

# THE EFFECT OF PUBLIC DEBT AND OTHER DETERMINANTS ON THE ECONOMIC GROWTH OF SELECTED EUROPEAN COUNTRIES

Humberto Nuno Rito Ribeiro<sup>1</sup>, Tadas Vaicekaskas<sup>2</sup>, Aušrinė Lakštutienė<sup>3</sup>

<sup>1</sup>*Polytechnic Institute of Bragança, Portugal, hn2r@ipb.pt*

<sup>2</sup>*Kaunas University of Technology, Lithuania, vaicekaskas.tadas@gmail.com*

<sup>3</sup>*Kaunas University of Technology, Lithuania, ausrine.lakstutiene@ktu.lt*

**crossref** <http://dx.doi.org/10.5755/j01.em.17.3.2108>

## Abstract

Public debt has diverse effects on GDP varying from country to country and resulting from a number of different factors. This project is dedicated to research the effects of various macroeconomic indicators on GDP, with an emphasis on debt related predictors, using a multiple linear regression model. Findings of this research confirm the hypothesis that country determinants influence the efficiency of public borrowing and its effect on GDP. Surprisingly, no relation between debt crisis, level of government debt and its effect on GDP could be found. On the contrary, private borrowing showed a positive effect on the economy in every country where it resulted statistically significant. Interesting results were achieved concerning the openness of the economy and foreign direct investment. They were unequal, whereas initially supposed to be mostly positive

**Keywords:** Public debt, government borrowing, debt crisis, economic growth, economic recession.

**JEL Classification:** H63, H69, A11, E6.

## Introduction

The recent economic recession that continues to spread across the world is resulting in severe setbacks for many countries. Although positive results of gross domestic product [GDP] and other macroeconomic indicators have been reached during the last few years, the shadow of crisis is still present. Among those most affected the financial sector. Public finance of many countries around the world is not an exception. With the increasing unemployment rate, decreasing exports and imports, and consequently GDP, greater demand of public spending for social needs and climbing budget deficits, the public debt levels increased enormously since 2008. Even very large economies like the United States [US] were influenced, a phenomena emphasized by a credit ratings cut by Standard & Poor's [S&P] for the first time in the US history. Worldwide, one of the regions most affected by debt is Europe, more precisely the euro zone. Countries like Ireland, Greece and Portugal already got bailout packages. Moreover, a number of others may be standing for a rescue in coming years. Needless to say, present situation leads to tension not only in international finance markets. Even American stock exchange results, are being affected by the unrest in Europe. Furthermore, it has a great effect on overall economy of the region, since governments of the affected countries have to turn to austerity measures in a pursuit of stable public finance sector. This diverts funds from public investment, subsidies and tax exemptions to potentially profitable industries in the near future to financing the costs of debt and elimination of budget deficit with attempt to reduce public debt level. Consequently, it leads to slower economic growth or even decline. Therefore, it is important to analyze public debt and other macroeconomic indicators influence on GDP, which is the indicator of the overall economic condition of the country.

**The purpose of this project** is to determine the effect of public debt to the economic growth.

**Main objectives** are to analyze benefits and drawbacks of public borrowing, to define causes of debt crisis in EMU, to research the variables influencing change of GDP with emphasis on debt indicators by analyzing the case of EU countries.

**Method of research** includes the analysis of academic literature as well as multiple linear regression analysis using SPSS 17 statistical program package.

## The benefits and risks of Public debt

According to Karazijienė & Sabonienė (2009), public borrowing is inevitable and not reprehensible phenomenon of economic growth. It is a way to stimulate economic growth by injecting money from foreign investors (external debt) into it as well as distributing assets (internal debt) among those who has more than they can use at the moment and those who lack assets for developing economic initiative or other needs. Since state bonds, treasury bills and loans to governments are considered to be one of the safest financial

instruments, the interest rate is much lower than in case of public borrowing. This is beneficial to the economy and generates additional surplus if public debt stream is being controlled efficiently.

Public debt is one of the main macroeconomic indicators, which forms countries' image in international markets. It is one of the inward foreign direct investment flow determinants. Moreover, since governments borrow mainly by issuing securities, their term, interest rates and overall costs of debt financing has significant impact on economy, future of the enterprises and social welfare for not only present, but also future generations. According to Martin (2009), public debt can also serve as means of delaying taxation that way reducing current distortions. Thus, government has two choices for covering financial needs (budget deficit). First one implies taxation system. Higher taxes results in lower present consumption, which may mean slow down of the economic growth. Meanwhile, debt financing puts more pressure on future generations and their ability to maintain economic and financial stability. They not only will have to pay the amount borrowed, but also cover the costs related to debt financing, which includes interest and costs of debt management. Such a debt is sustainable if it is used to generate economic growth and benefits higher than initial costs, otherwise serious public finance issues are about to appear. Taking these two factors into account, government has to maintain the equilibrium between taxation and debt financing in order to maintain economic and financial stability in a long run.

Despite all the benefits, public finance must be handled with care, since in case of too high debt levels the cost of debt becomes higher than its benefits and starts reducing the GDP. Berben & Brosens (2007) note that rise of government debt result in fall in private consumption in the case of high government debt countries, while it has no effect on private consumption in low government debt countries. Furthermore, the research carried out by Aiyagari & Mcgrattan (1998) suggests that optimal debt level is closely related to private consumption. In case of constant growth in private consumption, high level of public debt is sustainable. On the contrary, if public consumption is declining, keeping low public debt level is more beneficial for the economy. Other authors also emphasize the importance of handling public borrowing with much care. Ismihan & Ozkan (2012), coins out that public debt is likely to harm financial development of the country with unfavorable implications for economic activity, especially if the country has limited financial depth and financial development. Unfavorable opinion regarding long term public borrowing is also expressed by Kellermann (2007). He demonstrates that in the long run the social opportunity cost of debt-financed public investment exceeds the social opportunity cost of tax financed public investment. Therefore, reasonable government should consider adapting tax system to serve public investment needs instead of debt financing. On the other hand, debt financing may prove beneficial if used for short term public investment, which has considerable growth effect on private consumption. Research by Lora & Olivera (2007) reveals yet another side of high debt level. It shows that higher debt ratios do reduce social expenditures. It is influenced not only by costs of interest payment but also it is associated with cuts of total social sector expenditures with an intention to reduce need of further indebtedness. Authors reached the conclusion, that, in case of high debt levels, defaulting on debt obligations does help to increase social expenditures in developing countries.

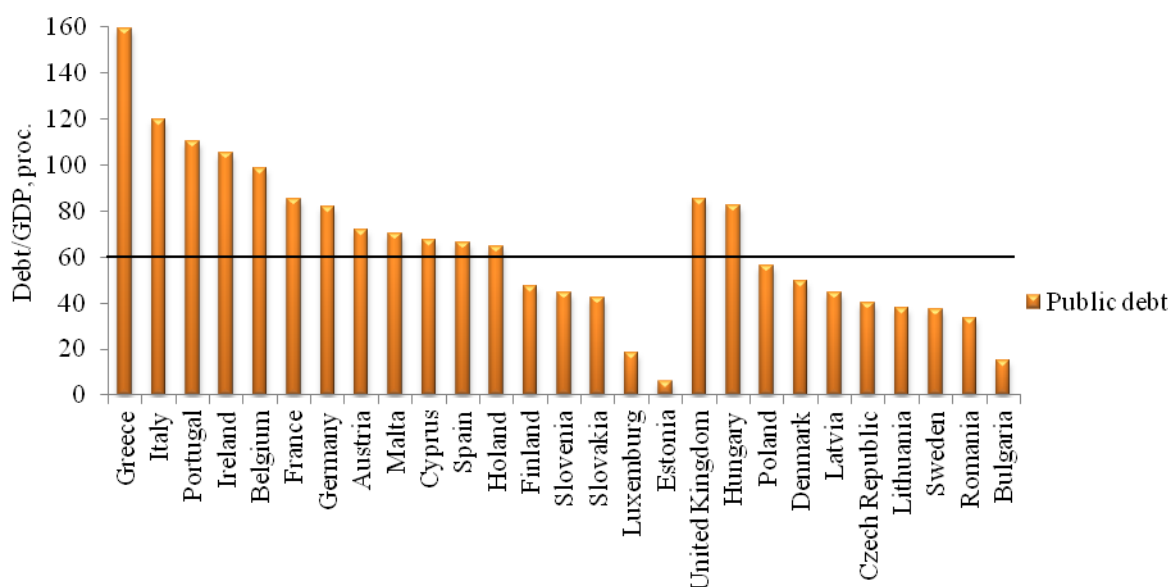
Public debt can be divided by borrower to external and internal debt. The former is based on attracting foreign investors for buying government issued securities and borrowing from international financial institutions. The latter comprises of borrowing within the country, using private banks and domestic investors as a main source. It is hard to determine which of these is more efficient. External debt holds more risk, since it is hard to negotiate with foreign investors for better terms in case of debt crisis. It also includes additional risks, such as exchange rate risk, if external debt is denominated in foreign currency. Meanwhile, domestic debt gives an opportunity to substitute delay of repayment with better tax rates, social guarantees. It is considered to be safer, since domestic debt could be looked at as a distribution of assets amongst ones who has excess and those who need it inside the country. Therefore, citizens of the country are in debt only with each other. However, high domestic government debt may result in reduced private credit flows. This would mean slower development on private enterprises and other economic initiatives. Consequently it could lead to economic slowdown. This case had been analyzed by Emran & Farazi (2009), who note that numerous possible bank responses to increased government sector borrowing from domestic banking sector can be pointed out. Some argue that the access to safe government assets allows banks to take more risk and thus increase their lending to the private sector. The alternative hypothesis implies that it may create moral hazard and thus discourage the banks from lending to risky private sector. Stifled incentives to seek out new profitable investment opportunities in the private sector could also be referred to as "lazy banks model". Division of external debt to government securities and loans also has uneven pros and cons. Loans from

international institutions usually has longer terms and lower interest rates. However, they usually refer to a particular project, which has to meet specific conditions, meaning restraints for using borrowed funds. On the other hand, emissions of government securities provides it with funds, which can be used freely for financing public spending, budget deficit, etc. All in all, efficient public borrowing planning must be present in order to determine which financial instruments will provide country with most benefits and will result in the least costs possible.

### Debt crisis in European Monetary Union

More risks for the public finance sector appear with the establishment of monetary union, such as European Monetary Union [EMU]. Despite all the benefits provided by the creation of EMU, differences between the countries and specific economic factors lead to unrest in a financial sector. Landon & Smith (2007) coin that debt spillovers over the monetary union may appear in case of a monetary accommodation risk, implicit or explicit inter-jurisdictional bailout provisions, or interdependent revenues. The authors' analysis empirically distinguishes two channels of risk, through which public debt spillovers can reach EMU partner countries: common currency depreciation risk and default risk. Findings of the research show that one percentage point rise in the government debt to GDP ratio leads to a statistically significant increase in government bond yields, which points to higher interest rate for future bond emissions and less sustainable public debt as a result.

Despite all the politicians' and policy makers' as well as financial institutions' efforts and extraordinary measures taken in order to stabilize situation in euro zone, debt spillovers are still spreading. Public debt to GDP ratio in 27 EU countries according to 2011 third quarter data is shown in *Figure 1* below.



**Figure 1.** Public debt level of EU countries (Eurozone versus Non-Eurozone)

In the first part of figure (*see Figure 1*), including Estonia, euro zone countries' data is shown. Starting with United Kingdom, ending with Bulgaria – non euro zone countries' data is depicted. In order to enter euro zone, country must meet four convergence criteria – Maastricht criteria. One of them sets the public debt and GDP ratio limit to 60%. However, even 12 out of 17 euro zone countries exceed it. Meanwhile, out of 10 non euro zone countries only two exceed the limit – United Kingdom and Hungary. According to Eurostat, 27 EU countries public debt to GDP ratio at the end of third quarter 2011 was equal 82,2%, while 17 euro zone countries had 87,5% debt to GDP ratio. All mentioned above emphasizes, that after entering EMU countries forget conditions of international agreement and looks more into their interest. On the other hand, it can also result from difficulties economy faces after entering EMU and consequently increasing government spending, which leads to greater borrowing demands. At the same time EMU countries are considered to be more reliable, because, in case of financial difficulties, strong economies, like Germany, are believed to bail them out. This leads to lower interest rates and better conditions, which acts as an encouragement to finance deficits by borrowing. In the mean time, non euro zone countries have ambition of entering EMU. Therefore they have to keep their debt to GDP ratio under 60%, which discourages them

from excess borrowing. It is worth mentioning, that United Kingdom is not planning to embrace euro, which leaves only Hungary exceeding 60% limit within range of countries candidates. This can be explained by public finance problems Hungary faced the first of the EU countries. Country received bailout package in 2008.

Excessive borrowing of EMU countries, such as Greece, Ireland, Portugal, Italy, are burdening future generations with financial liabilities, leading Europe to a contagious sovereign debt crisis. Budget deficit was used as compensation for structural problems, such as uncompetitive labor market or unstable social system. Issues of public finance sector was clearly seen only after worldwide economic struck. This resulted in increase of public spending, decreased government revenue, which led to huge budget deficits. Consequently, countries like Greece, Ireland and Portugal were not able to refinance their debt without help from international institutions (Grammatikos & Vermeulen, 2012). Greece already received two bailout packages – in 2010 and 2012 (Argyrou & Tsoukalas, 2011). Ireland and Portugal settled with only one so far, received respectively in 2010 and 2011. Despite austerity measures taken by governments, situation is still intense. It is highly probable that other bailout packages will be needed in ear future in order not to let EMU countries default (Dias, 2012).

One more question arising – what level of public debt is sustainable? Is Maastricht criteria of 60% convenient rate for stability in financial sector? However, public finance management is tricky and results from many different factors related. These specific factors can lead a country to default even if sustainable debt levels are kept. It is hard to explain by economic theories. Besancenot & Huynh (2004) gives an example of 1994-1995 crisis in Mexico. Although Mexico's public debt was comparatively low (around 30% of GDP), the government was forced to default. It was brought about essentially by investors' refusal to roll over the public debt. Consequently, it resulted from imperfect control over the stream of future primary surpluses. While debt was getting closer to sustainability threshold, investors perceived it as a risk and refused to buy the debt. Thus, conclusion of small sustainability risk possible resulting in big illiquidity risk can be made. On the contrary, investors may agree to finance the debt under acceptable terms even with very high debt to GDP ratio if economic conditions are favorable and sustainability risk is considered to be small. Japan has the highest debt to GDP ratio of all developed countries. It already exceeds 198% (Doi & Hoshi, 2011). The country's strong external economy, materialized by an external trade balance surplus together with a positive balance of payments, allowed Japan to borrow more than any other developed country. However, with the outcoming consequences resulting from economic setbacks, the recent natural disaster, and the aging population, the sustainability of such debt levels are being questioned.

Taking analyzed literature (Landon & Smith, 2007; Besancenot & Huynh, 2004; Doi & Hoshi, 2011; Emran & Faranzi, 2009) into account, public debt is a positive variable of economic growth until it reaches level, which is unique for every country. Too high debt levels results in difficulties to refinance it, reducing GDP and even possibility of the default. Therefore, government finance must be managed carefully, by researching present and possible future economic development scenarios.

### **Model and data**

Dataset used in the research was constructed using European Union [EU] statistics agency's database (Eurostat). In total 13 countries were selected: Greece, Italy, Portugal, Belgium, France, Germany, Spain, Finland, Estonia, Hungary, Denmark, Lithuania and Sweden. One of the criteria for selecting countries was data availability with intention to have the least possible number of blanks in dataset. Moreover, diversity regarding euro zone – non euro zone countries, current public finance stability and the burden of public debt were taken into account. In order to get samples from both – strong economically and yet developing or suffering from crisis countries, contrasting countries' data, like Germany and Lithuania, Portugal and Sweden, was chosen.

Dataset was composed with the focus on the debt variables, such as public debt, private debt and private credit flow. Macroeconomic indicators included in the model were selected judging by the availability of quarterly data in order to have the least blanks possible in the dataset. Logical predictors' relationship to the GDP was also tested. Openness of the economy relates to the external trade, which is important constituent of GDP. Meanwhile, general government debt, private debt and private credit flow pose a potential surplus for the economy, which can be lower than debt financing costs or exceed it. Population is one of the key factors affecting GDP, since the number of workforce available is highly correlated with total output of the industry and the overall economy. Foreign direct investment may have an ambiguous effect on GDP since it provides finance needed for economic growth, but also results in profits

flowing out of the country. Data ranging from year 2000 first quarter till year 2011 third quarter was used for the research – in total 47 quarterly observations.

The model was composed according to multiple linear regression equation with one dependent and seven independent variables for the time period  $t$ , which equals 47 periods. The equation can be represented as:

$$GDP_t = \alpha + \beta_1 OPN_t + \beta_2 GGD_t + \beta_3 PD_t + \beta_4 PC_t + \beta_5 PP_t + \beta_6 FDI_t + \beta_7 FC_t + \varepsilon_t \quad (2)$$

where:

*Unknown parameters to be estimated*

$\alpha$  is a constant variable;

$\beta_k$  are  $k$  number of regression coefficients;

$\varepsilon_t$  is the error term, a random variable at the time  $t$ ;

*Dependent variable at the time  $t$*

$GDP_t$  represents gross domestic product in euro (including euro converted from national currencies using the irrevocably fixed rate for all years) at current prices and in volume terms. Seasonally adjusted data was used;

*Independent variables at the time  $t$*

$OPN_t$  (openness) was calculated summing up *import* and *export* of goods and services and dividing it by  $GDP$ . All the variables involved were in euro (including euro converted from national currencies using the irrevocably fixed rate for all years) at current prices and in volume terms. Import, export and GDP data extracted was seasonally adjusted. Calculations were made by the means of Excel program;

$GGD_t$  (general government debt) is defined as the total gross debt at nominal value outstanding at the end of each quarter between and within the sectors of general government expressed in euro. The quarterly general government debt refers to the debt at the end of each quarter. For non euro area Member States, the debt expressed in euro is converted using the exchange rate at the last working day of the quarter;

$PD_t$  (private debt) is the stock of liabilities held by the sectors non-financial corporations and households and non-profit institutions serving households expressed in percentage of GDP. The instruments that are taken into account to compile private sector debt are securities other than shares and loans;

$PC_t$  (private credit flow) represents the net amount of liabilities in which the sectors non-financial corporations and households and non-profit institutions serving households have incurred along the year. The value is expressed in percentage of GDP. The instruments that are taken into account to compile private sector debt are securities other than shares and loans;

$PP_t$  (population) is total number of inhabitants of a given country on January 1<sup>st</sup> of the year in question. The population is based on data from the most recent census adjusted by the components of population change produced since the last census, or based on population registers. Since quarterly data was not available, assumption of constant population during the year was accepted;

$FDI_t$  (foreign direct investment) is the ratio between the inward foreign direct investment and GDP expressed in percentage. Data are expressed as percentage to GDP to remove the effect of differences in the size of the economies of the reporting countries. It covers investment from the rest of the world;

$FC_t$  (financial crisis) is a dummy variable evaluating the effects of the financial crisis and the following economic recession. It takes value equal to 1 starting the occurrence of a crisis and 0 otherwise.

The main indicators taken into account when evaluating the relevance of the model is *adjusted R square* and number of variables significant to the model.

Research was carried out using SPSS Statistics 17 statistical program package, since it contained all the features and analysis tools required.

According to the literature analyzed and commonly believed truths, the following hypotheses were formed to be tested by the model:

- H1: Public debt and its level has significant negative impact on GDP in countries affected by debt crisis;
- H2: Public debt has significant positive effect in countries, where its level is relatively low;
- H3: Private debt influences GDP more positively than public debt.

### Research and main findings

Research according to the model mostly showed very good *adjusted R square* results for almost every country. *Adjusted R square* and Durbin-Watson test results for euro zone and non euro zone countries are depicted respectively at *Table 1* and *Table 2*.

**Table 1.** Euro zone countries' output of the multiple linear regression model

	Greece	Italy	Portugal	Belgium	France	Germany	Spain	Finland	Estonia
<b>Adjusted R Square</b>	0,879	0,930	0,953	0,844	0,918	0,862	0,427	0,808	0,856
<b>Durbin-Watson</b>	1,490	1,678	1,492	1,795	1,213	1,597	2,495	1,967	1,904

**Table 2.** Non euro zone countries' output of the multiple linear regression model

	Hungary	Denmark	Lithuania	Sweden
<b>Adjusted R Square</b>	0,893	0,919	0,784	0,619
<b>Durbin-Watson</b>	2,008	2,470	1,817	2,289

Although all countries showed better than expected result, Spain is an exception with *adjusted R square* totaling 0.396. This means that 39.6% of GDP variance is explained by the independent variables used, which is an acceptable result. The remainder of the countries researched showed results of *adjusted R square* equaling more than 0.7. The value of *adjusted R square* tops in the case of Portugal, equaling 0.953. Out of non euro zone countries, Denmark showed the best result, *adjusted R square* = 0.916. Tables 1 and 2 also reveal that countries were arranged according to their general government debt to GDP ratio with intention to determine its effect on model. However no significant relation between results of the research and public debt to GDP ratio could be established.

The value of Durbin-Watson test stayed within the limits of 1.2 and 2.5 in most cases, which shows no autocorrelation of residuals. However France, Lithuania and Sweden stood out with D-W equaling 1,817, 2,008, 2,470 and 2,289 respectively. Nevertheless, the deviation from interval allowed was not significant. Putting everything into account, the model worked well with all selected countries.

Results of  $\beta$  coefficient and significance of each variable used are presented in *Table 3*.

**Table 3.** Output of the multiple linear regression model

	Openness	GG Debt	Private debt/GDP	Private flow/GDP	credit	IFDI/GDP	Financial crisis
<b>Greece</b>	0.087	1.393***	-0.572***	0.618***		0.068	-0.022
<b>Italy</b>	-0.110**	0.018	1.135***	0.332***		-0.091*	-0.258***
<b>Portugal</b>	-0.034	0.444***	0.855***	0.278***		-0.061	-0.428***
<b>Belgium</b>	0.282***	-0.245**	0.937***	-0.001		0.142*	0.010
<b>France</b>	0.010	0.467**	0.810***	0.010		-0.364***	0.095
<b>Germany</b>	0.398*	0.416**	-0.107	0.101		-0.162**	0.045
<b>Spain</b>	-0.922**	0.420	0.771	0.407		1.072**	-0.448
<b>Finland</b>	-0.025	0.908***	-0.308*	-0.171**		-0.120	0.382***
<b>Estonia</b>	0.227*	-0.977***	1.937***	0.026		-0.005	-0.244
<b>Hungary</b>	-0.170**	1.530***	-0.464	0.130**		0.102	-0.048
<b>Denmark</b>	0.267**	0.003	0.797***	0.042		-0.047	-0.066
<b>Lithuania</b>	0.108	-0.375**	0.980***	0.036		0.262	0.277
<b>Sweden</b>	0.905***	0.401**	0.253	-0.151		-0.013	-0.244

Note: \*\*\*, \*\*, \* denote significance at 1%, 5%, and 10%, respectively

The results of the regression differ from country to country (see Table 1). Research suggests that openness of the economy is significant for 6 tested countries. While openness has a positive effect to GDP in Germany, Finland, Denmark and Lithuania, it shows negative impact in Spain (significant at 5% level) and Hungary (significant at 1% level). It can be justified by negative external trade balance in Spain during all periods. Meanwhile, Hungary has positive external balance since 2009, therefore suggesting that positive effect to the GDP is lagged. Public debt has positive effect on the economy until it reaches certain amount, when costs of debt and payment of interest becomes a burden to economy and starts reducing GDP. The research supports this theory by resulting in significant positive effect in Germany, Hungary and Sweden –

countries with relatively low debt levels. However, the results of Portugal are contradictory.  $\beta$  coefficient equaling 0,361 with significance at 5% level suggest positive effect of public debt in a country struggling because of debt crisis. That can be explained with lagged effect of debt crisis to GDP, since the public finance problems in Portugal appeared only recently. Belgium on the other hand faces negative impact of public debt to GDP – the result of debt levels around 100% of GDP. Interesting exception is Estonia – country of lowest public debt to GDP ratio in all EU. Model shows strong negative impact (significant at 1% level) of public debt to its GDP. The problem may lie within efficiency of use of borrowed assets – the costs of financing public debt of Estonia may be greater than the benefits. Another variable – private debt – resulted in less controversy. It shows positive effect to GDP of all 6 countries where it is significant. It is particularly strong in Lithuania, Italy and Estonia where  $\beta$  coefficient are significant at 1% level and equals 2.066; 1.500 and 1.462 respectively. Private credit flow also has unanimously positive effect to a dependent variable in all the countries where it shows high significance. Population affects GDP in a positive way as expected, with exception of Italy, which can be explained by its ageing and declining population. Variable is significant in Greece, Italy, France, Portugal, Belgium and Lithuania. Inward foreign direct investment harms GDP in Italy and Sweden. It m be explained by profits of the companies going to foreign investors that way exiting strong economies, which are capable of financing itself without external assets. However, effect to Spain and Hungary is positive and significant at 5% and 10% level respectively. Model shows that the dummy variable for crisis had a negative impact for Italy and Portugal, significant at 1% level. Both countries still have serious public finance and macroeconomic issues, which confirms the findings.

Normality of residuals' distribution was tested by nonparametric Kolmogorov – Smirnov test. The results are depicted in *Table 4*.

**Table 4.** Output of the K-S test

	Greece	Italy	Portugal	Belgium	France	Germany
<b>K-S Z</b>	0.697	0.443	0.442	0.809	1.361	0.600
<b>Asymp. Sig.</b>	0.717	0.992	0.990	0.529	0.049	0.864

	Spain	Finland	Estonia	Hungary	Denmark	Lithuania	Sweden
<b>K-S Z</b>	0.453	0.564	0.583	0.660	0.496	0.549	0.586
<b>Asymp. Sig.</b>	0.986	0.908	0.885	0.776	0.966	0.924	0.882

If K-S test asymptotic significance is higher than 0.05, we can assume normal distribution, which is desirable result for residual analysis. This is the case in almost all countries analyzed with only France as an exception. Nevertheless, in case of France K-S statistics asymptotic significance is only 0.001 lower than desired value of 0.05. Therefore, the overall assumption of normal distribution of residuals can be accepted. In this research, private debt and private credit flow have positive effects on the economy for every country, suggesting that private borrowing is more efficient than public borrowing. Therefore, H3 is accepted, because since the cost of private debt is bigger than the public one, it leads to a somewhat paradox conclusion, that assets financed privately are used more efficiently, which is, nevertheless, confirmed by literature.

### Conclusions

1. Findings of this research confirm the hypotheses that the public debt level may have a significant impact on GDP, something which is worrying as in some cases it has a negative impact. Nevertheless, this varies from country to country because of specific country differences. Sweden, Germany, Hungary and Portugal are affected positively by public debt and the results are significant. Conversely, Belgium and Estonia experienced significant negative effect. No significant evidence were found on relation between debt crisis or debt level and public debt effect to GDP. Therefore, H1 and H2 are rejected.
2. As most countries, Portugal experiences a debt crisis from 2008, that has being worsening since then. However, findings of this research suggest that its GDP was still being affected positively by the increase in public debt, at least until the end of 2011. This may be explained by lagged effects of public debt on the economy.

3. In this research, private debt and private credit flow have positive effects on the economy for every country, suggesting that private borrowing is more efficient than public borrowing. Since the cost of private debt is bigger than the public one, it leads to a somewhat paradox conclusion, that assets financed privately are used more efficiently, which is, nevertheless, confirmed by literature. Therefore, H3 is accepted.
4. Openness of the economy and inward foreign direct investment have varying effects on GDP, resulting from different characteristics of the countries researched. Furthermore, the economic crisis affected most economies negatively, as expected. On the other hand, population is significant and affects GDP positively, with the exception of Italy, which may be explained by its ageing population.

### References

1. Aiyagari S. R., McGrattan E. R. The optimum quantity of debt. *Journal of Monetary Economics*: 1998. 42, p. 447-469.
2. Arghyrou M. G., Tsoukalas J. D. The Greek debt crisis: Likely causes, mechanics and outcomes. *The World Economy*: 2011. 34, p. 173-191.
3. Berben, R. P.; Brosens, T. The impact of government debt on private consumption in OECD countries. *Economics Letters*: 2007. 94, p. 220-225.
4. Besancenot D., Huynh K., Vranceanu R. Default on sustainable public debt: illiquidity suspect convicted. *Economics Letters*: 2004. 82, p. 205-211.
5. Boguslauskas V., Bliedienė R., Grondskis G., Maksvytis L. *Ekonometrija: Regresijos modeliai*. Technologija, Kaunas: 2009.
6. Dias J. Sovereign debt crisis in the European Union: A minimum spanning tree approach. *Physica A*: 2012. 391, p. 2046-2055.
7. Doi T., Hoshi T., Okimoto T. Japanese government debt and sustainability of fiscal policy. *Journal of The Japanese and International Economies*: 2011. 25, p. 414-433.
8. Emran M. S., Farazi S. (2009). Lazy banks? Government borrowing and private credit in developing countries [interactive]. *Social science research database* [access 2012-04-17]. Internet access: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1418145](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1418145)
9. Grammatikos T., Vermeulen R. Transmission of the financial and sovereign debt crises to the EMU: Stock prices, CDS spreads and exchange rates. *Journal of International Money and Finance*: 2012. 31, p. 517-533.
10. Ismihan, M.; Ozkan, F. G. Public debt and financial development: A theoretical exploration. *Economics Letters*: 2012. 115, p. 348-351.
11. Karazijienė, Ž.; Sabonienė, A. The structure of the NATIONAL debt and state's borrowing influence for the Lithuanian economy. *Economics and Management*: 2009. 14, p. 271-279.
12. Kellermann K. Debt financing of public investment: On a popular misinterpretation of "the golden rule of public sector borrowing". *European Journal of Political Economy*: 2007. 23, p. 1088-1104.
13. Landon, S.; Smith, C. E. Government debt spillovers in a monetary union. *North American Journal of Economics and Finance*: 2007. 18, p. 135-154.
14. Lora E., Olivera M. Public debt and social expenditure: Friends or foes? *Emerging Markets Review*: 2007. 8, p. 299-310.
15. Martin, F. M. A positive theory of government debt. *Review of economic Dynamics*: 2009. 12, p. 608-631.
16. Ramcharan R. Regressions: Why are economists obsessed with them? [interactive]. *Finance and development*: 2006. 43 [access 2012-04-22]. Internet access: <http://www.imf.org/external/pubs/ft/fandd/2006/03/basics.htm>
17. Statistics database. European Union statistics department web page [access 2012-03-20]. Internet access: [http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)