cohen, 1993).

Reinhart & Rogoff (2010), using 44 countries over two hundred years, analyze the debt-growth causal link focusing on its bi-directional nature. They clarify a non-linear relationship and find a threshold effect, which appears to be the key point of their analysis. They find that below 90 percent, the relationship is weak, but beyond this value, median growth as well as average growth fall with a sharper fall for average growth.

Cecchetti, Mohanty & Zampolli, (2011) attempt to identify the debt threshold in 18 advanced OECD countries. They address this issue using the level of debt of three different entities, namely the government, non-financial corporation and households over the period 1980-2010. They find different debt thresholds: for the government 85 percent of GDP and 90 percent for non-financial corporations. For Households, the threshold is the same as for the government, but the estimation of the impact is not accurate.

Checherita & Rother (2010) assess how public debt affects the growth of GDP per capita in 12 European nations. Their analysis covers 1970-2010 and uses panel data with fixed effect with robust estimation. They attempt to explain the growth of GDP per capita using government debt, population, fiscal indicators, saving rate, investment rate, etc. The authors use lagged debt (average debt in the euro area) as an instrumental variable to control for endogeneity. Their results suggest the debt/growth relationship is nonlinear and debt is associated to a decline in growth from 90 to 100 percent. Based on confidence intervals, 70 to 80 percent of GDP are suggested as the start of the negative relationship.

Greenidge et al. (2012) investigate the public debt/economic growth nexus in the Caribbean region. Using the threshold estimation method developed by Hansen (1996, 2000), the debt-to-GDP ratio they identify as threshold is 55-56, meaning that up to this critical value, external debt stimulates economic growth but does the reverse beyond it. However, well below 55-56 percent, debt influence on economic growth is not homogenous. Thus, below 30 percent, increasing debt ratios leads to higher economic growth rates; between 30 and 55 percent, the impact is still positive, but weaker; and beyond 55-56 percent which is the threshold, increases in debt is associated to reductions of economic growth.

Woo & Kumar (2015) are interested in the long-run effect of the initial public debt value on real GDP per capita growth. The study focuses on emerging and advanced countries with populations over five million. The data used cover 1970-2007 and 38 countries are included in the study. The results suggest that controlling for other factors determining growth, initial debt affects growth negatively. When initial debt increases by 10 percent, real per capita growth declines by 0.2 percent. They find that above 90 percent, initial debt lowers growth.

Pattillo & Ricci (2011) break external debt into its public and private components, and analyze their effects on economic growth in low-income nations. The study includes 93 low-income nations and covers 1969-1998. Using robust GMM estimation to wipe away the risk of endogeneity, they distinguish between the average and the marginal impact of debt. This marginal impact is about assessing the impact of a rise in initially high debt. They use two different debt ratios namely external debt to GDP and external debt to exports as key variables and find a nonlinear relationship with economic growth. Estimated

thresholds range between 35 to 40 percent for external debt/GDP and 160 to 170 percent for external debt/exports.

Reinhart, Reinhart & Rogoff (2012) used historical data on public debt to investigate the long run consequences of long periods of particularly high public debt. They identified 26 cases of debt overhang, which corresponds in this particular case to a debt/GDP ratio exceeding 90%. Out of all the episodes, 23 countries recorded growth rates below the average of the other years. Also, considering all the episodes, growth is lower by 1.2% in average. They also show that even when real interest rates are low, meaning that capital markets are accessible, the effect of debt on growth is significant. This means that, apart from interest rates debt affects growth through other channels as well.

In the same vein, Fosu (1999) tests the debt overhang hypothesis in Sub-Saharan Africa and finds evidence to support it.

In contrast, Hansen (2001) finds that the external debt/economic growth nexus is not significant when the budget balance, inflation and openness are added. His study is based on 54 developing countries. Similarly, Savvides (1992) finds that debt does not significantly affect growth, Djikstra and Hermes (2001) find no enough evidence to confirm the debt overhang.

Balassoni, Francese & Pace (2011) introduce the identification of a temporal break in the analysis of the public debt-economic growth relationship. Furthermore, they analyze distinctly domestic and external debt. Their study spans from 1861 to 2010, and econometrical techniques are used to deal with heteroscedasticity and endogeneity. They find that a rise in public debt results in the decline of economic growth over the entire period of study, but the correlation becomes weaker from 1985. The relationship was stronger before

1914 because external debt was a key factor at that time. Thus far, the review focused on the direct action of debt on economic growth. The next section will discuss the indirect effect, namely through investment.

INDIRECT EFFECT

On the one hand, Warner (1992) found that investment did not decline following the debt crisis. On the other hand, Greene and Villanueva (1991), Deshpande, (1997), showed that debt negatively affects growth. Likewise, Pattillo et al, (2003) find that increased indebtedness induces a lower increase in physical capital and total factor productivity. They assess the indirect effect of heavy indebtedness on growth through the impact on both physical capital and total factor productivity in 68 low-income countries from different regions.

Bhattacharya et al, (2003), using data on 55 low-income nations, investigate the indirect linkage between debt and growth through public investment. They use data from 1970 to 1999 and focus on countries classified by the IMF, as eligible for the debt forgiveness program. The authors confirm the indirect effect through public investments. The findings reveal a nonlinear and negative relationship between external debt and public investment. They also find that increased debt service leads a decline in public investment, which ultimately reduces growth. They advocate for the use of a greater share of debt-service relief granted in the PRGF scheme for public investment. Based on their finding, if the budget deficit is maintained constant and half of the debt-service used by the government to invest, HIPCs' economies will grow by an additional 0.5 percentage point. They also find a direct impact. In this regard, increased debt leads to a decline in

growth of low-income economies. Their findings corroborate the debt overhang theory and they identify two thresholds: 20 to 25 percent and 50 percent of GDP respectively for the estimated net present value of external borrowing and for its face value. Beyond these thresholds, increased debt leads to lower economic growth. External debt is also likely to reduce private investment and modify the structure of public expenditure. In fact, debt servicing burden may reduce public savings, thus increase interest rates, and eventually lead to the crowding-out of credit opportunities for private investors, which depresses economic growth. High indebtedness leaves few funds available to dedicate to human capital, and infrastructure development, which in turn reduces growth.

Many studies investigated this relationship using panel data. Although the conclusions are insightful, the uniqueness of each country is not accounted for. Therefore, there is a need to analyze this nexus for each country considering their unique features. The following are the studies that focused on a single country.

SINGLE COUNTRY STUDIES

Ogunmuyiwa M.S, 2011 examines the debt/growth nexus in the Nigerian context with time-series observations from 1970 to 2007. He applied various econometrics techniques such as the Granger causality test, the Johansen cointegration test and Vector Error Correction. He finds no significant causality between debt and growth in the Nigerian case and debt promotes growth in the long-run.

Faraji & Said (2013) investigate the debt effect on growth in Tanzania. Covering 1990-2010, they find that both external debt stock and debt servicing

have a significant influence on GDP growth. However, as external debt stimulates growth, debt service has the adverse impact. Regarding the debt/growth nexus, they also conclude that no cointegration can be established between them.

Mohd, Ahmad, & Azman-Saini (2015) conduct a study on Malaysia using data from 1991 to 2009. They use the ARDL bound test so as to clarify external debt-growth relationship. They find a long-run relationship and estimate a threshold using the method developed by Hansen (2000). Overall, external debt stimulates growth up to 171% and then, the adverse effect starts.

Malik (2015) studies the case of Pakistan from 1972 to 2005. They find that increasing external debt induces a fall in the growth rate. Similarly, a higher debt service reduces growth.

M. Were (2001) conducted a study on Kenya. She assesses the effect of external debt both on growth and private investment. Increased external debt leads to a decline on both variables. For debt service, the author finds that it crowds-out private investment, but does not cause growth to decline. The paper also finds that present debt inflow boost private investment.

CHAPTER 4: RESEARCH METHOD

DATA AND MODEL

I retrieved the data from one source, namely the World Development Indicators 2019 (WDI 2019). The variables are: the annual GDP growth, external debt as a percentage of GNI, gross fixed capital formation as a percentage of GDP, general government final consumption expenditure as a percentage of GDP, progression to secondary school in percentage and annual percentage of inflation, GDP deflator. The study is based on the following model:

$gdp\_gr_t = \beta_0 + \beta_1 ext\_debt_t + \beta_2 gfcf_t + \beta_3\ hc_t + \beta_4\ govexp + \beta_5\ inflation + \varepsilon_t$

where (at time t), gdp_gr_t is the annual gdp growth, ext_debt_t is the external debt as a percentage of GNI, $gfcf_t$ is the gross fixed capital formation, hc_t is the progression to secondary school in percentage, govexp is the general government final consumption expenditure (percentage of GDP), and inflation is the annual inflation in percentage, based on the GDP deflator.

The ARDL[2] approach is used to estimate the model. The ARDL approach is used for cointegration analysis, indifferent of the orders of integration of the variables. However, it does not allow variables integrated of order 2 and above in the model. Therefore, before estimating the model, I conduct the Augmented Dickey Fuller stationarity test.

STATIONARITY

In time series analysis, the variables used must to be stationary. If not, the ordinary econometric methods cannot have the appropriate statistical properties. Essentially, this requires that some characteristics of the time series to be independent of the time period where they are observed, namely the means, variances and covariances. If the data are not

[2] Autoregressive Distributive Lag

stationary, the parameters estimated could be spurious, meaning that a significant relationship could be found where there not any.

I employ the Augmented Dickey-Fuller test (ADF) to analyze the stationarity. Depending on the results of the ADF test, one of these equations is estimated:

$$\Delta z_t = \delta z_{t-1} + \gamma_1 \Delta z_{t-1} + \gamma_2 \Delta z_{t-2} + \ldots + \gamma_p \Delta z_{t-p} + \varepsilon_t$$

$$\Delta z_t = \beta_0 + \delta z_{t-1} + \gamma_1 \Delta z_{t-1} + \gamma_2 \Delta z_{t-2} + \ldots + \gamma_p \Delta z_{t-p} + \varepsilon_t$$

$$\Delta z_t = \beta_0 + \alpha t + \delta z_{t-1} + \gamma_1 \Delta z_{t-1} + \gamma_2 \Delta z_{t-2} + \ldots + \gamma_p \Delta z_{t-p} + \varepsilon_t$$

In these equations, we test two hypotheses:

H_0: $\delta = 0$ against H1: $\delta < 0$.

A comparison of the t-ratio of the coefficient δ with the critical values provided by the table or the statistical software package, STATA is necessary. The conclusions of the stationarity test will guide us into the ARDL model.

ARDL BOUND TEST

Cointegration can be tested by several methods, among which the most common ones are the Engle-Granger and the Johansen cointegration tests. However there are some important differences between them. First of all, the criterion to perform the Engle-Granger cointegration test is that the variables used must be of identical order of integration. The Johansen test is more flexible in the sense that it allows variables of different orders to be tested together. Another characteristic of the Johansen cointegration approach worth noting is that when this procedure is applied to small samples, it produces biased coefficients. In contrast, the ARDL method initiated by Pesaran, Shin and Smith (2001) is robust to small sample bias. In this model explanatory variables are lagged, then tested using an F-test. This procedure is done through an Unrestricted Error Correction Model. The hypotheses of the test

are no cointegration and cointegration between the variables indifferent of their order of integration, respectively null hypothesis and alternative hypothesis.

Three possible conclusions can be drawn from the test. If the F-statistic falls:

- Between the two bounds: no conclusion can be drawn
- Below the lower bound: failure to reject the null hypothesis
- Beyond the upper bound: the null hypothesis is rejected

After conducting the bound test, the next stage is the estimation of the model depending on the results of the test. The dependent variable is GDP growth, the interest variable is external debt and the control variables are gross fixed capital formation, government expenditure, human capital and inflation. I get the following error correction version of the ARDL.

$$\Delta gdp\_gr_t = \beta_0 + \sum a_1 \Delta ext\_debt_{t-i} + \sum b_2 \Delta gfcf_{t-i} + \sum c_3 \Delta hc_{t-i} + \sum d_4 \Delta govexp_{t-i} + \sum e_5 \Delta inflation_{t-i} + \phi_1 gdp\_gr_{t-1} + \phi_2 ext\_debt_{t-1} + \phi_3 gfcf_{t-1} + \phi_4 hc_{t-1} + \phi_5 govexp_{t-1} + \phi_6 inflation + \varepsilon_t$$

ε_{t-1} is essential in the cointegration model. It indicates the response after a deviation from the long-term equilibrium.

As final step, I perform the threshold test, which is presented in the following section.

THRESHOLD TEST

In order to identify the optimal debt stock Côte d'Ivoire should consider, I test for the presence of a threshold using the threshold test developed by Hansen (2000). This method tests the hypothesis of no threshold against the presence of threshold. If the test cannot reject the first hypothesis, a linear model should be estimated. In contrast, if the test rejects the first hypothesis, there is a nonlinearity is confirmed. In this case, the threshold could be identified. The threshold model can be written as follows:

$$Z_t = \alpha_1 x_t + \phi x_t (\lambda) + \mu_t$$

Where x_t is the vector of independent variables, and μ_t is the error term; $d_t = I (q_t \leq \lambda)$ where I (.) representes the indicator function and sets the variable $x_t (\lambda) = x_t d_t(\lambda)$.

According to Hansen (2000), the distributions of the classical tests are not standard ones and are not appropriate for econometric inferences. Therefore he suggests a stimulation of the empirical distribution of the likelihood ratio LR through a bootstrap technique. In this model, q_t represents external debt, the threshold variable in the model and can be used in the regression for sample splitting. Z_t is the dependent variable, which in our case corresponds to the annual growth rate.

I will now turn to the results and their interpretations.

CHAPTER 5: RESULTS AND DISCUSSION

RESULTS OF THE STATIONARITY TEST

The Augmented Dickey-Fuller tests yield the results below:

Table 1: Results of the ADF Test

Variables	Augmented Dickey-Fuller Test (ADF)			
	Order zero		Order one	
	Constant	Constant and Trend	Constant	Constant and Trend
gdp_gr	-3.116	-3.130	-8.725	-8.658
ext_debt	-1.023	-1.600	-5.691	-6.346
gfcf	-1.552	1.149	-4.842	-4.900
hc	1.149	-1.344	-5.364	-5.627
govexp	-2.556	-3.843	-	-
inflation	-4.071	-4.442	-	-

The values in the table are compared to -1.684 and -3.528 which are respectively the critical values at five percent level of significance.

The orders of integration of the variables are summarized in the table below:

Table 2: Order of integration of the variables

Variables	Order
GDP growth (gdp_gr)	I(1)
External Debt (ext_debt)	I(1)
Government expenditure (govexp)	I(0)
Human capital (hc)	I(1)
Investment (gfcf)	I(1)
Inflation	I(0)

The ADF stationarity test reveals that the variables are a mixture of I(0) and I(1). None of the variables is of order 2 or above, thus these results allow us to apply the ARDL model which requires the model to have no variables integrated of order 2 or higher.

ARDL BOUND TEST

The model we are estimating is an ARDL (5, 5, 2, 3, 1, 4). The ARDL bound test yields the results summarized below.

Table 3: F-Statistic testing for the presence of cointegration

ARDL Bounds Test: Pesaran/Shin/Smith (2001)			
Test Statistic:			
F-statistic	**7.085**		
10 percent		5 percent	
Lower , Upper		Lower , Upper	
bounds	2.26 , 3.35	bounds	2.62 , 3.79
2.5 percent		1 percent	
Lower , Upper		Lower , Upper	
bounds	2.96 , 4.18	bounds	3.41 , 4.68

The F-statistic is **7.085** and is beyond the upper bounds. Therefore, the null hypothesis is rejected. This results mean that there is a long-run relationship. The presence of a long-run relationship annihilates the risk of spurious regression. The long-run debt-growth model in Côte d'Ivoire is valid and robust.

Table 4: Estimated Long-run coefficients with ARDL

	(1)
	ADJ
L.gdp_gr	-1.855***
	(0.331)
VARIABLES	LR
ext_debt	0.0251**
	(0.00880)
gfcf	0.608***
	(0.156)
hc	0.101
	(0.129)
govexp	-0.468
	(0.457)
inflation	-0.264
	(0.152)
Constant	-5.325
	(18.84)
Observations	40
R-squared	0.944
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

First of all, the lagged GDP growth (L.gdp_gr) has a negative a significant coefficient. This confirms the validity of the cointegration model estimated. A positive or non-significant sign would suggest that the model is not valid.

External debt significantly promotes growth in the long-run. The estimated coefficients show that increasing external debt is associated to higher growth rates in Côte d'Ivoire.

External borrowing contributed to the economic growth of the country in the long-run. Rising external debt by 1 percent is associated to a 0.0251 percent rise in GDP growth in the long run. Likewise, gross fixed capital formation promotes growth in the long-run. Increasing gross fixed capital formation by 1 percent is associated to a 0.608 percent rise in growth.

These results confirm the debt overhang theory which considers the investment in physical capital as the growth-enhancing channel. This theory requires both variables to have the same signs. The results show that gross fixed capital formation and external borrowing have the same sign.

The other control variables all display the expected signs. However, they are not significant.

SPECIFICATION TESTS

Autocorrelation test

- Durbin-Watson d-statistic(26, 40) = 2.192602
- Breusch-Godfrey LM test for autocorrelation

H_0: no serial correlation

Table 5: Results of the Breusch-Godfrey autocorrelation test

lags(p)	chi2	df	Prob > chi2
1	1.060	1	0.3032

Based on the results of the Durbin Watson and the Breusch-Godfrey tests, we fail to reject the null hypothesis of no serial correlation, meaning that there is not enough evidence to prove that there is serial correlation. Therefore, there is no serial correlation.

Heteroscedasticity test

White's test for Ho: homoscedasticity

Against Ha: unrestricted heteroscedasticity

chi2 (39) = 40.00

Prob > chi2 = 0.4256

Based on White's test for homoscedasticity, I cannot reject the null hypothesis of homoscedasticity. There is not heteroscedasticity in our estimated model.

Ramsey Specification test

Ho: model has no omitted variables

F (3, 11) = 2.40

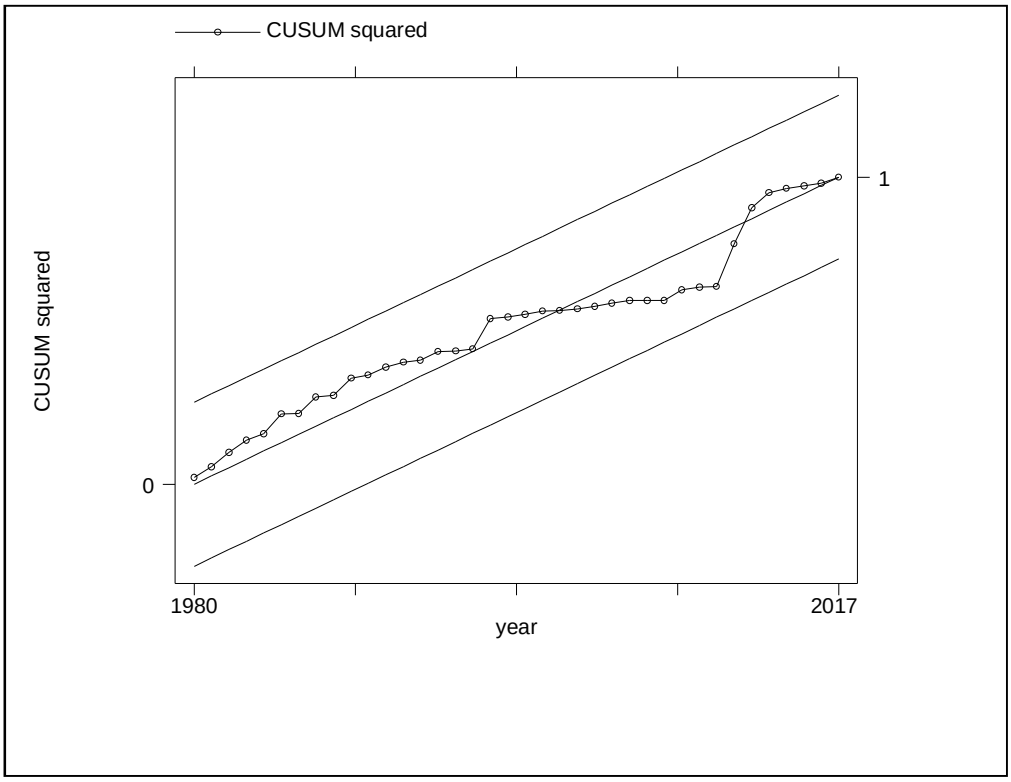
Prob > F = 0.1232

Ramsey specification test concludes that, overall, the model is well-specified. I could not reject the hypothesis of no omitted variables in the model.

Dynamic Stability: Cusum Test

Finally, the Cusum test concludes that the model is stable because the curve does not cross the corridor.

Figure 5: Cusum squared test



Overall, all the diagnostic tests conducted show that the estimated model is robust.

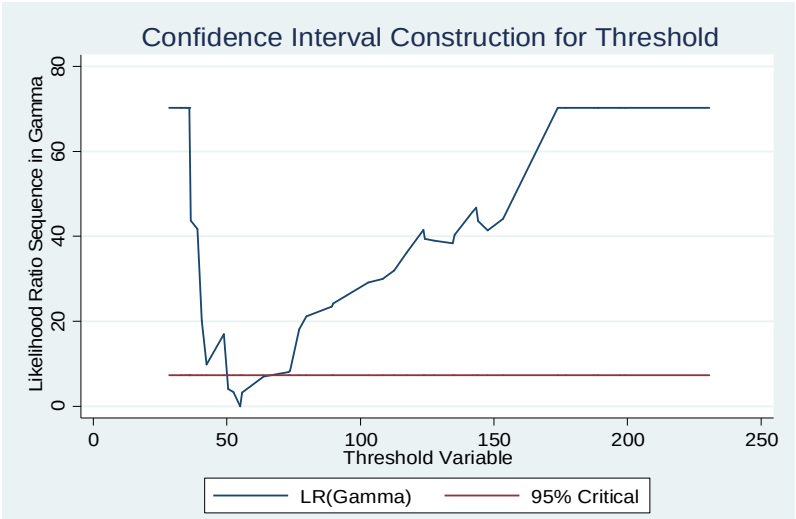
TESTING FOR THRESHOLD IN EXTERNAL DEBT

The test consist in a “no threshold” hypothesis against a “threshold” hypothesis. The table below summarizes the results:

Table 5: Threshold Test Results

Number of Bootstrap Replications:	**5000**
Trimming Percentage:	**.15**
Threshold Estimate:	**134.589005**
LM-test for no threshold:	**17.7472546**
Bootstrap P-Value:	**.002**

Figure 6: Hansen (2001) Threshold Test



Hansen (2000) tests the presence of a threshold. Based on the test, I reject the hypothesis of no threshold, meaning that there is a threshold. In other words, the optimal value of debt stock can be identified. External borrowing and growth display a non-linear linkage.

Based on this result, we can estimate the point from where the effect changes using the sample-splitting method suggested by Hansen (2000). However, due to the relatively small number of observations (from 1973 to 2017), the sample-splitting method does not give significant results. In this threshold estimation approach, the sample is split into two regimes: one regime is estimated below the threshold and another one above the threshold. The number of observations should then be relatively large on both sides of the threshold in order to yield significant coefficients. Future research with more observations should explore this avenue, and provide a clear numerical value of external debt threshold to guide policy makers in managing the national debt.

CHAPTER 6: CONCLUSION

This paper aimed at investigating the nexus between the Ivorian external debt and economic growth. It attempted to clarify the type of the relationship, assess the magnitude of the impact of external debt on growth, test for the presence of an external debt threshold and estimate the threshold.

Côte d'Ivoire resorted to external debt to fund its development needs following its independence in 1960. The high debt levels were associated to high growth during two decades, before the debt crisis starts. Poor debt management led the country to a crisis in the 1980s, a declaration of insolvency in 1987, debt rescheduling and the classification of the country as a Highly Indebted Poor Country (HIPC) with a debt relief granted in 2012.

The paper used an ARDL bound test so as to test for the existence of cointegration between external debt and economic growth. As required by the bound test, I checked the stationarity of the variables employing the Augmented Dickey-Fuller test. Since the test concluded that there is cointegration, I estimated the long-run coefficients, and finally tested for the existence of an external debt threshold using Hansen (2000) threshold test.

Findings from the current analysis confirm that external debt and economic growth are cointegrated. External debt had a positive and significant effect on economic growth in the long-run. In other words, external debt promoted economic growth in the Ivorian case. The threshold test confirmed the presence of a threshold, meaning that when external debt equals a certain value, its sign changes. In other word, the relationship is non-linear. However, due to the relatively small number of observations, I was not able to estimate the threshold.

Based on these results, the following recommendations can be formulated:

- External debt should be used in a productive manner to induce long-run growth.
- Externally borrowed funds should be used to invest in physical capital which appears to be the primary way through which external debt affects growth in the long-run in Côte d'Ivoire.
- Due the threshold, external debt stock should be closely monitored and high levels should be avoided as it will negatively affect growth rates.

The relatively small number of observations could be one of the reasons why we could not identify the external debt threshold. Future studies should fill the gap to allow policy-makers to have a clear milestone to guide debt management in Côte d'Ivoire.

REFERENCES

American, T., & Review, E. (1993). Low investment and large LDC debt in the 1980 ' s.

Bhattacharya, R., Nguyen, T. Q., & Clements, B. J. (2014). External Debt, Public Investment, and Growth in Low-Income Countries. *IMF Working Papers*, *03*(249), 1. https://doi.org/10.5089/9781451875904.001

Bruce Hansen (2000). Sample splitting and threshold estimation b, *68*(3), 575–603.

Cecchetti, S. G., Mohanty, M. S., & Zampolli, F. (2011). The real effects of debt, September 2011, (352).

Deshpande, A. (1997). The debt overhang and the disincentive to invest. *Journal of Development Economics*, *52*(1), 169–187. https://doi.org/10.1016/S0304-3878(96)00435-X

Faraji, K., & Said, M. (2013). Impact of external debt on Economic Growth : a Case Study of Tanzania. *Advances in Management and Applied Economics*, *3*(4), 363–380.

Fosu, A. K. (1999). The external debt burden and economic growth in the 1980s: Evidence from sub-Saharan Africa. *Canadian Journal of Development Studies*, *20*(2), 307–318. https://doi.org/10.1080/02255189.1999.9669833

Greenidge, K., Craigwell, R., Drakes, L., & Thomas, C. (2014). Threshold Effects of Sovereign Debt: Evidence From the Caribbean. *IMF Working Papers*, *12*(157), i. https://doi.org/10.5089/9781475504507.001

International Monetary Fund. (2018). *Fiscal Monitor Capitalizing on Good Times.*

Malik, S. (2015). External Debt and Economic Growth : Empirical Evidence from Pakistan External Debt and Economic Growth : Empirical Evidence from Pakistan, (July).

Mohd Dauda, S. N., Ahmad, A. H., & Azman-Saini, W. N. W. (2015). Does External Debt

Contribute to Malaysia Economic Growth? *Economic Research-Ekonomska Istraživanja*, *26*(2), 51–68. https://doi.org/10.1080/1331677x.2013.11517606

Ngalaiijo, B., Bernard, C., Kunvaly, D., & Mamadou, K. (1992). Crise economique et programmes d'ajustement structurel en cote-d'ivoire. *Crises Et Ajustements En Cote D'Ivoire: Les Dimensions Sociales Et Culturelles*, 10–23.

Ogunmuyiwa M.S. (2011). Does External Debt Promote Economic Growth in Nigeria ? *Current Research Journal of Economic Theory*, *3*(1), 29–35.

Pattillo, C., & Ricci, L. A. (2011). External debt and growth. *Review of Economics and Institutions*, *2*(3), 30.

Reinhart, B. C. M., & Rogoff, K. S. (2010). Growth in a Time of Debt, *100*(May), 573–578.

Reinhart, C. M., Reinhart, V. R., & Rogoff, K. S. (2012). Public Debt Overhangs : Advanced-Economy Episodes Since 1800 †, *26*(3), 69–86.

Warner (1992).pdf. (n.d.).

Woo, J., & Kumar, M. S. (2015). Public Debt and Growth. *Economica*, *82*(328), 705–739. https://doi.org/10.1111/ecca.12138

APPENDIX

Appendix A

Data used for the study

year	gdp_gr	ext_debt	Debt_serv	gfcf	hc	govexp	inflation
1973	5.9392	35.8899	3.14352999	21.8029	10.3422	15.7575	13.228
1974	4.32738	35.8581	4.16574401	19.4317	9.71766	16.1976	26.6942
1975	8.25289	39.0238	3.79070527	22.0371	10.6464	16.9922	4.31395
1976	12.9164	40.5825	4.99777413	22.1903	10.0991	16.1849	18.223
1977	7.31446	42.3803	5.00249161	25.8316	10.8061	13.624	28.7513
1978	10.9095	50.5285	6.22736677	29.6612	11.5536	16.289	4.4333
1979	2.39441	54.962	7.62632532	27.1017	11.9911	18.1912	6.5414
1980	-10.9577	77.0871	14.5352786	24.3546	13.2197	16.8566	24.1437
1981	3.5005	102.915	19.3769172	24.3694	15.1298	17.6137	2.97699
1982	0.200822	127.535	21.9139666	21.6641	15.8074	17.3932	8.30132
1983	-3.90024	144.037	20.6090633	17.722	16.4802	16.8585	9.04678
1984	-2.70126	134.589	17.9352081	12.9654	16.4898	15.1631	17.9099
1985	4.50122	153.422	17.698177	11.7711	16.2947	14.087	0.343657
1986	3.25935	135.21	15.5979353	11.8175	16.138	15.1281	-2.0204
1987	-0.348973	147.632	14.8778446	11.7697	14.5634	16.2944	-4.07521
1988	1.13648	143.427	11.5546644	11.4849	14.8864	17.1027	-0.380926
1989	2.948	177.016	12.8521087	10.3175	15.7601	18.2543	-1.01241
1990	-1.09591	187.326	13.7026409	8.50214	16.2729	16.7997	-4.52327
1991	0.040925	199.244	14.0278978	8.5742	18.516	16.3612	0.663489
1992	-0.244561	189.11	11.8238749	8.50242	17.5776	17.4418	-0.023837
1993	-0.192485	197.033	11.3012429	9.34546	18.0952	15.4744	6.15419
1994	0.811207	230.723	16.5023236	11.5492	18.003	12.0241	46.3861
1995	7.12574	188.745	10.4480691	13.6861	17.9221	10.6082	11.0438
1996	7.72933	173.956	12.2485572	14.808	17.1836	10.46	4.98308
1997	3.74355	141.861	10.6033342	13.9048	21.2254	15.045	6.20168
1998	4.93068	123.551	11.5090825	14.3236	22.285	13.7183	3.63948
1999	1.61753	112.598	12.3577082	13.9982	22.085	13.8444	0.786182
2000	-2.0684	124.136	10.52446	10.2725	23.5532	14.351	2.24582
2001	0.121372	117.238	6.24845385	8.64097	23.0276	13.6149	7.39641
2002	-1.66764	108.347	7.68919366	10.0705	24.9359	12.9771	6.66731
2003	-1.35954	89.7275	4.38559959	8.25347	26.8745	14.8035	4.80102
2004	1.23177	89.2688	2.65439675	9.34926	26.8745	14.895	-2.89062
2005	1.72125	73.0895	1.86887463	9.16694	26.8745	14.4274	1.30131
2006	1.51584	79.8303	1.58006358	9.7881	26.5474	13.5916	1.74402
2007	1.76504	73.6381	2.20760266	11.6148	26.6391	13.3386	2.93314
2008	2.54284	55.5903	4.49269195	10.9387	34.8754	12.6698	8.50257
2009	3.25145	63.8151	4.85411255	10.871	33.1322	12.6353	2.34574
2010	2.01764	48.8224	3.13458662	12.3165	30.9723	12.1776	5.38642

year	gdp_gr	ext_debt	Debt_serv	gfcf	hc	govexp	inflation
2011	-4.38725	52.4383	2.99668765	8.95112	28.3334	11.2461	1.63542
2012	10.7065	36.4564	2.77794368	12.8049	31.5812	12.3213	3.15487
2013	8.88942	32.9922	3.52687449	16.9953	35.1516	12.2627	3.71048
2014	8.79408	28.4077	2.93081359	18.8792	32.1116	12.3315	3.90936
2015	8.84286	35.3906	2.10540884	19.5298	34.5581	11.9407	3.10615
2016	7.97175	32.6491	4.44054228	18.2801	39.5238	12.7336	-1.06855
2017	7.70209	34.4083	6.18094599	19.4703	47.0968	14.3613	-1.7422