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PUBLIC DEBT AND GROWTH IN GREECE. AN EMPIRICAL APPROACH.

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 Classification: C01, H63, O40

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[1].

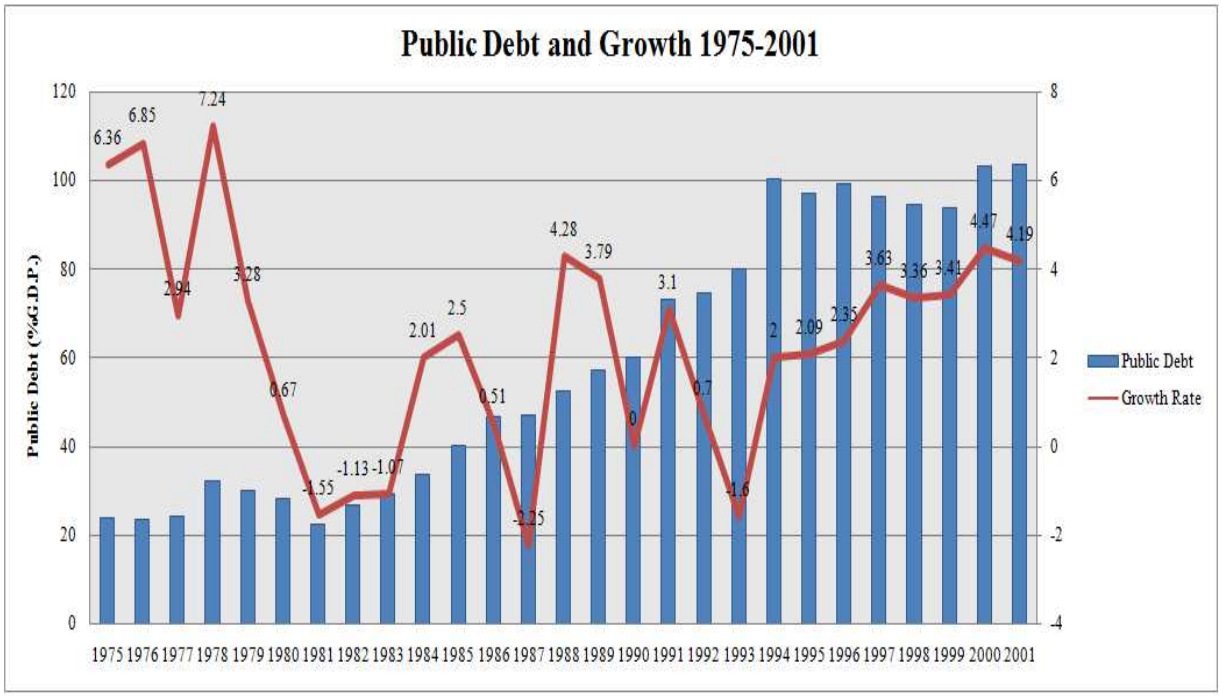
Specifically Greece in the modern history lacked in ability to create a development plan that would create the foundation for a sustainable economy. The private initiative in the country expressed mainly by the financial sector, the tourism[2] and the construction sector. The financial sector, from the 90s until 2008, has experienced significant growth in Greece. The growth was driven primarily by granting consumer and mortgage loans, which were not supported by reliable criteria for the selection of borrowers. Additionally, the construction activity grew from the 70s until 2008. When the mortgage crisis of the U.S. started to affect the rest of the world these two areas faced severe liquidity constraints. The interbank lending was difficult because there was suspicion, leading banks to become stingier on lending. This situation directly affected the construction industry due to the sudden interruption of channeling funds from the financial system.

At this critical time when the attention of the financial markets turned to Greece, officials proceeded to the reporting of actual fiscal data of the country, which fell far from the image that existed previously. The falsification of economic data was one year regular of successive governments in the country. The notification of the actual data caused surprise and vigorous discomfort. At this crucial turning point, the inertia and the numb stance of Greek government demolished the credibility of the country with a continuous barrage of downgrades by rating agencies[3]. The future actions that were taken in order to improve country's public finances retained the country in recessionary track with its public debt to be considered unsustainable.

1. The Case of Greece

The level of public debt of a country 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. Figure 1 shows the variation of public debt and growth rate as a percentage of GDP from 1975 to 2010.

Figure 1



Source: Eurostat

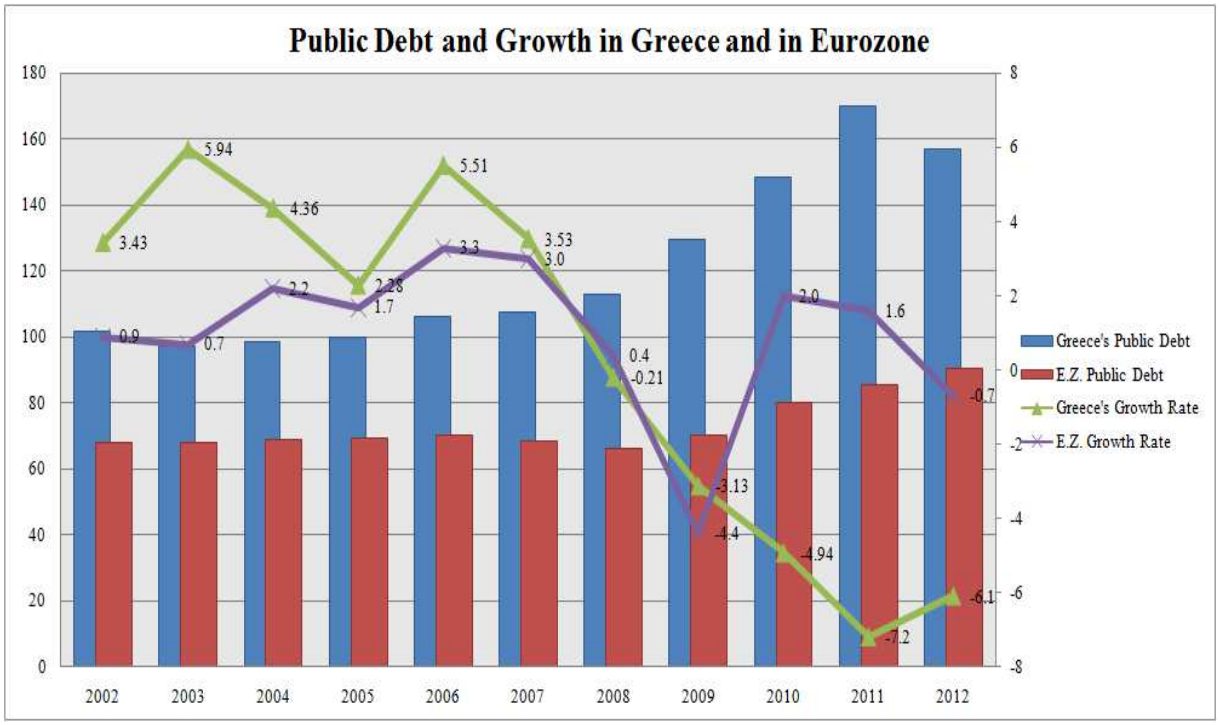
The levels of public debt in the country have tended upward since 1974, due to the excessive borrowing. The country after the regime change and the establishment of a parliamentary political system made some efforts to integrate the country into the European Economic Community (EEC). During the period 1975-1981 public debt increased by 1.8 billion euros (400 million euros in 1975) Filistor. I, (2010). The period 1975-1987 were made loans of 13.4 billion euros, of which 10.8 billion (ie 80.6%) allocated to service existing debt Pini M., (2011). During the same period the GDP notes a considerable variation from year to year. The main causes of these transitions are due to the two oil crises, and the unstable political situation that existed in the country. From 1975 to 1978 the economy grows rapidly. In 1979 breaks out the second oil crisis which is translated into a continuing decline of the growth rate of the economy in the coming years.

Following the insertion of Greece into the EEC in 1981 the public debt follows a continuously increasing trend. This happens because of the interests which increased greatly since 1981 and also due to the increased borrowing by the government. Furthermore, the economic growth of the country notes negative rates because of the impending oil crisis of 1979 in conjunction with the increased welfare expenditure of the previous period, resulted in the phenomenon of stagflation. From 1981 until 1989 public debt increased by 21.8 billion euros, due to the policy of fiscal expansion. A positive feature of this debt was that it was internal by 80 percent[6]. For this period the average growth rates was 0.78 percent, while the appearance of phenomena of illegal trade and profiteering, gave rising to the black economy. From 1989 to 1993 the country's debt is increasing alarmingly. Within this period the public debt to GDP from 57.2 percent that was in

1989 reached 80.1 percent in 1993. Furthermore this period is characterized by intense privatization and de-industrialization of the economy, whilst an increase in intakes is noted in the public sector. Finally the period 1994-2001 the public debt stabilized recording a slight decline due to the reduced interest rate[7]. Since 1993 the growth rate of the Greek economy is slowing but the climate is reversed and the economy enters a long period of growth from 1994 to 2007. Until 2002, the positive rates are based on a period of public investment, expansion of the financial sector and to the stimulation of consumption.

In 2002, Greece is part of the euro area. Figure 2 shows the variation of public debt and growth rate of Greece, compared with the euro zone's average public debt and growth rate from 2002 to 2012.

Figure 2



Source: Eurostat

From 2002 to 2004 the country's debt seems to rise significantly and remain at high levels. This is happening due to increased loans taken by the country for the project preparation of the Olympic Games. In 2004 the actual data of public finances are presented which had been tampered with in order for the country to join the euro zone. The data endanger the credibility and sustainability of the economy because there is a divergence with the European data. The country was in a critical juncture of the reduction of public debt, being under European surveillance. From 2004 to 2007, an effort to restrain the public debt is made, whilst the national income is increased by 12-15 billion euros per year of which 10 billion euros come from debt. The growth rate continues to be positive until 2007. It is noteworthy that the years 2003 and 2006 the growth rate notes the highest rates of the past 26 years. From 2008, the debt is

increasing steadily. This increase is attributable to the fact that public spending increased 5.5 as percentage of GDP; revenues decreased and the expenditures increased significantly. Along with government debt the country's deficit soared, since in this period governmental facilitates allowed the increase in the importation of luxury items and there was favorable treatment of the offshore companies. The 13 years of ongoing positive growth rates in Greece ended with the global financial crisis of 2008. The 2008 financial crisis that began in the United States had an impact on Greece, with the recession in 2008 being at 0.21 due to the poor situation which the banking industry were, due to the accumulation of debt and the lack of liquidity.

In April 2010, Greece made a request to lending from the European Financial Stability Fund (EFSF) to a sum of 110 billion euros. The loan would cover debt repayment of the country to its lenders and guarantee the avoidance of bankruptcy. The funding from the EFSF made possible with the government signing a bilateral memorandum of cooperation between Greece and its three partners who have granted the loan (European Central Bank, European Commission and International Monetary Fund). The measures that were implemented were aimed to reducing state expenditure and in short term finding revenue to cover the deficit and in the long term to meet the country’s debt obligations. With tax evasion and illegal trading to remain uncontrolled the government proceeded to reductions in wages and pensions and increasing the tax rate on the key articles of consumption (applying the policy of internal devaluation). The result was the propensity to consume to drop dramatically and the consumer's ability to eradicate. The fall in consumption had as a natural consequence the liquidity problems of the market. The situation in the banking sector is equally bad. Due to the large exposure to Greek government bonds (which were used as guarantees for the ECB loans) their credibility has suffered a serious blow. The main event that led banks to experiencing liquidity problems was the flight of deposits from Greece to other destinations. The depositors having uncertainty over a possible bankruptcy and return to the old currency withdrew their deposits from Greek banks. The result was banks faced significant liquidity problems. For this situation of the banking system in Greece is worth mentioning that responsible is also irresponsible lending by them. As a consequence the vulnerable banking system refuse to fund new and existing business plans deepening even more the recession. The Greece is considered a benchmark, as it is the only country in peacetime that has recession for seven consecutive years.

2. 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. Table 1 describes the notation of the data and Table 2 and 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

2.1 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 the second 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.

2.2 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.

2.3 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.

3. Results and Data Analysis

3.1 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

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

3.2 Public Debt

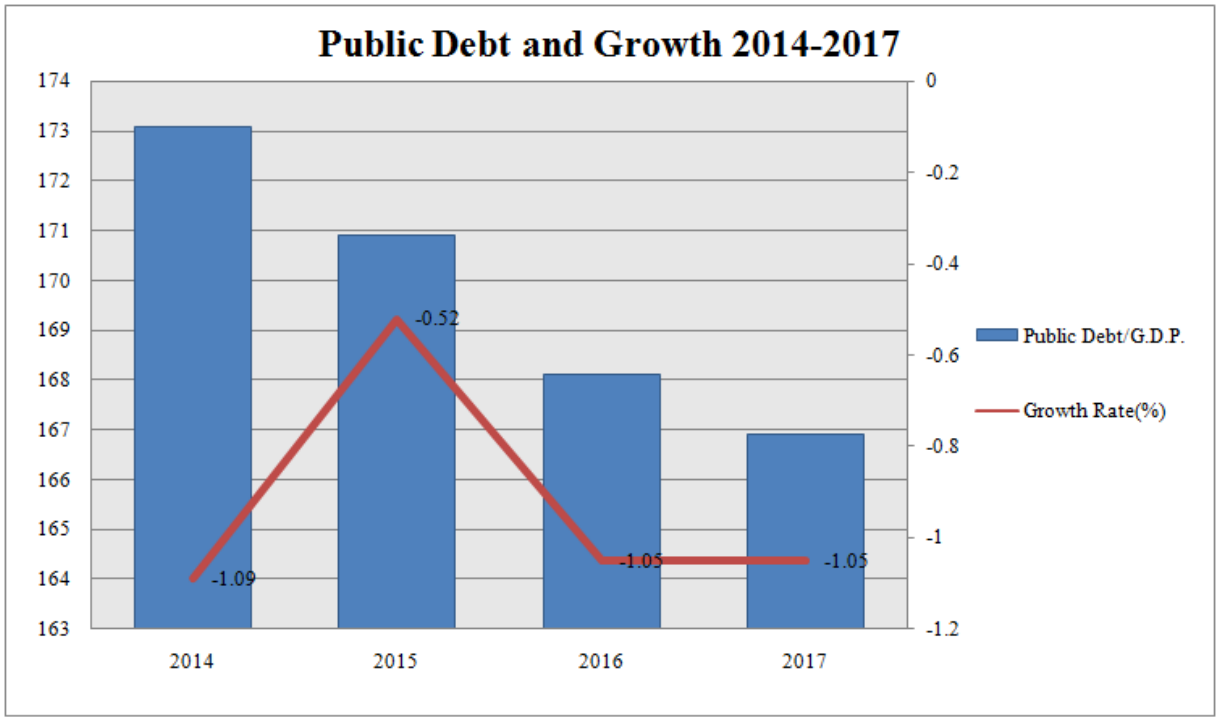
According to the estimate that was made for the Greek public debt, the years covered are from 2014 to 2017. In this econometric analysis the public debt of the country in 2014 reaches 173.1% whilst from 2015 and onwards the rate of public debt decreases. From 2014 and then, public starts declining and 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 3 describe the data of estimation for the course of public debt to GDP ratio.

Table 4

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

Figure 3



3.3 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.

Notes

1. The trigger was the Dubai one country directly dependent on foreign investment in the construction sector, where in November 2009 was affected by the crisis. The government after the bankruptcy of the firm DubaiWorld asked semester freeze its debt obligations, declaring automatically inability to meet its obligations. This fact has led markets to turn to the economic situation of the sovereigns.
2. Although tourism contributes significantly to the country's economy was not affected so much compared to construction and financial sectors.
3. By early 2009 the spreads of Greece started to rise. Following the disclosure of the real financial data, the rating agencies have made continuous downgrades, further exacerbating the spread. The same year, the country borrowed 36 billion of which one billion was interest.
4. The country has many untapped reserves of mineral wealth. Large fertile land in conjunction with the climatic conditions (temperate Mediterranean climate) could

develop much more on agriculture and livestock farming, two areas that disappear with the passage of time. Finally the island region and the vast area of the sea territory of the country favor the development of fisheries, which does not flourish with proportionate rates.

5. Interests had already started to become huge from the period 1987-1988. In just one year the interest rate increased by 2.3% of GDP, but that had risen to a total of ten years, from 1974 to 1984.
6. Nationalization of banks
7. The fall of the interest rate was due to policies relating to the reduction of inflation, and the debt reduction effort in order the country to have a stable exchange rate, because of the attempt to enter the euro zone.

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