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# **PUBLIC DEBT DYNAMICS: THE CASE OF ROMANIA**

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## **Abstract**

The public debt is at the centre of current crisis of the Peripheral European countries. Presently, the public debt to GDP ratio in Romania reached its maximum ever record. The objective of this paper is to provide a better understanding of public debt dynamics in Romania in the period from the first quarter of 2000 to the second quarter of 2011, which covers both prior and subsequent time periods to the recent financial crisis that started in August 2007. It decomposes changes in public debt to GDP ratio into macroeconomic components attributable to primary fiscal deficits, real interest rate, real GDP growth, and to the gains or losses on foreign currency denominated debt as result of exchange rate variation. The research findings suggest that the reaction of the public debt to GDP ratio to the real growth rate of the output increased after the financial crisis, which is especially harmful since the financial turmoil caused a deep recession. The real interest rate on government bonds remained an important determinant of public debt in the whole sample period. In addition, we find a limited effectiveness of fiscal policy as an automatic stabiliser through the whole sample period. Also, contrary to what happened with the leu-dollar exchange rate, variations in the leu-euro exchange rate didn't have a significant impact on the variation of the debt to GDP ratio.

**Keywords:** public debt, debt sustainability, financial crisis

**JEL Classification:** H63, H69, H60, H87.

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## 1. Introduction

The public debt is at the centre of current crisis of the Peripheral European countries like Greece, Ireland and Portugal that have already been intervened by the European Commission, the European Central Bank and the International Monetary Fund. Meanwhile, financial markets are showing doubts about the ability of Spain and Italy to fulfil its obligations towards its creditors without a similar intervention.

Governments may accumulate public debt to finance public and productive investment, for example in physical infrastructures and in human capital by public spending in education and health care. Also, in advance economies, the existence of developed social safety nets partially financed by public deficits that respond, for example, to the increase of the unemployment rate has an important role as economic automatic stabilisers. Public debt can increase in these circumstances to avoid distorting taxes fluctuations (see Barro, 1979).

Nonetheless, increasing public debt and budget deficits have become a crucial issue in many industrialized and emerging economies. In recent decades, many countries have accumulated large stocks of public debt, usually followed by increases in public sector size and imprudent fiscal and budgetary policies. These developments raised concerns about debt sustainability with the possible consequences of debt monetization that originates inflation, tax rises and/or expenditures cuts that entail large economic costs, or in extreme cases sovereign debt default.

Romania, a recent joiner to the European Union (EU),<sup>3</sup> in spite of retaining its ability to devaluate the currency, is greatly suffering as a consequence of the Euro Zone crisis, and presently the country's public debt reached its maximum ever record forcing the government to apply austerity measures and to borrow from the International Monetary Fund (IMF).

The objective of this paper is to provide a better understanding of public debt dynamics in Romania in the period from the first quarter of 2000 to the second quarter of 2011, which covers both prior and subsequent time periods to the recent financial crisis that started in August 2007.

Our empirical strategy is: first, to decompose changes in public debt to GDP ratio into macroeconomic components attributable to primary fiscal deficits, real interest

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<sup>3</sup> Romania joined the EU in 2007.

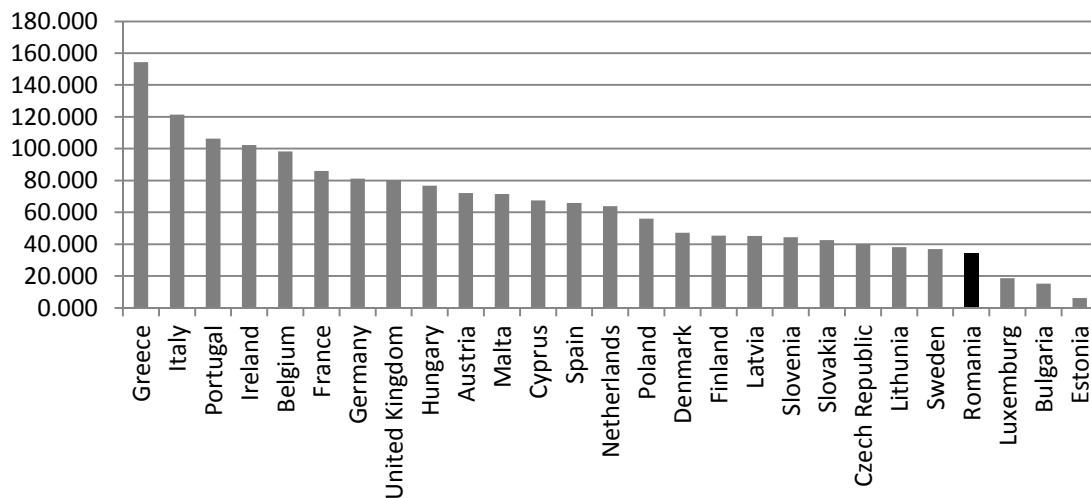
rate, real GDP growth, and to the gains or losses on foreign currency denominated debt as result of exchange rate variation; second, to analyse the contribution of each factor to the debt dynamics.

The paper is organized as follows: section 2 briefly describes the recent evolution of public debt in Romania, as well as its structure; section 3 describes the model to be tested and the used data set; section 4 presents and discusses the estimated results. Finally, section 5 draws some final conclusions.

## 2. Recent Dynamics of Romania’s Public Debt

Public debt as a percentage of the GDP in Romania reached 34.3 percent in the second quarter of 2011, which is still rather low by international standards (see Figure 1).

**Figure 1.** *Public Debt to GDP Ratio in the EU (Second Quarter of 2011)*



Source: IMF

Despite this fact, it is known that debt intolerance thresholds vary across countries, being determined by the country’s record of default and inflation, and by weak fiscal structures and financial systems (see *e.g.*, Reinhart *et al.*, 2003). For example, the IMF World Economic Outlook (2003) states that fiscal policy as a countercyclical tool is less effective in countries with high public debt: for industrial

countries it is defined as above 75 percent of GDP, and for emerging markets – such as Romania - as above 25 percent of GDP.

Also, the currency composition of the debt and its maturity structure are relevant to assess the vulnerability of a country to a debt crisis.<sup>4</sup>

In fact, even a moderate debt to GDP ratio can hide unsustainable public debt dynamics when a large share of public debt is denominated in foreign currency. When such is the case, countries are highly vulnerable to the devaluation of the domestic currency. In Romania the share of the domestic currency denominated debt has increased until 2008, and remained stable after that. In 2010 there is still a larger share of debt denominated in foreign currency (60 percent) than in lei (see Figure 2).

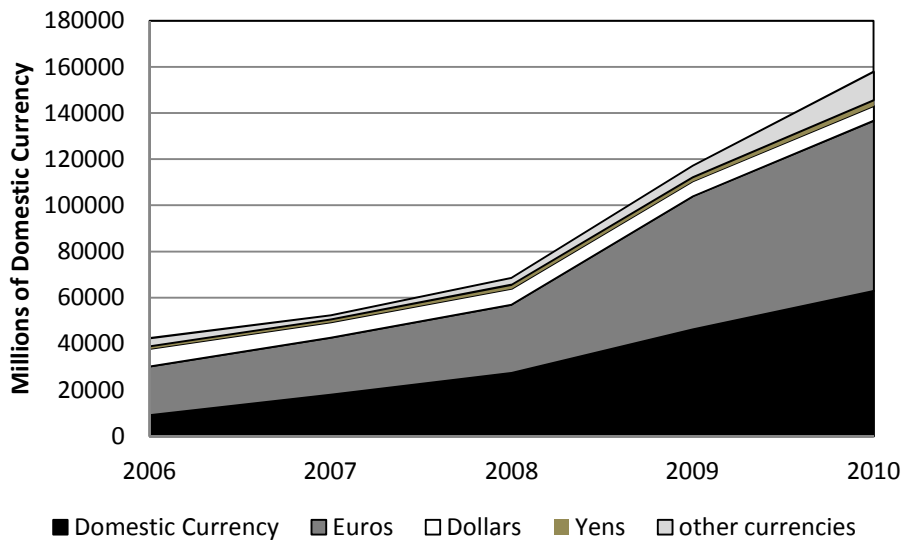
Furthermore, a large share of short-term debt exposes a country to interest rate volatility, making public debt very sensitive to the increase in the interest rates. After showing a tendency to decrease in the beginning of the decade of 2000, the share of short-term debt increased again after 2006, due to the budget's necessity to borrow resources in order to be able to ensure current expense pay, such as the budgetary salaries and the pensions. In 2010 about 20 percent of the public debt has maturity less than one year (see Figure 3).

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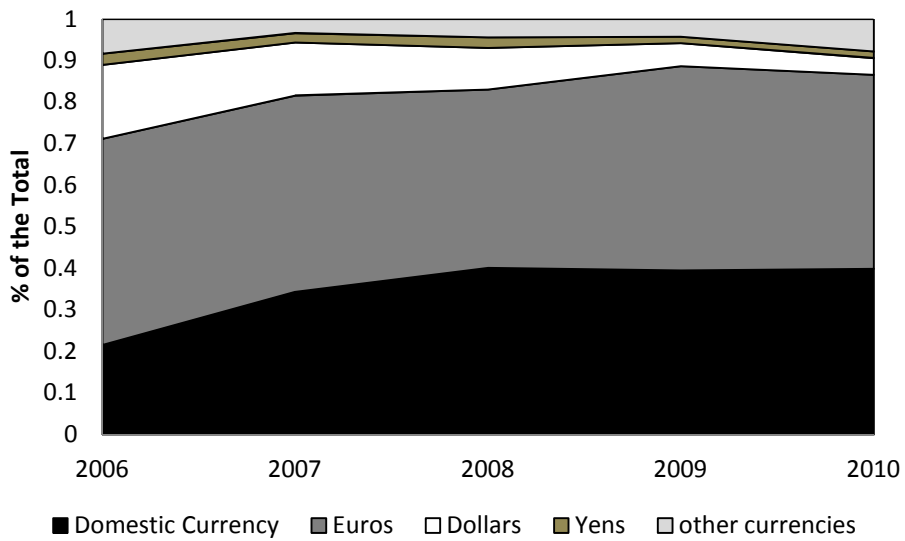
<sup>4</sup> See World Bank (2005), *Public Debt and Its Determinants in Market Access Countries*.

**Figure 2. Public Debt Structure: Domestic vs. Foreign Currency Denominated Debt**

a)



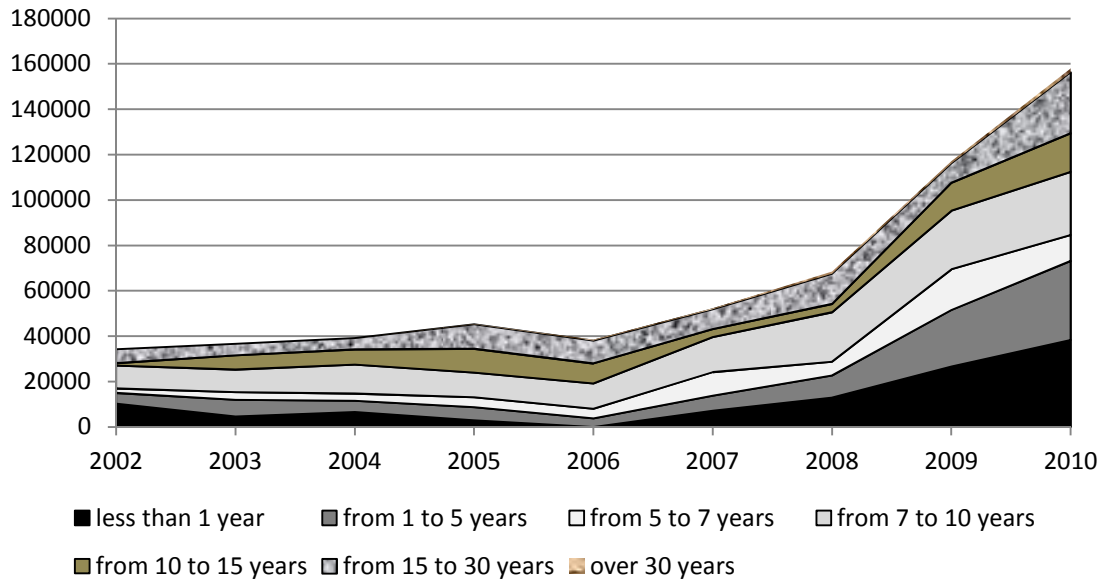
b)



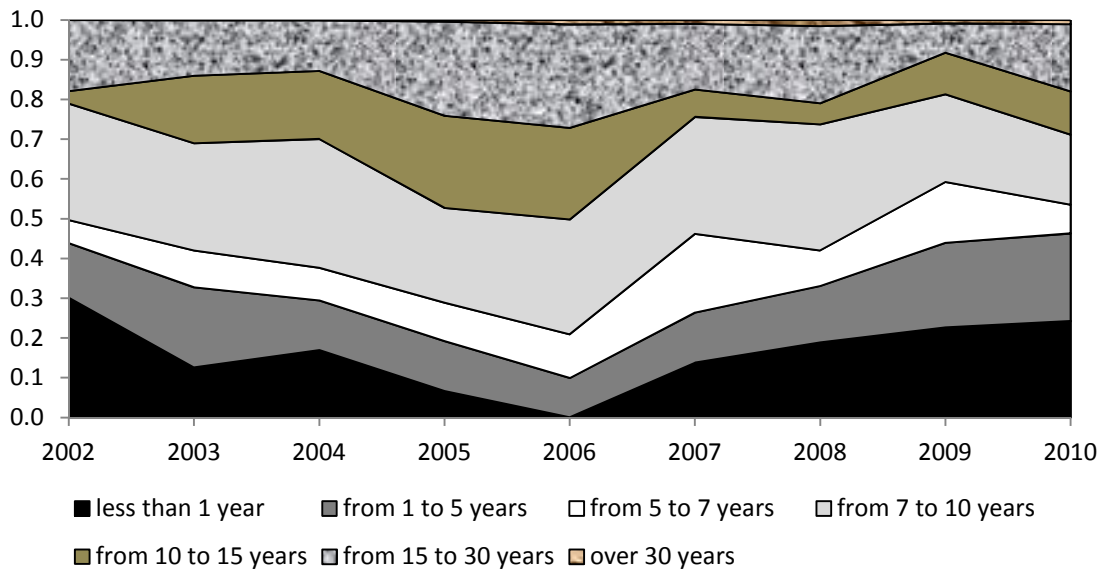
Source: Eurostat

**Figure 3. Public Debt Maturity Structure**

a)



b)



Source: Eurostat

At the beginning of the 90s, Romania recorded a consolidated value of public debt lower than the other former planned economies such as Czech Republic, Hungary and Poland. In the period 1992-1995 it showed stable values of 15-17 percent of the GDP.

A large increase of the debt to GDP ratio occurred after 1995. In the period 1996-1997, it increased by about 16 percent. The cause was the increase of the external indebtedness in these two years by 12.2 percent. By this time, public debt to GDP ratio had already exceeded the same macroeconomic indicator in the Czech Republic, and the difference to Poland and Hungary was reduced significantly. In the period from 1995 to 2001, the debt to GDP ratio grew considerably from 7 percent, recorded in 1995, to about 26 percent in 2001.

The public debt to GDP ratio declined steadily from the last quarter of 2002 until the more acute phase of the recent financial crisis following the Lehman Brother Collapse in September 15 of 2008 (reaching de decade record low of 11.6 percent of the GDP in the third quarter of 2008), in line with the requirements of the Stability and Growth Pact of the EU. The reasons for this sharp reduction were the economic and fiscal reforms implemented towards the accession to EU, the increase of the growth rate of the GDP, and a deceleration in issuing new debt. After that, it climbed sharply to 34.3 percent of the GDP in the second quarter of 2011 (see Figure 4).

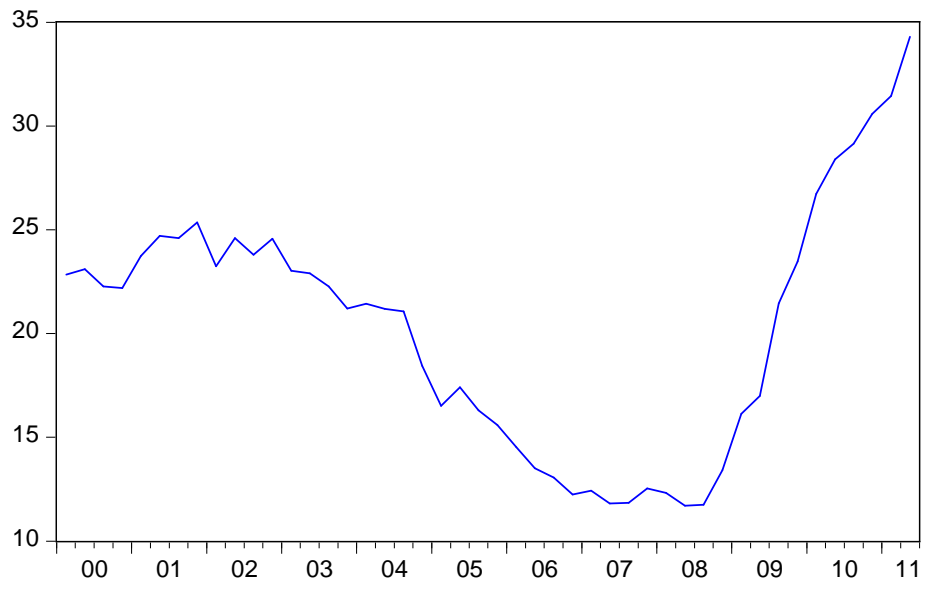
From visual inspection of Figure 5 emerges as the main cause the sharp decline in the GDP growth rates that implies a significant fall in tax revenues. For example, in 2008 the economic growth was 7.3 percent of the GDP, while in 2009 the economy contracted by 7.1 percent of GDP, as the result of the financial crisis that reduced domestic and Foreign demand. This conclusion is indeed in line with the findings of Reinhart and Rogoff (2009a, b) that documented that after a deep financial crisis, public debt increases on average 86 percent, the cause being mainly the fall in the fiscal revenues due to slow GDP growth rate or even recession. Additional determinants of the increase of public debt were the higher interest rates on the foreign markets (LIBOR and EURIBOR), higher yields on government securities (see Figure 5 c.), the more restricted access to external financing on international markets, and the exchange rate depreciation against the major foreign currencies in the government debt portfolio like the euro and the dollar (see Figure 5 d.).<sup>5</sup>

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<sup>5</sup> See Public Debt Management Strategy 2011-2013, Ministry of Public Finance – General Directorate for Treasury and Public Debt.

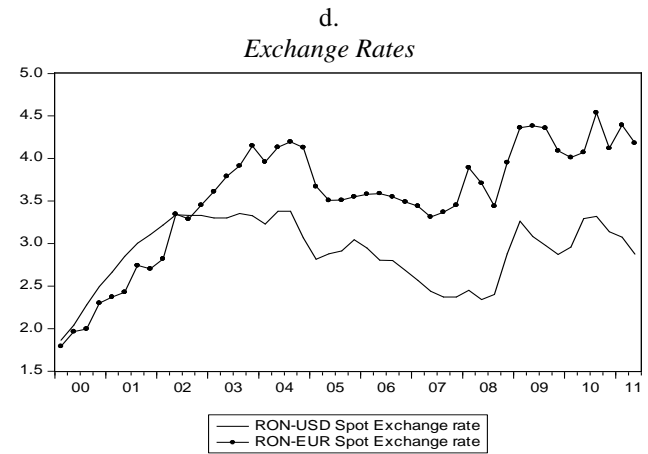
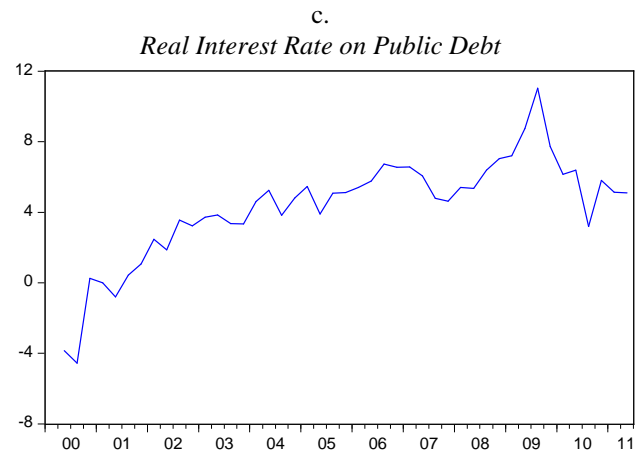
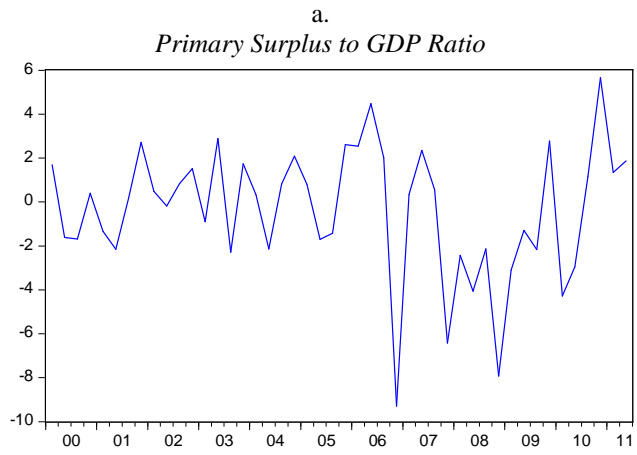


**Figure 4.** Romania' Public Debt to GDP Ratio



Source: IMF

**Figure 5. Determinants of Public Debt Dynamics**



Source: IMF

### 3. Model and Data Set

The background of our empirical model is the government budget constraint equation in each period  $t$ :

$$B_t = (G_t - T_t) + (1 + i_t^D) \times B_{t-1}^D + (1 + i_t^F) \times B_{t-1}^F \times S_t - \Delta BM_t \quad (1)$$

According to equation (1), the variation of total public debt at period  $t$ ,  $B_t$ , depends on the current primary deficit (non interest total general government expenditures during period  $t$ ,  $G_t$ , minus total general government revenue during period  $t$ ,  $T_t$ ), on the public debt incurring in the past, including the interest payments on government borrowing,  $B_{t-1}$ , and on changes of the monetary base,  $\Delta BM_t$ . As Romania is issuing debt in local currency, as well as in foreign currency (the main foreign currencies in the government debt portfolio are the euro and the dollar), we split the sovereign debt inherent from the period  $(t-1)$  into domestic,  $B_{t-1}^D$ , and foreign currency denominated debt,  $B_{t-1}^F$ . In Equation (1),  $i_t^D$  is the nominal interest rate applied to domestic denominated debt,  $i_t^F$  is the nominal interest rate applied to foreign currency denominated debt, and  $S_t$  is the nominal exchange rate defined as lei per foreign currency.

It is standard to write the government budget constraint in a form that expresses the evolution of debt to GDP ratio in terms of the ratio of the primary deficit to GDP, the real interest rate, and the GDP growth rate. Diving both sides of equation (1) by nominal GDP, neglecting debt monetization,<sup>6</sup> and defining lower case variables as upper case variables expressed as a proportion of GDP, we can rewrite equation (1) as the public debt dynamics equation:

$$b_t - b_{t-1} = (g_t - t_t) + (i_t^D - \pi_t - y) \times b_{t-1}^D + (i_t^F - \pi_t - y_t + s_t) \times b_{t-1}^F \quad (2)$$

where  $\pi_t$  is the inflation rate, and  $y_t$  is the rate of growth of real GDP.

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<sup>6</sup> This simplification is acceptable as the European Union Framework for conducting monetary policy restricts the direct monetization of public debt by National Central Banks.

Equation (2) decomposes the change in public debt to GDP into three components: *i*) the primary fiscal balance,  $g_t - t_t$ ; *ii*) the real interest rates,  $i_t^D - \pi_t$  and  $i_t^F - \pi_t$ ; *iii*) the real GDP growth rate,  $y_t$ ; and *iv*) the nominal exchange rate,  $s_t$ . Accordingly, the public debt to GDP ratio changes as a result of: the primary deficit; the ‘automatic debt dynamics’ determined by the real interest rate on public debt and by the real rate of growth of the GDP; the capital gains or losses on foreign currency denominated debt as the result of exchange rate variation.

Based on equation (2), we estimated by OLS and using the Newey-West procedure (Newey and West, 1987) to correct the eventual problems of heteroscedasticity and autocorrelation the following model:

$$\Delta DEBT_t = \beta_0 + \beta_1 DEBT_{t-1} + \beta_2 PSURPLUS_t + \beta_4 RIR_t + \beta_5 GDPGR_t + \beta_6 EXCUSD_t + EXCEUR_t + \gamma \mathbf{X}_t + \varepsilon_t \quad (3)$$

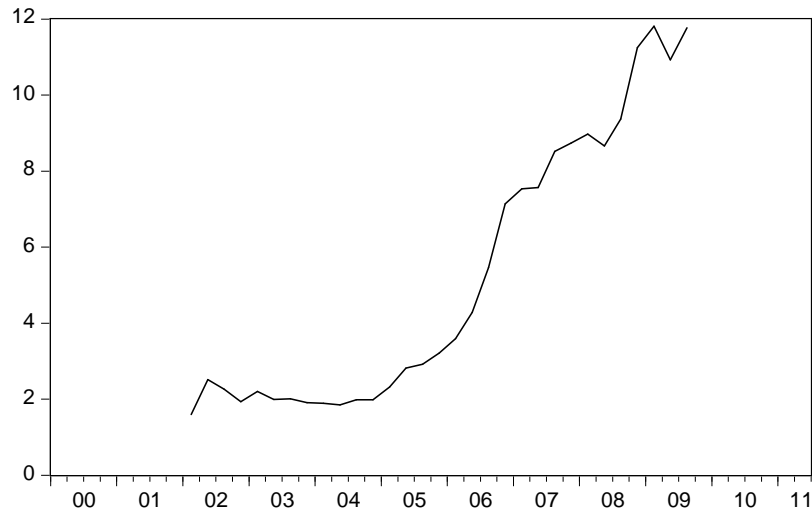
where  $\Delta DEBT_t$  is the variation of total amount of public debt as a percentage of GDP at period  $t$ ,  $DEBT_{t-1}$  is the public debt as a percentage of GDP in the previous period,  $PSURPLUS_t$  is the primary government surplus as percentage of GDP,  $RIR_t$  is the real average interest rate paid on public debt,  $GDPGR_t$  is the real rate of GDP growth,  $EXCUSD_t$  is the leu – dollar exchange rate defined as the number of lei per dollar,  $EXCEUR_t$  is the leu – euro exchange rate defined as the number of lei per euro,  $\mathbf{X}_{i,t}$  is a vector of other control variables, and  $\varepsilon_t$  is a random disturbance term. The vector of control variables includes: the degree of openness of the economy at current prices, measured as total trade (sum of imports and exports) as a percentage of GDP,  $OPEN_t$ ; the net foreign direct investment as percentage of GDP,  $FDI_t$ ; and a set of dummy variables,  $ELECT_t$ ,  $ELECT1_t$ ,  $ELECT2_t$  and  $ELECT3_t$  that are (1) if there is a parliamentary election in a given quarter, and in one, two or three quarters ahead respectively, and (0) otherwise. Trade openness is a variable very often present in fiscal policy models since early times (see, *e.g.*, Cameron, 1978; and Myrdal, 1960). Openness should have a positive effect on economic growth which contributes to the reduction of the debt to GDP ratio (Berg and Krueger, 2003). The reason for the inclusion of  $FDI_t$  is that it leads to an increase of productivity and consequently to a

decrease of the debt to GDP ratio. Reinhart and Rogoff (2008), *e.g.*, found that this variable is relevant to explain the debt to GDP ratio in low and middle income countries. The election dummies are included to verify the so called opportunistic hypothesis that states that incumbent governments inflate the economy prior to elections in order to maximize their probabilities of being re-elected; hence producing political business cycles (see the early contributions of Nordhaus (1975), Lindbeck (1975), Hibbs (1977), and MacRae (1977)). Further contributions can be found in Alesina and Roubini (1992), Rogoff (1990), and Shi and Svensson (2006). The empirical literature on this hypothesis remains, however, rather inconclusive (see Schneider, 2010).

Then, following Barro (1979) and Bohn (1998), we admit that the primary deficit is a function of temporary government expenditures, defined as the difference between non interest government spending as percentage of GDP,  $G_t$ , and its trend,  $\bar{G}_t$ , computed using the Hodrick-Prescott filter, and as a function of the cyclical state of the economy, defined as the difference between the unemployment rate,  $U_t$ , and its Hodrick-Prescott trend,  $\bar{U}_t$ . The output gap is an alternative to the unemployment gap. However, unemployment rate has several advantages (Fernandes and Mota, 2011): It is more objective in its quantification; It is available to the public in general on a monthly basis; and it is waited by the markets as a good indicator of the state of the economy. Moreover, since it directly affects the well-being of the electors and their opinions of the government, politicians feel obliged to respond to it by means of appropriate discretionary fiscal policy.

To account for a structural break after 2007 caused by the recent financial crisis, we add an interaction term between the explanatory variables and a dummy variable,  $CRISIS_{i,t}$ . The Quandt-Andrews unknown breakpoint test (Andrews, 1993; Andrews and Ploberger, 1994) indicates a structural break in the regression in the first quarter of 2009 (where the LR F-statistic reaches a maximum of 5.679 – see Figure 6). Accordingly,  $CRISIS_{i,t}$  takes the value of (1) for all the quarters after the first quarter of 2009, and (0) for the quarters before.

**Figure 6.** *Quandt-Andrews unknown breakpoint test (LR F-statistic)*



*Source:* Author's calculations

In the estimation, we use quarterly data from IMF – International Financial Statistics, BOPS – Balance of Payments, GFS – Government Finance Statistics and Coordinated Direct Investment Survey, electronic databases provided by International Monetary Fund. The data covers the period from the first quarter of 2000 to the second quarter of 2011, which includes both prior and subsequent time periods to the recent financial crisis that started in August 2007. All the variables were seasonally adjusted.

The summary descriptive statistics are in Table 1. The dynamics of public debt to GDP ratio is displayed in Figure 4, and the main determinants of public debt are displayed in Figure 5.

**Table 1.** *Summary Statistics of Variables*

Variable	Mean	Standard Deviation	Max	Min	Variation (%) 2000:01 – 2011:02
$DEBT_t$	20.3	6.0	34.3	11.6	50.44
$PDEFICIT_t$	-0.3	3.4	5.9	-12.1	10.21
$G_t$	36.3	5.6	48.7	24.7	-16.11
$U_t$	7.0	2.3	12.9	3.8	-54.37
$RIR_t$	4.291	2.954	11.040	-4.554	232.46
$GDPGR_t$	3.8	4.9	11.6	-8.6	-87.63
$EXCUSA_t$	2.901	0.387	3.381	1.866	54.18
$EXCEUR_t$	3.535	0.694	4.539	1.790	113.58
$OPENC_t$	0.8	0.1	0.9	0.7	26.86
$FDI_t$	4.8	3.1	11.2	0.4	38.42

*Source:* Author's calculations

#### 4. The Estimated Results

Table 2 (column) presents the estimation results of the effect of the primary fiscal balance, the real interest rates, the real GDP growth, and the exchange rate variation on the dynamics of public debt (Equation 3). This is our baseline model. The regression is overall significant and the signs of the main explanatory variables are those that are expected. An increase of the primary surplus to GDP ratio originates a reduction in the public debt to GDP ratio, while an increase of the real interest rate and a decrease of the GDP growth rate originate a positive variation of the debt to GDP ratio. The debt in the previous period does not have a significant impact on the variation of the debt in the current period. This result means that governments didn't show any urgency to react to the increase of debt to GDP ratio. Concerning the exchange rate variations, the leu-dollar exchange rate is significant and with the expect sign, meaning that a devaluation of the leu against the dollar increases the debt to GDP ratio, while the leu-euro exchange rate is non-significant. Among the control variables, only foreign direct investment is significant, implying that an influx of capital contributes to reduce the public debt to GDP ratio. The degree of openness of the economy is not significant, and we also didn't find electoral cycles in the behaviour of public debt.

Based on this estimation, we decompose the public debt dynamics into its significant components<sup>7</sup> (see Figure 7). Our results show that the real GDP growth rate contributed to a reduction of the debt to GDP ratio until the beginning of the financial turmoil. After that, the recession has been contributing to the increase of the debt ratio. Before the recent financial turmoil, foreign direct was also an important factor that contributed to the reduction of the public debt. Nonetheless, its effect diminished considerably after 2008. The leu-dollar exchange rate contributed to the reduction of public debt from 2002 to 2008. After the crisis, the devaluation of the leu increased the domestic value of the foreign currency denominated debt, leading to an increase of the debt to GDP ratio. The real interest rate on public debt contributed to the increase in debt to GDP ratio throughout in the whole period, and its effect increased after 2008. Primary budget had an impact either positive or negative to the public debt accumulation through the period, but nonetheless its contribution is relatively small. This result hasn't changed very much after 2008, which is an indicator of the limited importance of the automatic stabilisers in Romania.

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<sup>7</sup> We follow the methodology of the World Bank (2005). *Public Debt and Its Determinants in Market Access Countries*.



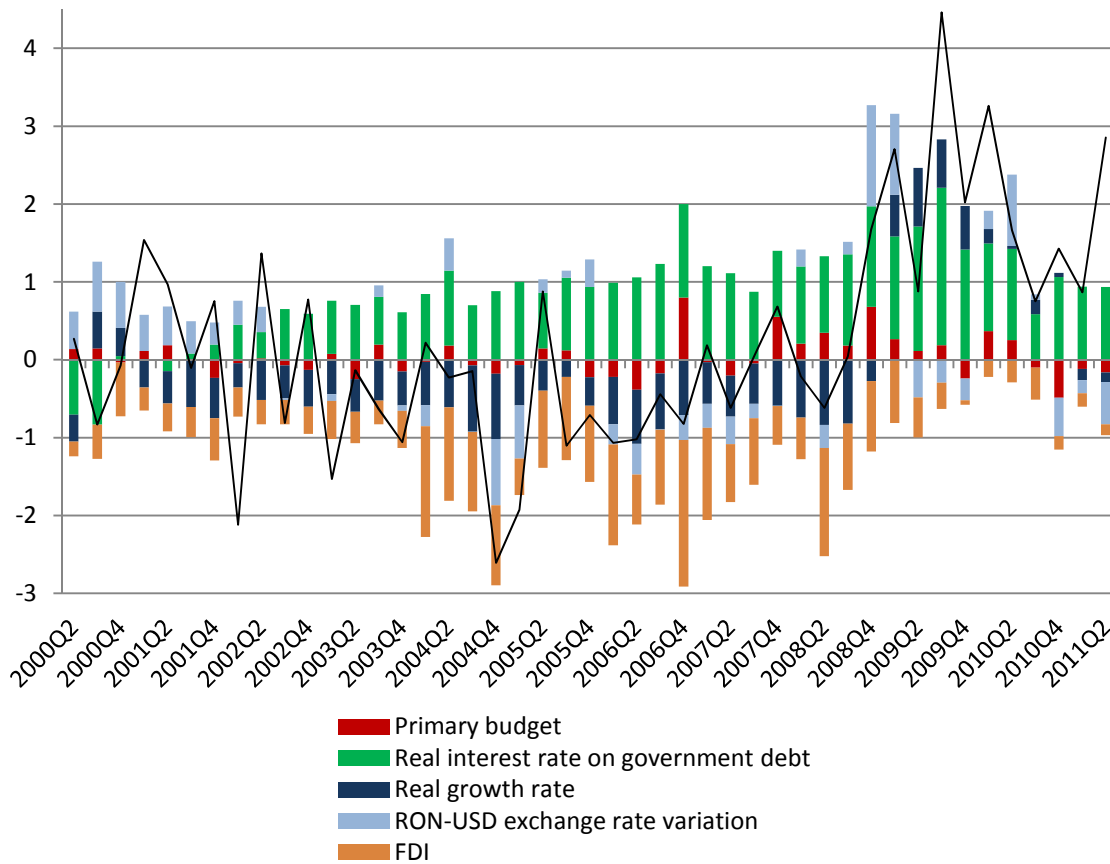
**Table 2. Estimation Results***(Dependent variable: quarterly change of the debt to GDP ratio)*

Variables	Model I Baseline		Model II Cyclical State of the Economy		Model III Crisis	
	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
$\beta_0$	0.509	0.256	1.127	0.486	0.094	0.098
$DEBT_{t-1}$	0.0003	0.008	0.029	0.601	-0.037	-1.032
$PSURPLUS_t$	-0.086*	-1.897	-	-	-	-
$U_t - \bar{U}_t$	-	-	-0.179	-0.470	-	-
$G_t - \bar{G}_t$	-	-	0.067*	1.844	0.003	0.124
$RIR_t$	0.183**	2.627	0.221***	3.270	-0.076	-1.031
$GDPGR_t$	-0.087**	-2.231	-0.096**	-2.003	0.087*	1.922
$EXCUSD_t$	2.719**	2.343	2.998***	2.823	4.575***	2.786
$EXCUSD_t$	-0.193	-0.197	-0.163	-0.147	-	-
$OPENC_t$	-0.374	-0.120	-2.118	-0.650	-	-
$FDI_t$	-0.133*	-1.751	-0.114	-1.492	-0.009	-0.184
$ELECT_t$	-0.381	-1.337	-0.421	-1.189	-	-
$ELECT1_t$	0.460	0.675	0.490	0.722	-	-
$ELECT2_t$	0.014	0.033	0.041	0.092	-	-
$ELECT3_t$	0.390	0.566	0.236	0.310	-	-
$DEBT_{t-1} \times CRISIS_t$	-	-	-	-	0.076***	3.055
$(U_t - \bar{U}_t) \times CRISIS_t$	-	-	-	-	-	-
$(G_t - \bar{G}_t) \times CRISIS_t$	-	-	-	-	0.254***	3.204
$RIR_t \times CRISIS_t$	-	-	-	-	0.432***	3.981
$GDPGR_t \times CRISIS_t$	-	-	-	-	-0.236***	-3.375
$EXCUSD_t \times CRISIS_t$	-	-	-	-	2.146	-0.618
$FDI_t \times CRISIS_t$	-	-	-	-	-0.509	-1.632
$R^2$	0.573		0.572		0.768	
DW	2.659		2.617		2.738	
F-statistic	3.237		2.879		5.803	

Note: \*\*\*, \*\*, and \* indicate significance at 1, 5 and 10 percent respectively (We used the Newey-West procedure to account for heteroscedasticity and autocorrelation)

Source: Author's calculations

**Figure 7. Determinants of Public Debt Dynamics**



*Source: Author's calculations*

(Note: Each column represents the contribution of each factor to quarterly change of the debt to GDP ratio. A positive value means that a given factor contributed to an increase of the debt to GDP ratio. A negative value means that a given factor contributed to a decrease of the debt to GDP ratio)

Then we replace the primary surplus to GDP ratio by the temporary government expenditures and the cyclical state of the economy (see Table 2, column II). Between the two considered determinants of primary surplus, only the temporary expenditures variable is significant implying deficit spending in periods of economic downturn. However, the non-significance of the cyclical unemployment variable indicates a limited ability of conducting counter-cyclical fiscal policy by the Romanian authorities.

Model III analyses whether there is a structural break in the relation between public debt growth and its determinants caused by the recent financial crisis. The results are in Table 2, column III. We consider only the significant variables included in Models I and II. We find that the coefficient of the lagged public debt to GDP ratio turns significant and positive after 2008, while it is negative, although not significant before 2007. This implies that after the financial crisis hit the world economy in the fall of 2007, the debt to GDP exhibits more persistence. We also find that temporary expenditures have a greater impact on the variation of public debt (we read the reaction of public debt after 2008 as the sum of the estimated coefficients of  $(G_t - \bar{G}_t)$  and  $(G_t - \bar{G}_t) \times CRISIS_t$ ). The increasing difficulty of accessing international financial markets and the increase of the interest rates are also reflected in greater reaction of public debt to the real interest rate on public debt after 2008 (we read the reaction of public debt after 2008 as the sum of the estimated coefficients of  $RIR_t$  and  $RIR_t \times CRISIS_t$ ). Finally, the impact of the growth rate of GDP also increased after 2008 (we read the reaction of public debt after 2008 as the sum of the estimated coefficients of  $GDPGR_t$  and  $GDPGR_t \times CRISIS_t$ ), which is especially negative since GDP fell sharply after this period.

## 5. Conclusions

The objective of our study was the analysis of the factors that determine the debt to GDP ratio in Romania. We found out that the primary fiscal balance, the real interest rate, the real GDP growth rate, and leu-dollar exchange rate variation are significant, while the leu-euro exchange rate is not. This result gives empirical support for the government intention<sup>8</sup> to increase the share of public debt expressed in domestic currency and to increase the euro denominated government debt share in total foreign currency government debt in order to limit the currency risk of the debt portfolio.

We also verify that the government has a limited ability of using fiscal policy as an automatic stabiliser on the basis on the non-significance of the coefficient of the

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<sup>8</sup> See Public Debt Management Strategy 2011-2013, Ministry of Public Finance – General Directorate for Treasury and Public Debt, p. 15.

variation of public debt on the cyclical unemployment rate, which is indeed common in emergent economies such as Romania.

Finally, we found an increasing reaction of the public debt to macroeconomic determinants such as the GDP growth rate after the financial crisis, which implies that restoring the conditions for growth and to reduce the interest rate risks are of fundamental importance to control the public debt.

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