

Fiscal sustainability based on reaction function: Case study Romania

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Abstract

This paper aims in investigating Romanian fiscal sustainability based on reaction function. Due to the fact that Romania experienced distorted negative interest rates, we considered inappropriate the use of classical tests. Therefore, it was estimated fiscal reaction function, mainly based on tax smoothing model. Our findings are consistent with the previous literature and reveal that Romanian fiscal stance reacts to high public debt by an increase of primary surplus with at least 0.02%. The reaction is not instantaneous, it is delayed by 1 or 2 lags, which it is considered as being acceptable, taking into account the quarterly data used.

JEL Classification: E62, H62, H63

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1. Introduction

Public finance sustainability has received much attention. Many authors have studied this topic among different countries by using different tools of investigation. The importance of such issue resides, at least in following. On one hand, assessing fiscal sustainability has much incidence on economic development. According to Gupta, Keen, Clements, Fletcher, de Mello, and Mani (2002), sustainable development is achieved within economic development, social development, and a protected environment, and due to their redistributive nature, fiscal policies have much incidence on economic growth and on human capital investments. Corsetti and Roubini (1991) revealed that if intertemporal budget constraint is not supported by empirical evidence, changes in policy or relevant macroeconomic variables, such as growth, inflation, interest rate will occur at some moment in the future. Moreover, Moraga and Vidal (2004) emphasized the impact of sustainable fiscal policies on economic growth, and the necessity of assessing intertemporal budget constraints in order to assure sustainability on long term. On the other hand, institutions as International Monetary Fund (IMF) or Organization of Economic Co-operation and Development (OECD) focused on fiscal sustainability issue, because, in the early '80s and afterward, most of the industrialized countries have confronted large public debt stocks that distorted economic activity. Therefore, they experienced many episodes of fiscal adjustments in order to limit their fiscal deficits. Moreover, member states of European Monetary Union (EMU) and European Union (EU) new comers face new challenges represented by public finance constraints imposed by Maastricht Treaty. Promoting consistent fiscal policies in order to maintain deficit within 3% of GDP and public debt within 60% of GDP constitutes a priority for each European government program.

There is a large amount of literature aiming in analyzing sustainability of fiscal policy. Most of the studies rely upon the seemingly work of Hamilton and Flavin (1986), Wilcox (1989), and Trehan and Walsh (1991). The starting point in analyzing fiscal sustainability consists in the existence of an intertemporal budgetary constraint, and, based on that assumption, the empirical investigation methodology is based on unit roots of public debt time series, and, on cointegration relationship between discounted budgetary revenues and expenditures.

This paper is structured as follows. Section 2 consists of general aspects of Romanian public finance within 1990-2006 and their influence on assessing fiscal sustainability. Section 3 presents the arithmetic of fiscal sustainability based on intertemporal budget constraint using real and ratio to GDP variables. Section 4 presents the main empirical findings of previous literature. Section 5 discusses the main difficulties confronting when testing sustainability of fiscal policy based on intertemporal budget constraint by using the Romania's case. Section 6 presents the methodology and database used in order to test the sustainability of Romanian fiscal policy by estimating fiscal reaction function based on quarterly data as ratio to GDP, spanned on 1991-2005. The last Section contains the main concluding remarks of this study.

2. Romanian Public Finance: General Aspects

A short description of Romanian public finance reveals a mixed record of influences due to historical background. A close attention has to be paid to the heritage of the communist system. The basic features which characterized the communist public finance were: (1) the lack of the boundaries between public policies and administration, (2) the unitary approach of all fiscal and budgetary matters. Due to these aspects, there was no clear separation of competences between the legislative and the administrative institutions of public finance. Such domination for almost half a century had significant incidence on public finance. As a result, the fall of communist regime went to a strong need for public finance reform. As a consequence, at the beginning of 1990 new legislative and institutional frames were enforced.

Starting 1990, fiscal policy entered a profound reform process, still developing, engaging organizational and competence changes, establishing mechanisms for taxation and budgetary revenues collection. The effective implementation of this reform was materialized in new laws regarding public finance and local autonomy. Moreover, this process still continues and aims in supporting macro-stabilization process by maintaining the budget deficit within a cautious level, improving tax collection, increasing budgetary revenues, program budgeting, controlling public expenditures, inflation targeting, keeping the current account deficit under control, etc.

For 16 years, Romanian public finance reform has been an undergoing process of many transformations from a central planned state to a democracy, governed by the rule of law, from a state-controlled economy to a free-market economy. Also, the accession to European Union, mainly, implies profound changes within many fields, including public finance. According to Romanian Government, the public finance reform process, under EU acceding criteria, has five main objectives: (1) reforming the basic public services and public utilities of local interest; (2) consolidation of fiscal and administrative decentralization process; (3) strengthening the institutional capacity of the structures within local and central public administration; (4) supporting the macro-stabilization process; (5) accelerating the internal efforts in order to reach as soon as possible the convergence with EU structures by accelerating the implementation of the measures stipulated within the *acquis communautaire*, the institutional integration which refers to the increase of our country's capacity to participate at the drafting and implementation of EU policies, and achieving the convergence with the European economic structure (see Romanian Government Program 1990-2006).

Though, there are large differences between official regulations and their effective enforcement. For instance, taking into consideration the first three objective of Romanian public finance reform process, previous mentioned, it is easy to show that there are still many steps to be made in order to achieve them. According to Câmpeanu (2006), the degree of fiscal autonomy of Romanian sub-national governments lies between 16.3% and 33.7% within 1995 -2004, which denotes a low level of financial autonomy, due to the fact that local authorities are strongly dependent on state budget transfers. Also, the author showed that even the degree of decentralization is below 100% for many of the public services. Only for education, the degree of decentralization is almost 70% in the last couple of years. Moreover, during 1990 – 2006 there were many cases in which Romanian public institutions showed their weakness. For example, in 2004, the percentage of bankrupt State owned companies or financial institutions' debts represented 1.6% of GDP. All those debts were taken by Ministry of Public Finance and incorporated into public debt, which means that the people has to pay for the debts of Romanian bankrupt corporations. Such a position of public institutions went to a free-rider behavior of many of the Romanian contributors. For instance, according to

Gueorguiev, Justice and Tieman (2004), during 2000 – 2003, the arrears to general government budget represented 3.5% of GDP in 2000, and 5.9% of GDP in 2003, and were placed on the second rank after those to the suppliers. These results could be evidence that contributors prefer to pay their financial obligations, first, to banks, then to other creditors, and then to state. As well, according to Romanian Government and Parliament regulations, some contributors (large State owned enterprises or others financial corporate) were allowed for the postponing of their dues to general government budget. Due to these aspects, tax collection level lies under 70%, and in some cases is almost 50%. Moreover, privatization revenues were not used properly, according to general recommendation (see, Boskin, 1982 for further details), in order to finance capital expenditures, but to finance public debt and fiscal deficit.

All those previous aspects are an illustration of situations where Romanian public institutions have proven their weakness, where public decision making process was strongly influenced by some interest groups, and, as a consequence, public finance reform process was slow down, and they were reflected in negative economic growth, high inflation rate and fiscal policy stance over the period 1990-2005. These issues also distort Romanian fiscal policy, and even if public deficit is low and public debt has reasonable levels, fiscal sustainability could be affected by the lack of consistency of the public finance policies promoted by Romanian government.

3. The arithmetic of fiscal sustainability

Defining fiscal sustainability is not an easy task. Metaphorically speaking, sustainability of fiscal policies means “a good management” of financial resources within public budget. Blanchard (1990), and Blanchard, Chouraqui, Hageman, and Sartor (1990) considered that fiscal policy is sustainable when (i) public debt does not explode, nor governments are forced to increase taxes, decrease spending, monetize fiscal deficit or repudiate public debt, or (ii) public debt, as ratio of GDP, converges to its initial level. Moreover, based on intertemporal budget constraint, Horne (1991) stated that fiscal policies are sustainable when government can run the same set of public finance policies for undetermined time.

The arithmetic of fiscal sustainability presented in previous studies (see for instance, Blanchard, 1990; Blanchard, Chouraqi, Hageman, and Sartor, 1990; Gramlich, 1990; Horne, 1991; Buiter, 1995 among a long list of studies) starts with the government budgetary constraint (see equation 1):

$$B_t = G_t - R_t + B_{t-1} + i \cdot B_{t-1} = G_t - R_t + (1+i) \cdot B_{t-1} \quad (1)$$

where:

B_t = total amount of real public debt at the moment t ;

G_t = non-interest real government expenditures (including transfers and capital expenditures) at the moment t ;

R_t = real government revenues (including non-taxes and privatization revenues) at the moment t ;

i = real interest rate for government borrowings.

According to equation (1), the total amount of public debt at a moment depends on the current primary deficit and on the public debt accumulated from the past, including interest payments on government borrowings.

Taking into account the expectations at moment t on equation (1), the intertemporal budget constraint (IBC) is represented by the following relationship:

$$B_t = -E_t \sum_{k=0}^{\infty} (1+i)^{-(1+k)} (G_{t+k} - R_{t+k}) + \lim_{k \rightarrow \infty} E_t (1+i)^{-(1+k)} B_{t+k+1} \quad (2)$$

Intertemporal budget constraint states that the public debt stock equals the discounted present value of expected primary deficit plus the limit value of discounted public debt at a terminal future moment. The fiscal policy is said to be sustainable if the present discounted value of terminal public debt converges to zero, according to (3):

$$\lim_{k \rightarrow \infty} E_t (1+i)^{-(1+k)} B_{t+k+1} = 0 \quad (3)$$

In a growing economy with growing government spending and tax base, budgetary equations (1) and (2) could be expressed by taking into consideration the real

growth rate of GDP, and the variables denoted by small letters, as ratio to GDP. As a result, we obtain the government budgetary constraint (4), as ratio to GDP:

$$b_t = g_t - r_t + \frac{1+i}{1+y} \cdot b_{t-1} \quad (4)$$

And, considering the expectations at moment t in equation (4), the IBC becomes:

$$b_t = -E_t \sum_{k=0}^{\infty} \left(\frac{1+i}{1+y} \right)^{-(1+k)} (g_{t+k} - r_{t+k}) + \lim_{k \rightarrow \infty} E_t \left(\frac{1+i}{1+y} \right)^{-(1+k)} b_{t+k+1} \quad (5)$$

Consequently, fiscal policy is sustainable if:

$$\lim_{k \rightarrow \infty} E_t \left(\frac{1+i}{1+y} \right)^{-(1+k)} b_{t+k+1} = 0 \quad (6)$$

A good starting point in assessing fiscal sustainability is to check for government solvency based on IBC. According to various authors, solvency is a necessary but not sufficient condition for fiscal sustainability (see for instance, Horne, 1991). Consequently, solvency requires that the debt be fully repaid at some point in the future, and sustainability requires that solvency is achieved under unchanged fiscal policy (Croce and Juan-Ramon, 2003).

Theoretically speaking, IBC represents a criterion based on which governments could choose from different public finance policies that set which proves to be sustainable in the future. But the major issue is that given a fiscal policy are the governments able to predict which would be the amount of budgetary expenditures and revenues or the real interest rate for future borrowings over a period of 20-30 years as to apply IBC in order to investigate the sustainability or to identify the moments of readjustments of that current fiscal policy? There are, for instance, studies (Corsetti and Roubini, 1996; Alesina, 2000; Kotlikoff and Hagist, 2005), which predict that current budgetary policies of most OECD countries based on growing social spending will

become unsustainable in the future. For example, Kotlikoff and Hagist (2005) pointed out that public expenditures on health rose within 1970-2002 more than GDP growth rate, due to larger health benefits, and if this situation maintains over the next four decades, then many countries, including United States, Germany or Japan, will confront large fiscal deficits. Based on the findings above, governments would have to adjust current public finance policies as to avoid future distortions. But, in most of cases, as Blanchard (1990) and Horne (1991) emphasized, inter-temporal budget constraint could be fulfilled ex-post by taking active measures of fiscal adjustments (increasing taxation or decreasing expenditures) or by monetization or repudiation. Therefore, in most of the papers aiming in studying sustainability of fiscal policies, empirical tests were run on historical data.

4. Empirical evidence on fiscal sustainability: a short history

The main stream of literature referring to testing fiscal sustainability relies upon the work of Hamilton and Flavin (1986), Wilcox (1989), and Trehan and Walsh (1991). Mostly, there are two methodological approaches on investigating fiscal sustainability: (i) first approach is based on the unit root hypothesis, testing if the discounted present value of public debt is stationary; (ii) the second approach starts from IBC and tests if there is any cointegration relationship between budgetary revenues and expenditures on long run.

In that sense, Corsetti and Roubini (1991) analyzed the evidence for intertemporal budget constraint for OECD countries, within 1960-1989 periods, based on stationarity tests and found sustainability problems in the case of Belgium, Netherlands, Greece and Ireland, which experienced large public debt to GDP ratio. Greiner and Semmler (1999) analyzed fiscal policy sustainability in Germany, using annual data within 1955-1994 and revealed the violation of the intertemporal budget constraint, due to large budget deficits in the period after 1989. Afonso (2000), using unit root tests for the stock of public debt and co-integration tests between public expenditures and revenues, within 1968-1997, found that fiscal policy is not sustainable for most EU countries, excepting Germany, Austria and Netherlands. Martin (2000) studied US fiscal deficit sustainability based on intertemporal budget constraint under structural shifts in fiscal policy and by using a cointegration model with multiple endogenous structural breaks. The results of his study showed that US budget deficit is sustainable during 1947-1992, with three breaks,

endogenously determined in the first quarters of 1975, 1985, and 1987. Uctum and Wickens (2000) conducted classical unit roots tests for discounted and undiscounted debt value and found that, generally, null hypothesis can not be rejected, only in the case of Netherlands and Denmark. Cunado, Gil Alana and Perez de Gracia (2002) found evidence for fiscal sustainability for US, but, also, revealed the fact that budgetary revenues and expenditures are cointegrated of an order between 0 and 1, meaning that sustainability is achieved based on slow fiscal adjustments on long run. Chortareas, Kapetanios și Merih (2003) analyzed public finance sustainability for a set of Latin American countries based on public debt stationarity tests, but allowing for non-linear process in order to correctly capture the adjustment-to-equilibrium process and not to underestimate the sustainability of public debt. Based on the same approach, Ricciuti (2003) found that fiscal policy is sustainable in Italy, due to the fact that public expenditures and taxes have a stationary non-linear trend and due to long run equilibrium relationship during 1861-1998. Jha and Anurag (2004) revealed that taking into account structural breaks for unit root tests, fiscal policy, in case of India, proved to be sustainable despite the results of previous studies, which run classical test but in an inappropriate manner. Marinheiro (2005), using unit root and cointegration tests, during 1903-2003, found evidence for Portuguese fiscal policy sustainability for the entire sample, but, the overall conclusion of sustainability is not maintained for 1975-2002 periods, due to large debt-to-GDP ratios. Kirchgaessner and Prohl (2006) performed unit root and cointegration tests for budgetary revenues and expenditures within 1900-2002, considering a structural break for World War II, and found evidence for sustainability of Swiss fiscal policy within this period. Uctum, Thurston and Uctum (2006), testing sustainability for G7 countries and some Latin American countries, during 1970-2002, found that classical stationarity tests are very sensitive to structural breaks, and, therefore, the results could be misleading.

Also, there are studies (see for instance, Bohn, 1998; Bohn, 2005; Bohn, 2006), which express their doubts on the relevance of classical empirical tests. In his 1998 paper, Bohn considered that it is very difficult to reject a unit root in real debt or in debt to GDP ratio, and, due to that issue, the declining US debt seems to be the result of luck. Based on Bohn's methodology, Greiner, Koeller and Semmler (2005) reassessed Greiner and

Semmler (1999) work and found that primary surplus reacts positively to higher debt ratio, implying a sustainable debt path. Furthermore, Bohn (2006) showed that IBC could be satisfied even if budgetary revenues and expenditures are not cointegrated, or debt, or primary deficit are not difference-stationary. On the other hand, Cuddington (1997) emphasized that unit root and cointegration – based test for sustainability should employ a long time series, which, in the case of less developed countries are not available or contaminated by structural breaks.

Alternative ways of analyzing fiscal sustainability, as, for instance, *accounting approach* (Cuddington, 1997), take into consideration the possibility of calculating some indicators of sustainability. In that sense, Blanchard (1990) proposed a set of three indicators for different time horizons, based on expectations over medium or long term. In their 1990 paper, Blanchard, Chouraqui, Hagemann and Sartor calculated these indicators for OECD countries, based on historical data between 1983-1989 and found dramatic turnarounds in fiscal policies for most of these countries. The authors, also, emphasized that in order to achieve fiscal sustainability, fiscal policy must be forward-looking, and must take into account the effects of different budgetary items (e.g. social spending), which could indicate latent sustainability problems on long run. Related to the indicators of fiscal sustainability proposed by Blanchard, Chalk and Hemming (2000) considered that in the case of high indebted countries, testing the sustainability by using these indicators must be made under a prudent approach. Croce and Juan-Ramon (2003) investigated fiscal sustainability for 12 developed and developing countries by using an indicator calculated based on the law of motion of the debt. The authors grouped these countries into three clusters depending on their degree of fiscal sustainability. Alvarado, Izquierdo and Panizza (2004) considered that sustainability indicators proposed by the main literature stream present many caveats, such as the assumption that GDP growth rate, interest rate, and primary gap are exogenous and not correlated. Moreover, the authors emphasized that these indicators do not take into account factors which characterize the situation in most of emerging and developing countries. Recently, Polito and Wickens (2005) proposed an index of sustainability calculated as ratio of present value of debt, derived from a simple VAR forecasting model of the economy, to the existing level of debt. The authors found that for US and UK sustainability index

fluctuated considerably, and in the case of Germany, unification and European Monetary Union joining, sharply deteriorated its fiscal sustainability.

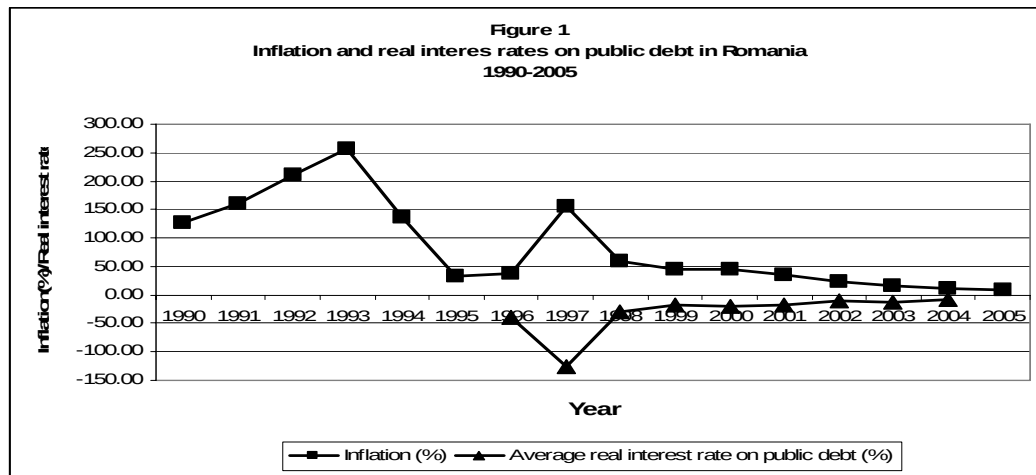
5. Some difficulties in applying intertemporal budget constraint on Romania' case

Testing fiscal sustainability for Romanian case based on intertemporal budget constraint, and taking into account historical data, requires certain aspects to be discussed, mainly related to the discount rate. The main literature stream makes the assumption that for equation (2) and (5), that both real interest rate and real growth rate, are positive and constant on long run. For instance, Hamilton and Flavin (1986) investigated fiscal sustainability of US by using a constant average real interest rate, while Wilcox (1989) proposed variable interest rates. Moreover, in Wilcox's paper, he allowed negative rates of discount and, therefore he obtained, for 1980, a discount factor larger than 1. But, negative discount rates were not very large and there were only for few years. Further, Trehan and Walsh (1991) stated that in the case of no constant interest rate, sustainability no longer implies cointegration between debt and primary balance, and also, integration order could be different for both variables. Besides, they emphasized that IBC holds as long as there are positive real interest rates.

Allowing for negative real interest rates on long run could be misleading from different point of views: (i) assuming negative interest rates, less than 100%, primary deficit, and terminal debt value converging to zero, implies large discount factor, which, in the sense of intertemporal budget constraint, means that government should borrow considerable amounts to cover the expected primary deficit; (ii) assuming negative interest rates, at least one case when it is larger than 100%, and terminal debt value converging to zero, depends on government's ability to reach primary surplus or primary deficit. Taking into account equation (2), if the government is able to reach primary surplus, meaning that the expected discounted primary balance has a positive sign, then government will become a creditor. If the government fails in assessing primary surplus, then the situation is the same as in the previous case (i). In order to illustrate the issues discussed above, we shall use Romania's case, which is a good example in that sense.

Excepting the years from the beginning of the analyzed period, Romania did not experience many episodes of high inflation, larger than 100% (see Figure 1). National

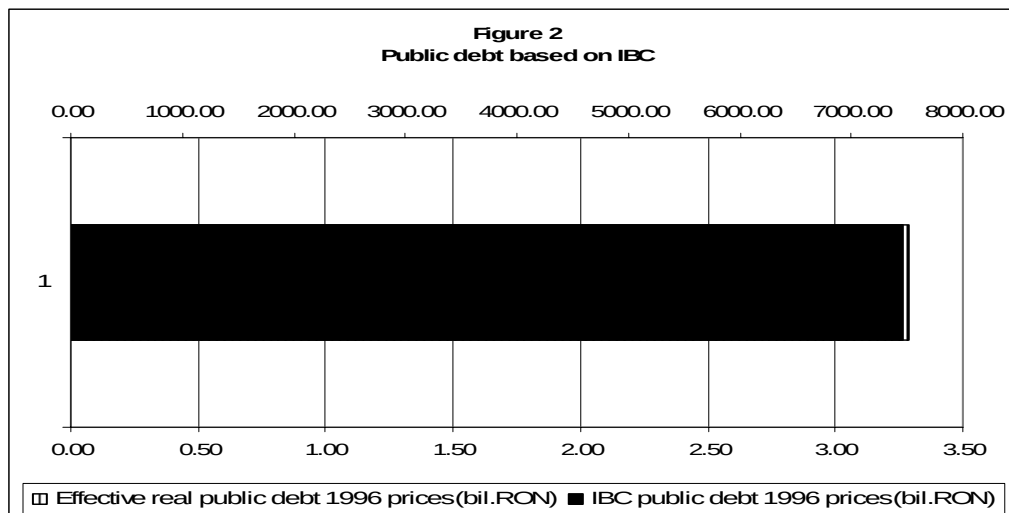
Bank of Romania (NBR) policy to keep inflation down went to a two digits rate in six years, and, after 16 years, inflation is less than 10% and still falling. The real interest rate on public debt calculated by IMF starting 1996 reveals negative rates until 2004. Moreover, in 1997, due to high inflation, real interest rate became negative and larger than 100% (see Figure 1).



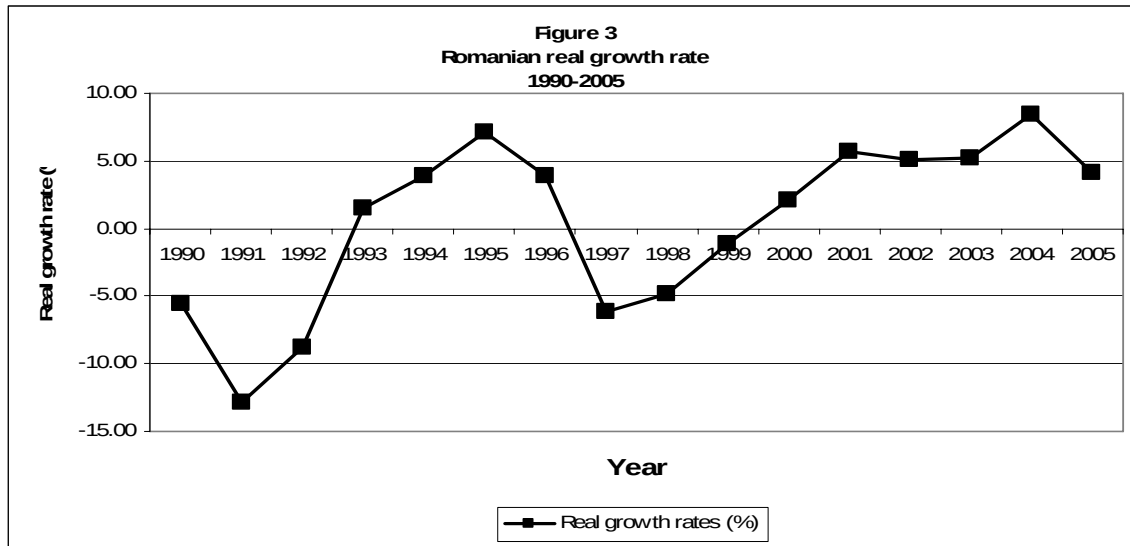
Data source: IMF

For 1990-1995 period there is no available data on real interest rates on Romanian public debt. According to IMF methodology, real interest rate on public debt is calculated as nominal interest rate minus change in GDP deflator, and nominal interest rate on public debt is derived as nominal interest expenditure divided by previous period debt stock.

Computing the discounted value of real primary balance (deficit/surplus) by using negative real interest rates and based on historical data spanned on 1996-2004, according to equation (2) and assuming that terminal discounted value of public debt is zero, the expected value of public debt in 1996 would had been around 7 457 billions RON (Romanian New Leu), much more than 1996 GDP, exceeding the effective level of that year by almost 7 455 billions RON, and GDP by more than 6 000 times (see Figure 2).



In the case of equation (5), when taking into consideration as discount rate, the real interest rate, as well as the real growth rate, IBC could be more relevant for fiscal sustainability, even if interest rates are negative. The distortions generated by large negative interest rates could be partially restored by positive growth rates. But, there could be some cases, when even real growth rates are negative. In Romania's case, for instance, between 1990 and 2005, there were 6 years when economy was decreasing (see Figure 3). Even so, the discounted value of primary balance in 1996 prices is about 4.5% of GDP, which, under zero terminal value of debt hypothesis, means that the debt to GDP ratio in that year, would have been around 4.5% of GDP.



Data source: IMF

For 1996, 1997, 1998, when real growth rates were negative, real interest rates were, also negative.

From intertemporal budget constraint viewpoint, if Romania had to run sustainable fiscal policy over 1996-2004 under negative real interest rates and growth rates expectations and expecting primary surplus in most over years from that period, then government would have borrowed only 4.5% of GDP in 1996 and not 30%, which it was the effective debt to GDP ratio at that moment. Consequently, comparing the effective debt ratio and the ratio implied by IBC, the conclusion is that over this period Romanian fiscal policy was not sustainable, and the assumption that the discounted value of terminal debt is zero has proven to be false. But, under normal circumstances, could it be possible for one government to have such small debt to GDP ratio? The possibility always exists, but not on long run. Romania, for instance, has no debt at all in 1990, but the necessity for government borrowings imposed by transition process increased constantly over the next years. Moreover, in the context of welfare state it is very difficult to attain such low debt to GDP ratio. Most of OECD countries and current EU members have confronted major difficulties in reducing public debt over the years, and yet, this problem is not entirely solved. Therefore, even this scenario could be possible it is unlikely to be realistic, too.

Taking into consideration the two situations presented above within this section, it is clear now that allowing for negative interest and growth rates could distort the results. Much more, if the rates are large enough or even higher than 100%, the findings are

hilarious, like in the case of debt ratio which outsized GDP by more than 6 000 times. The question referring which is most appropriate discount rate to be used when applying IBC still remains. Like in any case of net present value of an investment the recommendation not to use large or small discount rates which could alter the investment decision is valid in the case of intertemporal budgetary constraint. IMF, for instance considers that NPV is sensitive to the level of the discount rate and can be difficult to interpret when discount rates change with market conditions, and, therefore, it proposes that the appropriate discount rate should ideally capture the long-term return on risk-free assets. This could be useful when applying IBC on estimated data on long run, but on historical data may be misleading, if there were high inflation.

6. Testing Romanian sustainability by estimating fiscal reaction function

Taking into consideration the difficulties confronting when testing sustainability of Romanian fiscal policy based on intertemporal budget constraint, we shall proceed on investigating fiscal sustainability by estimating fiscal reaction function. This methodology has become used to a large extent in those cases when classical tests (e.g. unit root test) fail due to some issues affecting time series (structural breaks, lack of data etc.).

The fiscal reaction function can be estimated by regressing primary balance on the public debt, while controlling for other determinants of fiscal stance (see equation 7):

$$p_t = \alpha + \beta \cdot b_t + \delta \cdot Z_t + \varepsilon_t \quad (7)$$

where:

p_t = primary balance (surplus/deficit) as ratio to GDP at moment t ;

b_t = public debt as ratio to GDP at moment t ;

Z_t = set for control variables at moment t ;

Most of the studies analyzing sustainability based on fiscal reaction function rely upon Barro's work (1979) on tax smoothing model which implies that the determinants (Z_t) of fiscal stance could be business cycles ($YVAR$) and temporary government spending ($GVAR$), but also, there are taken into account several others explanatory variables. In that sense, Bohn (2005) uses squared debt and time trend in order to improve the main model expressed in equation above. De Mello (2005) estimates equation (7) by making

use of lagged primary balance, indebtedness and inflation and also allowing for institutional variables which took into account the impact of different acts of law within fiscal field. Greiner, Koeller and Semmler (2005), besides *YVAR* as explanatory variable for primary balance work with social surplus ratio, long term interest rate and lagged debt to GDP ratio. Kirchgaessner and Prohl (2006) added to the main model as explanatory variables the expected inflation and temporary fluctuations of government military expenditures.

In the case of Romania, we shall estimate equation (7), based on quarterly data as ratio to GDP, spanned on 1991-2005 and by using OLS. It is recommended to use variables as ratio to GDP for relative long sample that is more relevant because it reflects the capacity of the economy's output to bear the debt burden. The results are presented in the table below:

Fiscal reaction function		
1991-2005		
Dependent variable: primary balance (surplus/deficit)		
Explanatory variables*	Main model (1)	Main model (2)
	58 obs.	58 obs.
Debt (-1)		0.03 (0.00) [3.86]
Debt (-2)	0.02 (0.01) [2.33]	
YVAR	0.07 (0.02) [3.48]	0.06 (0.01) [3.04]
Primary (-2)	0.48 (0.08) [5.67]	0.54 (0.08) [6.32]
Intercept	-9.98 (2.71) [-3.68]	-9.19 (2.450) [-3.74]
R-squared	0.46	0.49
F-stat	15.67	17.58
P-value	0.00	0.00
Breusch-Godfrey Serial Correlation Test (F-stat) 12 lags	0.41	0.57
ARCH LM Test (F-stat) 12 lags	0.50	0.30
Jarque-Bera	2.03	3.06

Source: data available from National Bank of Romania and Ministry of Public Finance

Standard errors in () and t-statistic in []

Newey-West HAC incorporated

Phillips-Perron unit root test (3 lags): Debt -3.80 YVAR -7.70 Primary -6.26

Critical values for PP: -3.54 (1%) -2.91 (5%) -2.59 (10%)

YVAR estimated by using Hodrick-Prescott filter based on GDP quarterly data January 1990 prices.

YVAR estimated as potential GDP to effective GDP ratio.

*We took into consideration more explanatory variables (inflation, variations of government consumption, variation of final consumption and of primary expenditures, elections) but their influence was not statistical significant.

According to the results presented in the table above, equation (7) has two alternatives which are different only by the number of lags for public debt. Both models reveal the fact that our estimations are consistent with previous literature. In that sense,

de Mello (2005) and Kirchgaessner and Prohl (2006) found that between indebtedness and primary balance exists a positive relationship by the same amount. In Romania's case, growing public debt by 1 percentage point goes to an increase of primary surplus by 0.02, respectively 0.03 percentage points. Moreover, using lagged debt ratios as explanatory variables means that fiscal stance does not react instantaneous to shocks on public debt, but with a delay of 1 or 2 lags. Generally, the theory states that the response of primary surplus on higher debt should be immediate, but there are authors who consider otherwise by reason of interest payments which occur at later moments (Greiner, Koeller and Semmler, 2005). In Romania's case, we believe that a delay of one or two quarters is acceptable. Consequently, based on our estimations Romanian fiscal policy reacts to high public debt, even if this reaction has some delays. According to literature main stream, this could, also, imply fiscal sustainability, but, we consider that in Romania's case this sustainability could be weak. The grounds on which we stand our affirmation regard the fact that when considering others explanatory variables for the main model, public debt had no longer statistical significance, meaning that primary balance mainly reacts to other factors excepting debt stock.

7. Concluding remarks

The issue of assessing fiscal sustainability was subject of numerous debates. The continuous concern regarding this topic is generated by the fact that public finance policy implies fiscal sustainability as an important goal. Many authors have studied this topic among different countries and by using different tools of investigation (unit root tests, cointegration test, sustainability indicators, fiscal reaction functions). Most of the studies relay upon the intertemporal budget constraint theory, which not allows for negative discount rates. In Romania's case, the government had to run sustainable fiscal policy over 1990-2005 under negative real interest rates and growth rates. Investigating the difficulties confronting when testing sustainability based on intertemporal budget constraint using real interest rate and growth rate, we found that over this period Romanian fiscal policy was not sustainable, and the assumption that the discounted value of terminal debt is zero has proven to be false. Moreover, applying intertemporal budget constraint in such case has led to distorted results, which let us to question the

appropriateness of using this method. Therefore, we proceed on testing sustainability of Romanian fiscal policy by estimating fiscal reaction function based on quarterly data as ratio to GDP, spanned on 1991-2005. Using lagged debt ratios as explanatory variables, we found that stance does not react instantaneous to shocks on public debt, but with a delay of 1 or 2 lags, which can be considered as being acceptable having in mind the quarterly data. The evidence of the estimations, also, reveals the Romanian fiscal sustainability is weak.

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