e-ISSN : 2347 - 9671 p- ISSN : 2349 - 0187

Impact Factor : 0.998

EPRA INTERNATIONAL JOURNAL OF ECONOMIC AND BUSINESS REVIEW

www . epratrust.com

August 2014 Vol - 2 Issue- 8

PUBLIC DEBT AND GROWTH IN GREECE: AN EMPIRICAL APPROACH

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ABSTRACT

On this paper is conducted a study on the impact that will have the public debt to the growth rate of Greece for the period 2014-2017. Along with the estimation, in order to be a comprehensive picture of public debt and growth in Greece we proceeded with a presentation of data for the period 1975-2012. The estimations were made, using econometric model for growth designed specifically to describe and estimate the growth rate, for this country. The estimations for public debt were made by using the standard type of debt to GDP ratio. In order to examine whether Greece's public debt has positive impact or not on its growth, a linear model has been used for this relationship. The results of research showed a further decline of the Greek economy meaning the continuation of country's recessionary path will and the public debt levels will remain high. Therefore the relationship between public debt and growth will be negative. In the end we make some useful conclusions on Greece's public debt and growth, presenting reliable solutions in order to be avoided any further downturn of the economy.

KEYWORDS: Public debt, Growth rate, Greece, Public debt crisis

***Jel Codes**: C01, C013, C51, H63, O40*

1. INTRODUCTION

Greece is considered one of the most developed economies in the world. Located in 42nd place in terms of per capita GDP, it is a core member of the euro monetary union from 2002 and is an important economy of Europe. However is also a country with chronic problems that revolve around the high levels of public debt and the overall poor image of its public finances.

The crisis of 2008 pulled to the surface the weaknesses of the Greek economy. In 2008, 28 billion euros were provided to in order to maintain liquidity. The crisis became apparent in 2009. Firstly because Greece is a "closed" economy and thus is not directly influenced by international developments and secondly because the credit crisis evolved to debt crisis.

2. OBJECTIVES

The level of a country's public debt and the growth rate of economic activity help in depicting an overview of the image of its public finances. For this reason a recording of the sizes of country's public debt and growth rate has been made from 1975 to 2012. Greece has based its growth pattern in four key pillars: tourism, construction sector, financial sector and public investment. The lack of valorization of the agricultural sector[4] in conjunction with a weak heavy industry sector and the rapid expansion of services mainly from the 80's caused major fluctuations in country's development.

3. EMPIRICAL APPROACH

This study aims to examine the relationship between public debt and growth rate. The estimate covers the period from 2014 to 2017. Within this time period is examined the path of GDP in conjunction with the course of public debt as a percentage of GDP. Afterwards, is investigated whether the government debt affects the growth rate and if this effect has positive or negative impact. It is difficult to choose the econometric models needed to assess a country's economy. Greece is a special case of econometric analysis because it may belong to the whole of the Eurozone countries, but is very different from other Member States in terms of economic, political and social structure. The problems which is facing many years in the economic, political and social level makes it a complex case, concerning the assessment that will be made. The data for the present assessment were taken from the IMF, Oxfords Economics and Eurostat.

Table1 describes the notation of the data and Table 2 the determinants of coefficients used for the estimation.

Table 1

Data and notation	
Y,y	GDP Growth Rate
C	Consumption
I	Investment
G,g	Public Spending
INF	Inflation
TB	Trade Balance
SCH	Schooling
AGE	Old Age Dependency Ratio
POP	Change in Population
EMU	European Monetary Union
BC	Banking Crisis
W	Wages of Public Employees
ND	National Defense
PI	Public Investment
X	Imports
M	Exports
D,d	Public Debt
Dd	Change in Public Debt
pb	Primary Balance
i	Nominal Interest Rate
H	Change in the Stock of Central Bank Liabilities
T,t	Taxes

Table 2

Estimation results on the determinants	
Growth Rate	
Consumption	0.9935 (0.170)
Investment	0.2111 (0.0111)
Government Spending	0.153 (0.0668)
Trade Openess (Trade Balance)	0.0311 (0.019)
Inflation	0.049 (0.787)
Schooling	0.0051 (0.001)
Old Age Dependency Ratio	0.1955 (0.000)
Change in Population	0.4482 (0.233)
European Monetary Union	0.0070 (0.0034)
Banking Crisis	0.0134 (0.000)
Relationship Between Public Debt and Growth Rate	
α	-0.076
β	-0.00042

3.1 Growth Rate

To estimate the growth rate of GDP was used the type of GDP measuring with the expenditure approach.

$$Y=C+I+G+(X-M) \quad (1)$$

The model was adjusted to a particular type of linear regression, by using a fixed axis of independent variables in conjunction with a number of dummy variables so that estimates will be closer to reality. In the econometric model of growth rate is also included the variable consumption, as it is one of the most important factors that influence the course of GDP. The general formula used for the estimation is as follows:

$$Y=a_0+a_1*C+a_2*I+a_3*G+a_4*TB+a_5*INF+a_6*SCH+a_7*AGE+a_7*POP+\varepsilon_t \quad (2)$$

$C=C_0+bY$ where $1>b>0$

$G=W+ND+PI$

$I=Y-C-G-TB$

$TB=X-M$

The first concerns the banking crisis whilst the second has to do with the integration and retention of the country in the eurozone. Therefore the final type will have the following format:

$$Y=a_0+a_1*C+a_2*I+a_3*G+a_4*TB+a_5*INF+a_6*SCH+a_7*AGE+a_7*POP+EMU+BC+\varepsilon_t \quad (3)$$

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	1
Standard Error	0
Observations	3

Variables a hold a special role in the outcome of the results because their prices are considered constants. These constants indicate the degree of involvement of each variable on the overall effect. In our case a_0 takes the price of -1 since Greece due to the recessionary track which the country is from 2008.

3.2 Public Debt (to G.D.P. ratio)

The methodology used to estimate the debt for the period under consideration includes the standard type estimating the public debt to GDP ratio. The model is linear and involves the following type:

$$G_t+i_t*D_{t-1}=T_t+(D_t-D_{t-1})+(H_t-H_{t-1}) \quad (4)$$

This type, in order to be used for the estimation of the public debt as a percentage of G.D.P. evolves to the following equation:

$$d_t-d_{t-1}=Dd*d_{t-1}+pb_t$$

$$Dd=i*inf_t-y_t \quad (5)$$

$$pb=g_t-t_t$$

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	1
Standard Error	0.000000000000006
Observations	3

Taking as granted the willingness of the euro area Member States to keep Greece in the euro on the condition that Greece from its side will honor its commitments which arising from the memorandum, will borrow until 2021 with a fixed interest rate. Under these conditions it is said to be running a Ponzi scheme, having an inexhaustible source of borrowing by 2021.

3.3 The relationship Between Debt and Growth Rates

The model used to calculate the relationship between debt and growth is the bivariate linear relationship by estimating the following regression for growth and debt: The type is as follows:

$$\Delta y_t=\alpha_{t+}\beta*d_{t+}\varepsilon_t \quad (6)$$

The debt level on growth depends on the amount of debt in the economy. The model of Reinhart and Rogoff (2010) separates countries into four regimes depending on the amount of debt. In the first regime the debt exceeds 30%. In the second regime is estimated that the rate of public debt is equal to or greater than 30% and

less than 60%. In the third regime is estimated that the rate of public debt is equal to or greater than 60% and less than 90%. Whilst in the fourth regime the rate of public debt is greater or maybe 90%. Basically the Reinhart and Rogoff for the threshold of public debt propose three thresholds of 30%, 60% and 90% of central government debt. The model of Reinhart and Rogoff is:

$$\Delta y_t \begin{cases} \alpha_1+\beta_1*d_t+\varepsilon_t & \text{If } d<30\% \\ \alpha_2+\beta_2*d_t+\varepsilon_t & \text{If } 30\%\le d<60\% \\ \alpha_3+\beta_3*d_t+\varepsilon_t & \text{If } 60\%\le d<90\% \\ \alpha_4+\beta_4*d_t+\varepsilon_t & \text{If } d\ge 90\% \end{cases} \quad (7)$$

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	-2
Standard Error	0
Observations	1

Although it has questioned the validity of this linear model, the research so far is not sufficient to create a combination of linear and non-linear model because the figures for studying this research is to estimate the impact of public debt on growth of a particular country. In order to evaluate the effect of debt on growth in Greece it will be used latter case of the Reinhart and Rogoff model, calculating the effects with public debt exceeding the 90% threshold.

4. RESULTS AND DATA ANALYSIS

4.1 Growth Rate

The estimation of the growth rate for the Greek economy was made for the period 2014-2017. From the present assessment it is indicated the recessionary trend throughout the examined period. The main reasons of recessionary trends derived from the low consumption, the negative trade balance (although since 2016 positive) and the reduced government spending. Another important factor which influencing the negative course is also the old age dependency ratio. The investments although showing an increase, are not sufficient in order to be noted positive growth rates. The negative effect comes also from the lack of competitiveness resulting from the monetary policy of the ECB which makes the Euro obstacle. Furthermore, the banking system of Greece because of its high exposure to Greek government bonds is in a disadvantaged position, making it difficult to finance any business initiatives. More specifically: For the year 2014, the growth rate is -1.09%. The next year, the slowdown of Greek economy will be lower with the recession standing at 0.52%. Finally, for the years 2016-17 the recessionary trends will remain at the same levels reaching 1.05%. Table 3 and Figure 3 describe show the data of estimation for the course of GDP.

Table 3

Growth Rate (%)				
Year	2014	2015	2016	2017
Growth Rate (%)	-1.09	-0.52	-1.05	-1.05

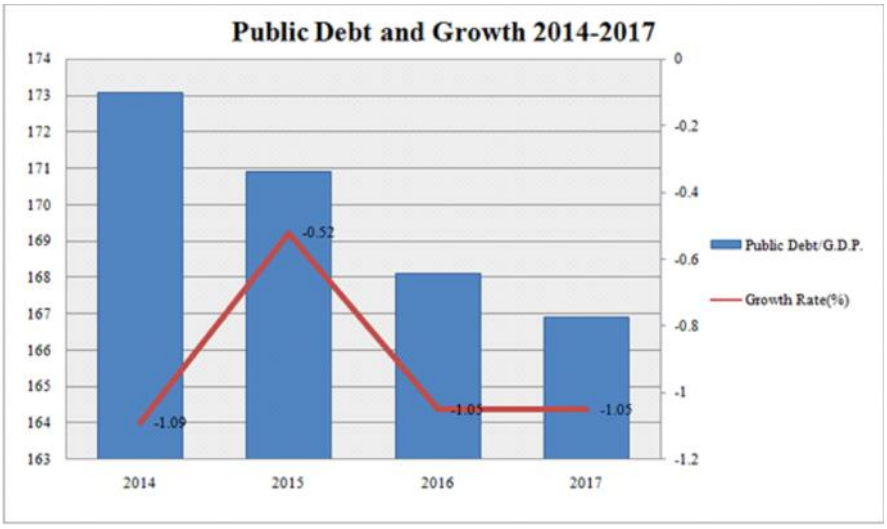
4.2 Public Debt

According to the estimate that was made for the Greek public debt, the years covered are from 2014 to 2017. In this econometric analysis the public debt of the country in 2014 reaches 173.1% whilst from 2015 and onwards the rate of public debt decreases. From 2014 and then, public starts declining and for the period 2014 to 2015 there's been a decline of debt by 2.2 percentage points. The reduction continues over the next years having a decline of 2.8 units for the period 2015-2016. Finally in the period 2016-2017 debt continues its downward path reaching 166.9% (as a percentage of G.D.P.). Table 4 and Figure 1 describe the data of estimation for the course of public debt to GDP ratio.

Table 4

Public Debt/G.D.P. ratio				
Year	2014	2015	2016	2017
Public Debt/G.D.P.	173.1	170.9	168.1	166.9

Figure 1



4.3 The relationship Between Debt and Growth Rate

From the relationship of public debt and growth rate derives the negative effect that has a high percentage of public debt on growth rate for the examined period. The public debt affects negatively the course of GDP at 0.075; effect which is constant over the entire period of the study. The generally stable trend (with minor variations), of the public debt above 90% shows a very small gap of about 0.00001% year-on-year as shown in Table 5. According to Reinhart and Rogoff «with debt to GDP over 90 percent have median growth roughly 1 percent lower than the lower debt burden groups and mean levels of growth almost 4 percent lower» Reinhart and Rogoff, (2010).

Table 5

Relationship Between Public Debt and Growth Rate				
Year	2014	2015	2016	2017
Relationship Between Public Debt and Growth Rate	-0.07527	-0.07528	-0.07529	-0.0753

4. CONCLUSIONS

The main conclusion derived from the present research is that indeed the high levels of public debt have a negative impact on growth rate of an economy. A typical example is Greece where the debt stands at triple-digit rates (above the threshold level of 90 percent) and the economy is from the 2008 on a recessionary trend. As mentioned above, the country relied heavily on public investment for positive growth rates. Efforts taking place since 2010 to reduce the fiscal deficit and for the improvement of public finances through austerity policies contributed to the continued slowdown of Greek economy and to the increase of public debt. The Greek economy in order to recover will require radical changes in order to design and implement a different growth model based mainly on investments coming from the private sector. Furthermore, as demonstrated in the above study, the high levels of public debt will adversely affect the growth process. Therefore changes should be made also regarding the model of lending in the euro zone countries. The present repayments system has the disadvantage of the continuous rise of public debt with the resulting Greece to not be considered creditworthy. Finally, the monetary policy of ECB does not favor the competitiveness of countries which facing problems with their image of public finances, so what is needed is to be pursued a common policy of the euro zone countries regarding growth in conjunction with the consolidation of public finances.

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