5. ESTIMATING THE CYCLICALLY ADJUSTED BUDGET BALANCE FOR THE ROMANIAN ECONOMY. A ROBUST APPROACH[1]

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Abstract

This paper provides estimates for the structural fiscal balance for the Romanian economy over the period 1998-2008. The calculation of the structural fiscal balance is useful, since it provides a clear picture of the fiscal stance of the economy and it is essential in the context of a medium term fiscal framework. In order to ensure the robustness of the estimation, we employed two methodologies for the computation of the elasticities of various categories of government revenues and expenditures with respect to the output gap. The two approaches issued similar results, the overall average budget sensitivity being equal to 0.285 and 0.290, respectively. The amplitude of the cyclical budget balance is around 1% of GDP. After constant improvement, the structural balance worsened in 2008, due mainly to the current crisis.

Keywords: fiscal policy, structural fiscal balance, cyclical budget balance, business cycle, tax elasticity

JEL Classification: E62, H30, H60

1. Introduction

Government revenues and expenditures are affected by the cyclical position of the economy, due to the effect of automatic stabilizers. Several components of

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government budget are influenced by the macroeconomic stance in ways that operate to smooth the business cycle, acting as automatic stabilizers. For example, in a recession fewer taxes are collected, which operates to support private incomes and dampens the adverse movements in aggregate demand. Conversely, during a boom more taxes are collected, counteracting the expansion in aggregate demand. This stabilizing property is stronger if the tax system is more progressive. Another automatic fiscal stabilizer is the unemployment benefit system: in a recession the growing payment of unemployment benefits supports demand and the other way around occurs in an upswing. If governments allow automatic an fiscal stabilizer to work fully in a recession but do to resist the temptation to spend cyclical revenue increases during an upswing, the stabilizers may lead to a bias toward weak underlying budget positions. The structural or cyclically adjusted budgetary balance is defined as the fiscal balance that would arise provided that output was at its potential level and, therefore, not reflecting the cyclical aspects in economic activity. Hagemann (1999) defines the structural fiscal balance as the residual balance after removing the balance of the estimated budgetary consequences of the business cycle. Therefore, the calculation of the structural fiscal balance is useful, as it provides a clearer picture of the underlying fiscal situation by subtracting from the impact of the business cycle. As a result, it can be used to guide fiscal policy analysis. One approach to examine the impact of discretionary fiscal policy over the cycle is to link the fiscal policy stance, generally measured as the change in the structural fiscal balance, to the cyclical conditions measured by the output gap. Econometric investigation covering the period from the mid-1990s to 2006 shows that the fiscal policy has been, on average, pro-cyclical in the Euro Area and in the EU (European Commission, 2006).

The importance of assessing the structural fiscal balance has increased after Romania entered the European Union. The structural fiscal balance does play a key role in the European Union surveillance procedures, especially in the Stability and Growth Pact. Although the condition of the Pact concerning the ratio of government deficit to GDP refers to the actual rather than the structural deficit, the cyclically adjusted budget balance is employed within the SGP framework to measure the stance of fiscal policy. Also, the structural balance is used by the European Commission in assessing whether the prevailing fiscal situation in individual countries is sufficient to comply with the requirements of the Stability and Growth Pact, whether it is strong enough to provide for a safety margin that the actual budget deficit does not exceed the threshold of 3% of GDP during a recession. On the other hand, the Euro Area and the ERM II member states need to specify a country-specific medium-term budgetary objective that should range between -1% of GDP and “in balance or surplus”, measured in cyclically adjusted terms, net of one-off effects and temporary measures.

Although several methodologies have been proposed (Giorno *et al*., 1995; Hagemann, 1999; van der Noord, 2000; Bouthevillain *et al*., 2001; Congressional Budget Office, 2004; Girouard and Andre, 2005), there is no generally accepted method of quantifying the part of the current budgetary balance that reflects short-term transitory influences caused by cyclical factors and the part due to structural measures taken by fiscal authorities. Generally, the measurement of the cyclically adjusted budget balance proceeds in three steps. The first step involves the estimation of the potential

GDP, of a reference path for the real GDP that could be obtained in the absence of cyclical fluctuations. The difference between the actual output level and estimated potential output provides a measure of the output gap. Budget revenues and expenditure are also sensitive not only to the output gap but to changes in the composition of aggregate demand (i.e. a composition effect). The measurement of the composition effect requires the existence of an equilibrium composition of aggregate demand. However, unlike potential output, there is no equivalent for the equilibrium structure of the aggregate demand. This issue argues for the usage of the output gap as benchmark for cyclical adjustment. The second step concerns the econometrical estimation of the elasticities of different budget revenues and expenditures with respect to the output gap. In the last step, the output gap and the government revenue and expenditure elasticities are combined to compute the level of government revenues and expenditures prevailing provided the output have followed the reference path. The structural fiscal position may also be affected by temporary shocks, not directly linked to the business cycles, including one-off fiscal measures, creative accounting, classification errors, etc. (Girouard and Price, 2004; Koen and van den Noord, 2005).

The potential GDP is unobservable and is sensitive to the method of estimation. Although a variety of methods exists for calculating the potential output, none of them is without shortcomings. For this reason, all output gap estimates and, hence, also the corresponding measures of the cyclically adjusted budget balances are subject to considerable uncertainty. Langedijk and Larch (2007) assessed the sensitivity of the EU fiscal framework to variations in the output gap estimates and concluded that the uncertainty surrounding output gap estimates is a serious issue, since it can give rise to an inappropriate policy response. Therefore, one should not rely on a single measure to compute the output gap. In this paper, we will employ the potential GDP estimates in Altãr, Necula and Bobeica (2009) that propose an eclectic approach, based on a battery of methods for assessing the amplitude of business cycles in the Romanian economy. The authors compute a potential GDP estimate using the Production Function methodology and a Consensus estimate weighting the results of various non-theoretical econometric methods based on the stability of these techniques. The authors point out that further aggregation of the two estimates into a single measure should be subject to expert judgment regarding the weights. In what follows, we employed an equal weighting scheme to come to a single estimate of potential GDP.

In the present study, we propose a robust approach for the estimation of the structural fiscal balance of the Romanian economy, by employing both quarterly and annual data. For quarterly data, we will employ a methodology similar to that of Giorno *et al.*, (1995) and van der Noord (2000). In order to check the robustness of the estimates, we will also use annual data and a methodology similar to that outlined in Girouard and Andre (2005). The main weakness of the cyclical adjustment method used in the EU fiscal surveillance framework is the assumption of constant tax elasticities (European Commission, 2006, 2007, 2008). Constant tax elasticities are an acceptable approximation in the short-term. However, after several years tax elasticities can depart quite substantially from their “normal values” (Wolswijk, 2007, European Commission, 2008). Therefore, in this paper we relax the assumption of fixed elasticities hypothesized in the OECD and European Commission methodologies and allow for varying tax elasticities along the business cycle.

The rest of the paper is organized in three sections. In the second and third sections we estimate the structural fiscal balance for the Romanian economy using quarterly and annual data, respectively. The final section concludes.

2. Estimating the Structural Budget Balance using Quarterly Data

In this section, we will employ quarterly data for the period 1998:Q1-2008:Q4. In order to estimate tax and expenditure elasticities, we will apply a methodology similar to that employed by the OECD and by the European Commission (Giorno *et al*., 1995; van den Noord, 2000). This approach involves the estimation of elasticities with respect to output for the various government revenue and expenditure categories. These elasticities, together with the estimated output gap, are then used to calculate the structural (i.e., not affected by cyclical conditions) tax revenues and expenditures. Every elasticity is decomposed in a number of components that can be estimated using the available data and specific econometric techniques. The OECD methodology computes for every government revenue and expenditure category a single elasticity for the whole period. Therefore, the estimated elasticities may be expected to reflect, at best, the average cyclical responsiveness of these revenue and expenditure items over a sample period. Actual quarter-to-quarter behavior may be more erratic as specific tax bases may react non-typically over the cycle. In this study, we will compute a different elasticity for each quarter in the data set.

The *cyclically adjusted budget balance (CAB)* is obtained by subtracting the cyclical component from the actual budget balance (*B*):

$$CAB_t = B_t - B_t^C = B_t - \sum_j B_{t\ j}^C \tag{1}$$

The *cyclical component* of each revenue or expenditure category ($B_{t\ j}^C$) is computed using the estimated output gap and the estimated output elasticity (α_j).

$$B_{t\ j}^C = B_{t\,j} \times \alpha_j \times output\_gap_t \tag{2}$$

We will describe next the techniques employed to compute each category of tax elasticity and expenditures elasticity, as well as the estimated cyclical component for each category of budgetary revenues and expenditures.

2.1 The Personal Income Tax Elasticity and Cyclical Component

In order to compute the personal income tax elasticity, this elasticity is decomposed as:

$$\alpha_{PIT} = \frac{\partial PIT}{\partial Y} \cdot \frac{Y}{PIT} = \frac{\partial[(PIT/L) \cdot L]}{\partial Y} \cdot \frac{Y}{T} = \left(\frac{\partial L}{\partial Y} \cdot \frac{Y}{L}\right) \cdot \left[1 + \left(\frac{\partial(PIT/L)}{\partial w} \cdot \frac{w}{PIT/L}\right) \cdot \left(\frac{\partial w}{\partial L} \cdot \frac{L}{w}\right)\right] \tag{3}$$

consisting of several auxiliary elasticities:

- the output elasticity of employment: $\left(\frac{\partial L}{\partial Y}\cdot\frac{Y}{L}\right)$
- the employment elasticity of wages: $\left(\frac{\partial w}{\partial L}\cdot\frac{L}{w}\right)$
- wage elasticity of the personal income tax: $\left(\frac{\partial(PIT/L)}{\partial w}\cdot\frac{w}{PIT/L}\right)$

where: Y is the GDP, PIT is the personal income tax proceeds, L is the employment and w is the average wage rate.

2.1.1 The Potential Employment

In order to compute the output elasticity of employment, a measure of the potential employment level (L^*) has to be estimated. Following the methodology outlined in Denis *et al*. (2006), we define the potential output contribution of labor as the level of employment consistent with stable, non accelerating (wage) inflation rate of unemployment (*NAIRU*). Therefore, the potential employment is given by:

$$L^* = L_S^* \cdot (1 - NAIRU) \qquad (4)$$

where: *NAIRU* is an estimate of the non-accelerating inflation rate of unemployment and L_S^* is the trend labor supply, quantified using a Hodrick-Prescott filter.

The approaches broadly adopted in the definition and modeling of *NAIRU* either distinguish between a series of labor market variables as being potential empirical determinants of the *NAIRU*, either employ a number of statistical methods in which the time series properties of the macroeconomic variables in question are used to identify the *NAIRU*. Since it allows a better economic interpretation of the results, we choose to follow the structural approach of Denis *et al.* (2006).

The *NAIRU* for the Romanian economy was estimated within a bivariate model including a Phillips curve to identify the cyclical component. The unemployment rate (U_t) is the sum between the unemployment gap (C_t) and a trend component (T_t):

$$U_t = T_t + C_t \qquad (5a)$$

The Phillips curve links the change in wage inflation $(\Delta\pi_t^w)$ to the unemployment gap:

$$\Delta\pi_t^w = \mu + \beta C_t + u_t \qquad (5b)$$

the error term u_t having a MA(1) structure:

$$u_t = \theta_0\varepsilon_t + \theta_1\varepsilon_{t-1} \qquad (5c)$$

It is assumed that the cyclical component of unemployment is an AR(2) stationary process with zero sample mean, and is characterized by the following equation:

$$C_t = \phi_1 C_{t-1} + \phi_2 C_{t-2} + \upsilon_t \qquad (5d)$$

where the stationary condition requires that $\phi_1 + \phi_2 < 1$.

The trend component is modeled as a random walk with drift:

$$T_t = \mu_t + T_{t-1} + z_t \tag{5e}$$

and the drift term itself is allowed to follow a random walk

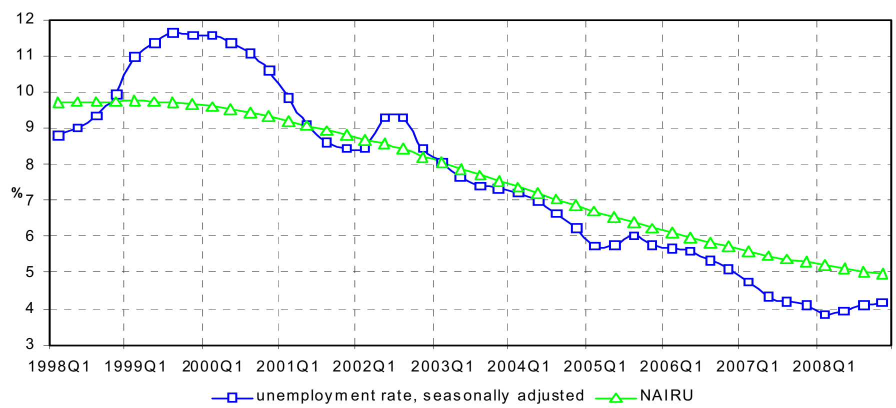
$$\mu_t = \mu_{t-1} + a_t \tag{5f}$$

where: ε, υ, z and a are i.i.d. shocks.

The equations described above are estimated on quarterly data over the period 1998:Q1 to 2008:Q4 using the Maximum Likelihood Estimator of a bivariate Kalman filter model. Figure 1 depicts the *NAIRU* estimate and the actual unemployment.

Figure 1

Actual unemployment and NAIRU



Source: *NIS, authors' calculations.*

The structural unemployment had a clear descending trend over the analyzed period. In Romania there are two series for the unemployment rate, reflecting different methodologies: the ILO (International Labor Office) unemployment rate, and the registered unemployment rate. Since in this paper the NAIRU is mainly used to compute the elasticity of the current expenditure, the registered unemployment rate was employed, because it reflects the actual number of people entitled to receive unemployment benefits.

2.1.2 The Output Elasticity of Employment

The output elasticity of employment can be computed as the estimate of the coefficient a_1 in the regression equation:

$$\log\left(L/L^*\right) = a_0 + a_1 \log\left(Y/Y^*\right) \tag{6}$$

where: L, L^*, Y and Y^* are the actual and potential employment and output, respectively.

In the case of Romania for the analyzed period the estimated output elasticity of employment was equal to 0.3753.

2.1.3 The Employment Elasticity of Wages

The employment elasticity of wages ο can be computed as the estimate of the coefficient b_1 in the regression:

$$\log\left(wL^*/Y^*\right) = b_0 + b_1 \log\left(L/L^*\right) \tag{7}$$

where: w is the average real wage, L^* is the potential employment, and Y^* is the potential GDP.

In the case of Romania for the analyzed period several econometric tests could not reject the null hypothesis that the coefficient b_1 equals 1.

2.1.4 The Wage Elasticity of the Personal Income Tax

In order to estimate the wage elasticity of the personal income tax, following the OECD and European Commission methodology, we consider a *representative household* consisting of a full-time male worker, a working spouse and two children. Since the average gross wage of a female was, over the analyzed period, 85% of the average gross wage of a male, we considered that in the representative family the secondary earner had a wage income equal to 85% of that of the principal earner. The OECD methodology employs a parametric log-normal distribution to assess the variation in wage income across households. To better account the large proportion of individuals in Romania earning the minimum wage we followed a slightly different approach. For each year, in the sample a *location-shifted log-normal income distribution function* was estimated. The estimation of the location-shifted log-normal distribution function was performed based on three inputs:

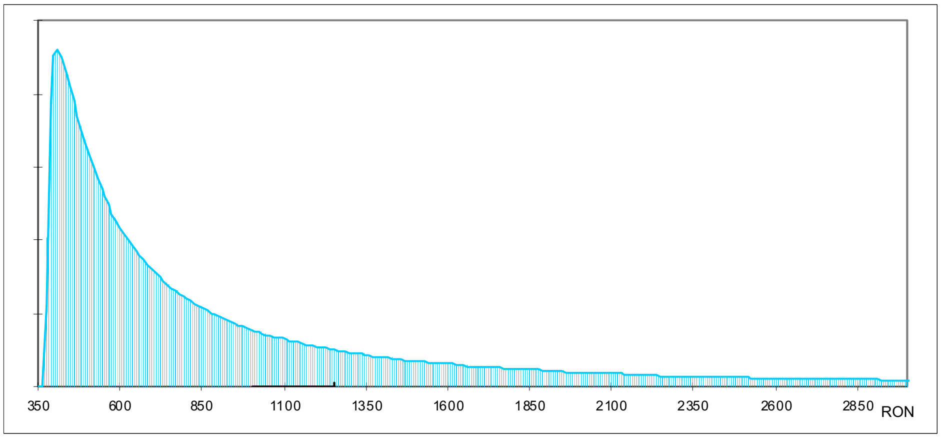
- the minimum wage level for each period;
- the average gross wage for each period;
- the 90-th percentile of the actual distribution.

Figure 2 depicts the estimated location-shifted log-normal distribution of the actual wage distribution in 2006, the last year in the sample that we had available data regarding income distribution.

Computing the wage income elasticity consists in calculating the marginal and average personal income tax rates of the representative household at various points on the distribution of gross earnings and then weighting them with the frequency of the "first-moment" distribution of the estimated location-shifted log-normal income distribution:

Figure 2

The estimated income distribution in 2006



Source: *Authors' calculations.*

$$e = \frac{\sum_i \gamma_i \frac{dPIT_i}{dw_i}}{\sum_i \gamma_i \frac{PIT_i}{w_i}} \tag{8}$$

where: e - the wage income elasticity of income taxes;

γ_i - the weight of earnings-level i in total earnings according to the first-moment distribution;

PIT_i - personal income tax payments per household at income level i;

w_i - wage income per household at earnings level i;

$\frac{dPIT_i}{dw_i}$ - the marginal income tax rate at point i on the income distribution;

$\frac{PIT_i}{w_i}$ - the average income tax rate at point i on the income distribution.

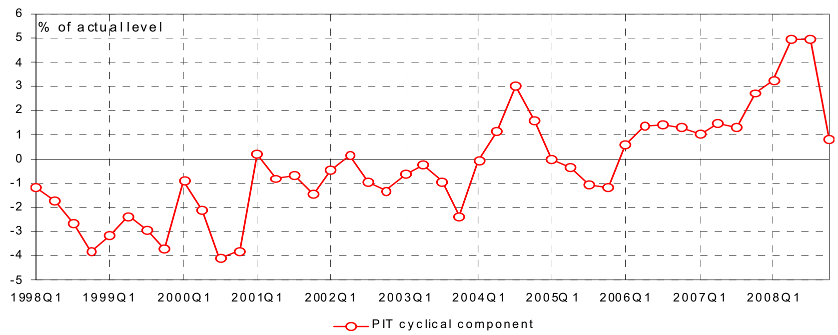
In the Romanian case, the wage elasticity of the personal income tax varied between 1.57 and 2.09. After the flat rate regime was introduced, it was a significant reduction in the wage income elasticity, although it remained above 1, due to the existence of personal deductions (Table A.1 in the Appendix).

2.1.5 The Cyclical Component of Personal Tax Income Revenues

The estimates of the Personal Income Tax output elasticity for the period 1998:Q1-2008:Q4 are presented in Table A.2 in Appendix. The estimated average elasticity over the entire sample is 1.034. The OECD cross-country average estimate is 1.03 with a standard deviation of 0.4 (van den Noord, 2000).

Figure 3

The Personal Income Tax cyclical component



Source: Authors' calculations.

Figure 3 depicts the cyclical component of the personal income taxes. In the analyzed period, the amplitude of the cyclical component was around 5% of the actual level.

2.2 The Social Security Contribution Elasticity and Cyclical Component

In order to compute the social security contribution elasticity, this elasticity is decomposed as:

$$\alpha_{SSC} = \frac{\partial SSC}{\partial Y}\cdot\frac{Y}{T} = \frac{\partial[(SSC/L)\cdot L]}{\partial Y}\cdot\frac{Y}{T} = \left(\frac{\partial L}{\partial Y}\cdot\frac{Y}{L}\right)\cdot\left[1+\left(\frac{\partial(SSC/L)}{\partial w}\times\frac{w}{SSC/L}\right)\cdot\left(\frac{\partial w}{\partial L}\cdot\frac{L}{w}\right)\right] \quad (9)$$

consisting of several auxiliary elasticities:

- the output elasticity of employment: $\left(\frac{\partial L}{\partial Y}\cdot\frac{Y}{L}\right)$
- the employment elasticity of wages: $\left(\frac{\partial w}{\partial L}\cdot\frac{L}{w}\right)$
- wage elasticity of the social security contribution: $\left(\frac{\partial(SSC/L)}{\partial w}\cdot\frac{w}{SSC/L}\right)$

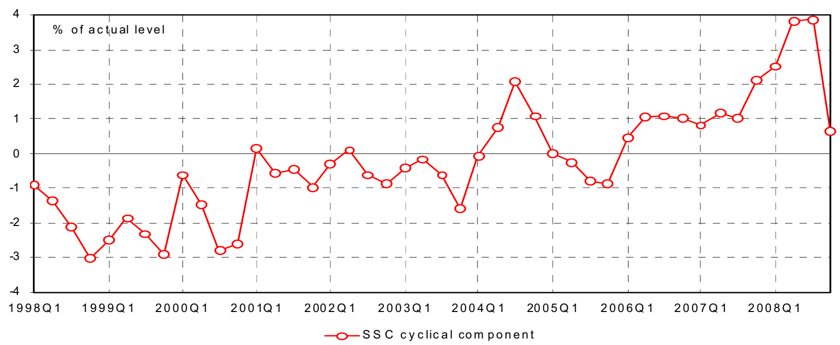
where: Y is the output, SSC is the social security contribution proceeds, L is the employment and w is the average wage.

The output elasticity of employment and the employment elasticity of real wages have already been estimated in the previous subsection. The wage elasticity of social security contributions calculated is based on the same methodology as the one used for the wage elasticity of personal income tax. Taking into consideration the fact that the contribution rate is flat and there are no deductions, the wage elasticity of social security contributions is constant and equal to 1 for the entire 1998-2006 period.

The estimates of the Social Security Contribution output elasticity for the period 1998:Q1-2008:Q4 are presented in Table A.2 in the Appendix. The estimated average elasticity over the entire sample is 0.751. The OECD cross-country average estimate is 0.81 with a standard deviation of 0.22 (van den Noord, 2000).

Figure 4

The Social Security Contribution cyclical component



Source: *Authors' calculations.*

Figure 4 depicts the cyclical component of social security contributions. In the analyzed period the amplitude of this cyclical component was around 4% of the actual level, the social security contributions being the least sensitive revenue component with respect to the output gap.

2.3 The Corporate Income Tax Elasticity and Cyclical Component

In the OECD methodology it is assumed that Corporate Income Tax elasticity is equal to the elasticity of the tax base (Corporate Income) with respect to output. The elasticity is decomposed into the profit share of national income, the output elasticity of employment (already estimated above) and the employment elasticity of wages (already estimated above):

$$\alpha_{CIT} = \frac{\partial CI}{\partial Y}\cdot\frac{Y}{CI} = \frac{\partial (Y-wL)}{\partial Y}\cdot\frac{Y}{CI} = \left[1-\left(1-\frac{CI}{Y}\right)\cdot\left(\frac{\partial L}{\partial Y}\cdot\frac{Y}{L}\right)\cdot\left(1+\frac{\partial w}{\partial L}\cdot\frac{L}{w}\right)\right]\cdot\frac{Y}{CI} \quad (10)$$

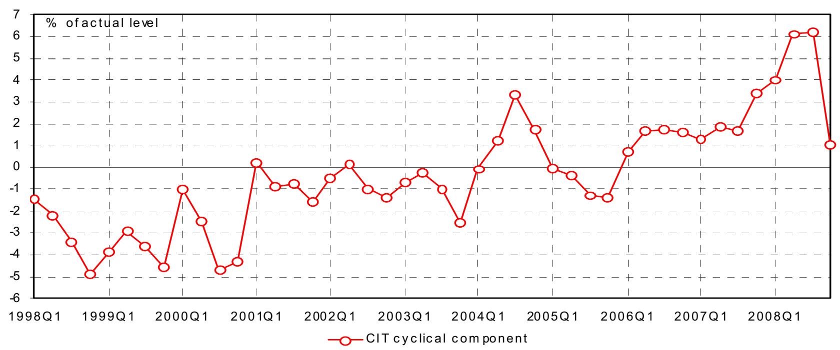
where: CI denotes the aggregate corporate income.

The estimates of the Corporate Income Tax output elasticity for the period 1998:Q1-2008:Q4 are presented in Table A2 in the Appendix. The estimated average elasticity over the entire sample is 1.205. The OECD cross-country average estimate is 1.26 with a standard deviation of 0.43 (van den Noord, 2000).

Figure 5 depicts the cyclical component of corporate income taxes. In the analyzed period, the amplitude of this cyclical component was around 6% of the actual level, the corporate income taxes being the most sensitive revenue component with respect to the output gap.

Figure 5

The Corporate Income Tax Cyclical Component



Source: Authors' calculations.

2.4 The Indirect Taxes Elasticity and Cyclical Component

In the OECD methodology it is assumed that the elasticity for indirect taxes is the same as the output elasticity of consumption. The output elasticity of real private consumption can be computed as the estimate of coefficient d_1 in the following regression equation:

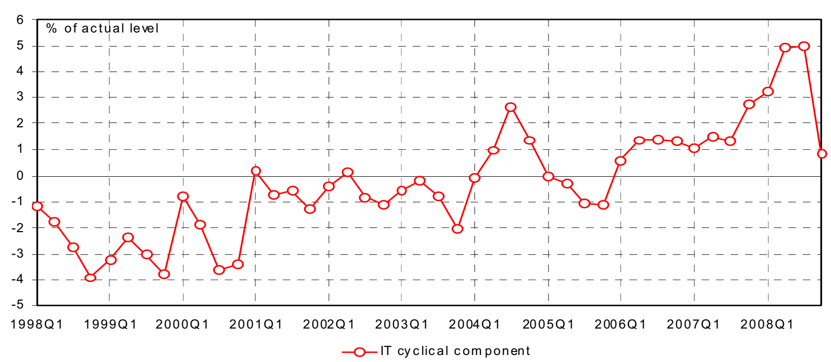
$$\log\left(C/Y^*\right) = d_0 + d_1 \log\left(Y/Y^*\right) \qquad (11)$$

where: C denotes private consumption, Y denotes actual output and Y^* denotes potential output.

In order to account for endogenous bias we employed the two stage least squares method and we obtained an estimated value of 0.97.

Figure 6

The Indirect Taxes Cyclical Component



Source: Authors' calculations.

The estimates of the Indirect Taxes output elasticity for the period 1998:Q1-2008:Q4 are presented in Table A.2 in the Appendix. The estimated average elasticity over the entire sample is 0.97. The OECD cross-country average estimate is 0.89 with a standard deviation of 0.35 (van den Noord, 2000).

Figure 6 depicts the cyclical component of indirect taxes. In the analyzed period, the amplitude of this cyclical component was around 5% of the actual level.

2.5 The Current Primary Expenditure Elasticity and Cyclical Component

The methodology assumes that the current primary expenditure fluctuates in proportion to the unemployment-related expenditure and that unemployment-related expenditure is strictly proportional to unemployment. The elasticity is decomposed into the following components:

- the output elasticity of employment (already estimated above);
- the employment elasticity of the labor force;
- the *NAIRU* (already estimated above).

According to:

$$\alpha_{CPE} = \frac{\partial CPE}{\partial Y}\cdot\frac{Y}{CPE} = \left(\frac{UB}{CPE}\right)\cdot\left(\frac{\partial UB}{\partial Y}\cdot\frac{Y}{UB}\right) = \left(\frac{UB}{CPE}\right)\cdot\left(\frac{\partial U}{\partial Y}\cdot\frac{Y}{U}\right) = \left(\frac{UB}{CPE}\right)\cdot\left(\frac{\partial L^s - \partial L}{\partial L}\cdot\frac{\partial L}{\partial Y}\cdot\frac{Y}{U}\right) =$$
$$= -\left(\frac{UB}{CPE}\right)\cdot\left(\frac{\partial L}{\partial Y}\cdot\frac{Y}{L}\right)\cdot\left\{\left[1-\left(\frac{\partial L^s}{\partial L}\cdot\frac{L}{L^s}\right)\right]\Big/\left(\frac{U}{L^s}\right)-1\right\} \tag{12}$$

where: CPE is the current primary expenditure, U is the unemployment, UB denotes the unemployment benefits and L_s is the labor supply

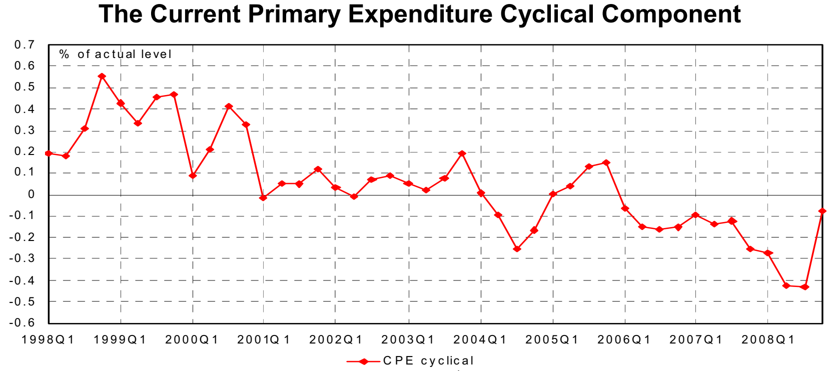
For the computation of the short-run employment elasticity of the labor force, the following regression is employed:

$$\log\left(L_S / L^*\right) = c_0 + c_1 \log\left(L / L^*\right) \tag{13}$$

where: L_S is the labor supply, L and L^* are actual and potential employment. The estimated value of the coefficient is 0.1925.

Figure 7

The Current Primary Expenditure Cyclical Component



Source: Authors' calculations.

The estimates of the Current Primary Expenditure output elasticity for the period 1998:Q1-2008:Q4 are presented in Table A.2 in the Appendix. The estimated average elasticity over the entire sample is -0.102. The OECD cross-country average estimate is -0.29 with a standard deviation of 0.26 (van den Noord, 2000).

Figure 7 depicts the cyclical component of the current primary expenditures. In the analyzed period, the amplitude of this cyclical component was around 0.5% of the actual level.

2.6 The Cyclically Adjusted Budget Balance

To construct the cyclically adjusted budget balance we first determined the elasticity of each budget category of revenues and expenditures to the business cycle fluctuations, and then we applied these responses together with the output gap estimates in Altar, Bobeica and Necula (2009) to compute the cyclical component of each budgetary category. The final step consists in adding the expenditure and revenue cyclical components to the actual budget values to obtain the cyclically adjusted or the structural budget balance. The average estimated budget balance semi-elasticity to the output gap is 0.285. The OECD cross-country average estimate is 0.49 with a standard deviation of 0.2 (van den Noord, 2000).

Based on the elements presented above, the cyclical and structural components of the budget deficit were calculated for each quarter. Table 1 presents the annualized data regarding the actual, cyclical and structural budget balance

Table 1

The Estimated Structural Budget Balance

	Actual Balance	**Cyclical Balance**	**Structural Balance**
	(% of GDP)	(% of GDP)	(% of GDP)
1998	-3.59	-0.76	-2.84
1999	-1.85	-0.99	-0.85
2000	-3.96	-0.77	-3.18
2001	-3.19	-0.18	-3.00
2002	-2.60	-0.16	-2.44
2003	-2.23	-0.27	-1.96
2004	-1.18	0.35	-1.53
2005	-0.79	-0.19	-0.60
2006	-1.64	0.34	-1.98
2007	-2.50	0.49	-2.99
2008	-5.40	0.99	-6.39

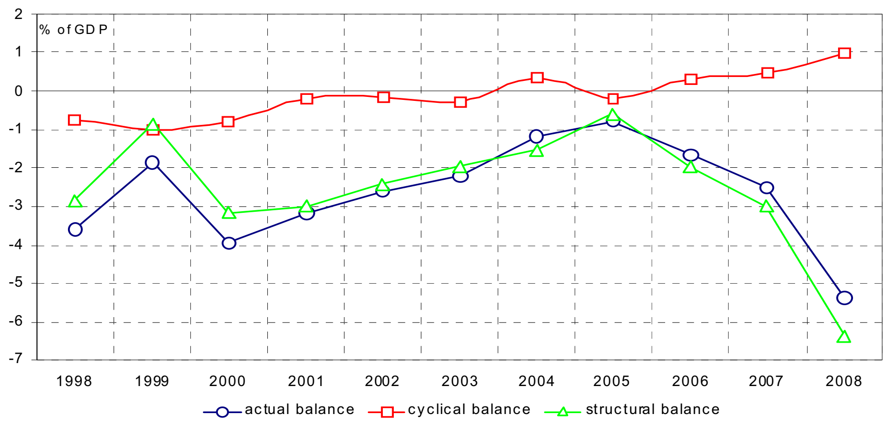
Source: Authors' calculations.

Figure 8 depicts the dynamics of the cyclically adjusted budget balance for the period 1998–2008.

The amplitude of the cyclical budget balance is around 1% of the GDP. The fiscal balance worsened in the context of the actual crisis, the cyclically adjusted budget deficit approaching 6.5% of the GDP.

Figure 8

The Dynamics of the Structural Budget Balance



Source: Authors' calculations.

3. Estimating the Structural Budget Balance using Annual Data

The estimated cyclical components of the budget balance are surrounded by significant margins of uncertainty. Therefore, it is essential to check the robustness of these estimates using various methodologies. In this section, we will compute the structural fiscal balance for the Romanian economy employing annual data and following the methodology outlined in Girouard and Andre (2005), with the main difference consisting in the fact that in this paper the elasticity of various budget items is not fixed but allowed to vary on a year-to-year basis.

Girouard and Andre (2005) updated the OECD methodology by introducing several innovations to account better for the lags between taxes and the stance of the business cycle and to ensure greater cross-country consistency in the estimates of the various budget categories elasticities, as well as to improve the statistical properties of the coefficients of the regressions linking the tax bases to the output gap. According to this methodology, every elasticity is separated into two components, namely an elasticity of tax incomes with respect to the relevant tax base, and an elasticity of the tax base relative to the output gap.

The elasticity of the tax income with respect to the tax base is determined by the structure and the evolution of the Romanian tax system:

- in the case of the Personal Income Tax, it is given by the wage elasticity of the personal income tax (estimated in subsection 2.1.4);
- in the case of the Social Security Contribution, it is constant and equal to 1 across the sample, since the contribution rate is flat and there are no deductions;

- in the case of the Corporate Income Tax, it is constant and equal to 1 since it is assumed that corporate income tax receipts are proportional to their tax base, namely the corporate profits;
- in the case of Indirect Taxes, it is constant and equal to 1 since it is considered that indirect tax income is proportional to the main tax base, namely the consumer expenditure;
- in the case of Current Primary Expenditures, it is equal to the share of unemployment-related spending in total government spending, since the elasticity of government expenditure reflects the cyclical variations in unemployment-related spending and an unitary elasticity is assumed between unemployment-related expenditure and unemployment.

The elasticity of the tax base with respect to output gap is quite complex, depending on whether the base is income, profits, consumption, because their behavior vary across business cycles. To improve the overall cross-country coherence and statistical robustness of the econometric estimation of the elaticities of the relevant bases with respect to the output gap, Girouard and Andre (2005) employ panel estimation techniques. Based mainly on economic and geographical criteria, subsets of countries were created and the elasticities of the tax base with respect to output gap were estimated for each subset using the seemingly unrelated regression (SURE) method. In this paper, we will employ the estimated values of these elasticities in Girouard and Andre (2005) for the subset consisting of the Czech Republic, Hungary, Poland and the Slovak Republic, since these countries have characteristics similar to those of the Romanian economy. As further research we intend to include Romania in a cross-country study of the transition economies and to estimate the elasticities of the tax bases with respect to output gap using various panel regression techniques.

The estimates of the elasticities of various government items to output-gap for the period 1998-2008 are presented in Table A.3 in Appendix. The average estimated budget balance semi-elasticity to the output gap is 0.29, similar to the results obtained in the previous section. Using these elasticities and the estimated output-gap one can compute the cyclical tax revenues and expenditures, and afterwards the cyclical and structural components of the budget deficit.

Table 2 presents the data regarding the actual, cyclical and structural budget balance obtained using the methodology employed for the annual data.

Table 2

The Estimated Structural Budget Balance

	Actual Balance	**Cyclical Balance**	**Structural Balance**
	(% of GDP)	(% of GDP)	(% of GDP)
1998	-3.59	-0.88	-2.71
1999	-1.85	-1.12	-0.72
2000	-3.96	-0.84	-3.12
2001	-3.19	-0.20	-2.99
2002	-2.60	-0.17	-2.43
2003	-2.23	-0.28	-1.95

	Actual Balance (% of GDP)	Cyclical Balance (% of GDP)	Structural Balance (% of GDP)
2004	-1.18	0.36	-1.54
2005	-0.79	-0.19	-0.60
2006	-1.64	0.34	-1.98
2007	-2.50	0.50	-3.00
2008	-5.40	1.00	-6.40

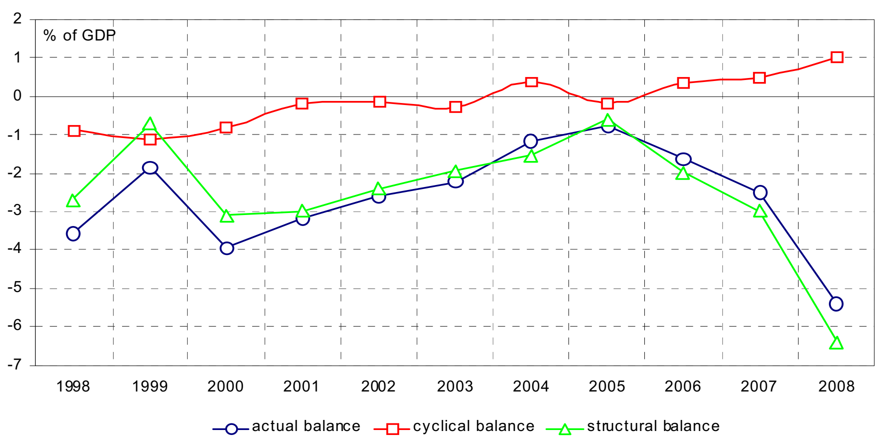
Source: Authors' calculations.

We obtained results almost identical to those in the previous section. The structural balance varied between -0.60% and -6.40% of the GDP. After a period of constant improvement in the structural fiscal stance, with a descending trend of the structural balance, the last period was characterized by a significant increase in the cyclically adjusted deficit. It will be quite a challenge to reach the medium term objective of a structural fiscal balance of -1.93% of the GDP for 2011 and -0.9% for 2012 as stated in the Convergence Program (Ministry of Public Finance, 2009).

Figure 9 depicts the dynamics of the cyclically adjusted budget balance for the period 1998–2008.

Figure 9

The Dynamics of the Structural Budget Balance



Source: Authors' calculations.

The amplitude of the cyclical budget balance is around 1% of GDP, with a shape similar to that obtained in the previous section.

4. Concluding Remarks

In this paper we estimated for the Romanian economy the structural fiscal balance in the period 1998–2008.

The potential GDP is a key element in estimating the cyclically adjusted budget balance. Since the potential output is unobservable and is sensitive to the method of estimation, for assessing the amplitude of business cycles in the Romanian economy we employed the potential GDP estimates in Altãr, Necula and Bobeica (2009) that used a battery of theoretical and statistical methods,.

To ensure the robustness of the estimation we employed for the computation of the elasticities of various categories of government revenues and expenditures with respect to the output-gap two approaches derived from the OECD and European Commission methodologies. Since the main weakness of the cyclical adjustment method used in the EU fiscal surveillance framework is the assumption of constant tax elasticities, in this study we relaxed the assumption of fixed elasticities hypothesized in the OECD and European Commission methodologies and allowed for varying tax elasticities along the business cycle.

The two approaches issued similar results, the overall average budget sensitivity being equal to 0.285 and 0.290, respectively. The amplitude of the cyclical budget balance is around 1% of GDP. After constant improvement, the structural balance worsened in 2008 due mainly to the current crisis.

References

Altãr, M., Necula, C. and Bobeica, G. (2010), "Estimating the Potential GDP for the Romanian Economy. An Eclectic Approach", *Romanian Journal of Economic Forecasting*, forthcoming.

Bouthevillain, C., Courthimann,P., Van den Dool, G., Hernández,P., Langenus, G., Mohr, M., Momiglianoand, S. and Tujula , M. (2001), "*Cyclically Adjusted Budget Balances: An Alternative Approach"*, ECB Working Paper, No.77.

Denis, C., Grenouilleau, D., McMorrow, K., and Roger, W. (2006), "Calculating potential growth rates and output gaps - A revised production function approach", *European Commission Economic Papers*, No. 247.

Giorno, C., Richardson, P., Roseveare, D. and van den Noord, P. (1995), "Potential output, output gaps and structural budget balances", *OECD Economic Studies*, 24:167-209.

Girouard, N. and André, C. (2005), "Measuring Cyclically-adjusted Budget Balances for OECD Countries", *OECD Economics Department Working Paper*, No. 434.

Girouard, N. and Price R. (2004), "Asset Price Cycles, One-off Factors and Structural Budget Balances", *OECD Working Paper*, No. 391.

Hagemann, R. (1999), "The Structural Budget Balance. The IMF Methodology". *IMF Working Paper*, WP/99/95.

Koen, V. and van den Noord, P. (2005), "Fiscal Gimmickry in Europe: One-off Measures and Creative Accounting", *OECD Working Paper*, No 417.

Langedijk, S. and Larch M. (2007), "Testing the EU fiscal surveillance: How sensitive is it to variations in output gap estimates?", *European Economy - Economic Papers* No. 285.

van der Noord, P., (2000), "The Size and Role of Automatic Fiscal Stabilizers in the 1990s and Beyond", *OECD Economics Department Working Paper*, no.230.

Wolswijk, G. (2007), "Short and long-run tax elasticities. The case of the Netherlands", *ECB Working Paper* No. 763.

***, Congressional Budget Office, (2004), "*The Cyclically Adjusted and Standardized-Budget Measures"*.

***, European Commission (2006), "Public finances in EMU – 2006", *European Economy*, 3/2006.

***, European Commission (2007), "Public finances in EMU – 2007", *European Economy*, 3/2007.

***, European Commission (2008), "Public finances in EMU – 2008", *European Economy*, 4/2008.

***, Ministry of Public Finance, (2009), *Convergence Programme 2008-2011*.

Appendix

Table A.1

Wage elasticity of personal income taxes

	Elasticity
1998	1.53
1999	1.55
2000	1.91
2001	1.92
2002	2.09
2003	1.98
2004	1.95
2005	1.68
2006	1.57
2007	1.57*
2008	1.57*

** Since there are no data on income distribution, for 2007 and 2008 the same estimates as in 2006 were employed.*
Source: Authors' calculations.

Table A.2

The output elasticities of budgetary revenues and expenditures (quarterly data)

	Revenues				Expenditures	Balance
	Output elasticity of personal income tax	Output elasticity of social security contribution	Output elasticity of corporate income tax	Output elasticity of indirect tax	Output elasticity of current primary expenditure	Budget balance semi-elasticity
1	2	3	4	5	6	7
1998Q1	0.951	0.751	1.208	0.970	-0.159	0.348
1998Q2	0.951	0.751	1.208	0.970	-0.100	0.292
1998Q3	0.951	0.751	1.208	0.970	-0.108	0.250
1998Q4	0.951	0.751	1.208	0.970	-0.136	0.283
1999Q1	0.957	0.751	1.172	0.970	-0.128	0.374
1999Q2	0.957	0.751	1.172	0.970	-0.135	0.317
1999Q3	0.957	0.751	1.172	0.970	-0.146	0.293
1999Q4	0.957	0.751	1.172	0.970	-0.120	0.276
2000Q1	1.093	0.751	1.248	0.970	-0.110	0.345
2000Q2	1.093	0.751	1.248	0.970	-0.109	0.319
2000Q3	1.093	0.751	1.248	0.970	-0.110	0.259
2000Q4	1.093	0.751	1.248	0.970	-0.095	0.270

1	2	3	4	5	6	7
2001Q1	1.096	0.751	1.205	0.970	-0.075	0.324
2001Q2	1.096	0.751	1.205	0.970	-0.072	0.290
2001Q3	1.096	0.751	1.205	0.970	-0.077	0.242
2001Q4	1.096	0.751	1.205	0.970	-0.090	0.241
2002Q1	1.158	0.751	1.198	0.970	-0.086	0.332
2002Q2	1.158	0.751	1.198	0.970	-0.084	0.282
2002Q3	1.158	0.751	1.198	0.970	-0.086	0.248
2002Q4	1.158	0.751	1.198	0.970	-0.077	0.240
2003Q1	1.120	0.751	1.204	0.970	-0.095	0.326
2003Q2	1.120	0.751	1.204	0.970	-0.096	0.285
2003Q3	1.120	0.751	1.204	0.970	-0.094	0.250
2003Q4	1.120	0.751	1.204	0.970	-0.092	0.240
2004Q1	1.106	0.751	1.212	0.970	-0.100	0.351
2004Q2	1.106	0.751	1.212	0.970	-0.099	0.291
2004Q3	1.106	0.751	1.212	0.970	-0.093	0.245
2004Q4	1.106	0.751	1.212	0.970	-0.115	0.235
2005Q1	1.004	0.751	1.196	0.970	-0.118	0.341
2005Q2	1.004	0.751	1.196	0.970	-0.121	0.300
2005Q3	1.004	0.751	1.196	0.970	-0.124	0.246
2005Q4	1.004	0.751	1.196	0.970	-0.128	0.245
2006Q1	0.965	0.751	1.200	0.970	-0.105	0.342
2006Q2	0.965	0.751	1.200	0.970	-0.108	0.293
2006Q3	0.965	0.751	1.200	0.970	-0.111	0.255
2006Q4	0.965	0.751	1.200	0.970	-0.113	0.250
2007Q1	0.965	0.751	1.208	0.970	-0.086	0.301
2007Q2	0.965	0.751	1.208	0.970	-0.088	0.286
2007Q3	0.965	0.751	1.208	0.970	-0.089	0.260
2007Q4	0.965	0.751	1.208	0.970	-0.091	0.245
2008Q1	0.965	0.751	1.201	0.970	-0.082	0.353
2008Q2	0.965	0.751	1.201	0.970	-0.083	0.302
2008Q3	0.965	0.751	1.201	0.970	-0.084	0.255
2008Q4	0.965	0.751	1.201	0.970	-0.086	0.227
Average	**1.034**	**0.751**	**1.205**	**0.970**	**-0.102**	**0.285**

Source: Authors' calculations.

Table A.3

The output elasticities of budgetary revenues and expenditures (annual data)

	Revenues				Expenditures	Balance
	Output elasticity of personal income tax	Output elasticity of social security contribution	Output elasticity of corporate income tax	Output elasticity of indirect tax	Output elasticity of current primary expenditure	Budget balance semi-elasticity
1998	1.074	0.700	1.250	1.000	-0.152	0.308
1999	1.085	0.700	1.206	1.000	-0.159	0.331
2000	1.338	0.700	1.298	1.000	-0.124	0.312
2001	1.343	0.700	1.246	1.000	-0.087	0.284
2002	1.460	0.700	1.238	1.000	-0.086	0.283
2003	1.388	0.700	1.245	1.000	-0.089	0.281
2004	1.363	0.700	1.256	1.000	-0.086	0.284
2005	1.173	0.700	1.236	1.000	-0.094	0.278
2006	1.100	0.700	1.241	1.000	-0.076	0.279
2007	1.100	0.700	1.250	1.000	-0.056	0.272
2008	1.100	0.700	1.241	1.000	-0.050	0.277
Average	**1.229**	**0.700**	**1.246**	**1.000**	**-0.096**	**0.290**

Source: Authors' calculations.