



Comparative Analysis Regarding the Accuracy of State Budget Revenues Forecasts in Romania

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Abstract *The objective of this research is related to the comparison between the government planning for the revenues and our own forecasts based on an econometric model. An auto-adaptive model was constructed for the revenues, taking into account the previous expectations regarding the government revenues. The U1 Theil's statistic was used to make the comparison between the two forecasts in terms of accuracy. The comparison of each type of prediction with the naive forecasts based on random walk was made using U2 Theil's statistic. The proposed auto-adaptive model could also be used by the government as a possible strategy to improve the government revenues accuracy.*

Key words:

State budget, forecasts, predictions, accuracy, government revenues, auto-adaptive model

JEL Codes:

C51, E21, E27

1. Introduction

The adjustment role of the economic life stems from the importance of the State budget as legal tool to reflect the economic policy promoted by the Government. Through the guidelines of the budget, the public authorities can act on the economy through fiscal policy, generated by investigation of public revenues, budgetary policy, generated by public expenditures and budgetary balance policy, aimed at financing the budget deficits or budgetary surpluses recovery.

The complexity of the budgetary interventions results from partial overlap of economic and financial phenomena composed of actions and reactions. Thus, the budgetary operations allow intervention on the economy, but at the risk of obtaining certain behaviors at the microeconomic level, which can negatively affect the situation of the State budget.

The economic approach of the concept of *budget* emphasizes macroeconomic correlations, and in particular, about the level and evolution of gross domestic product. In modern economic theory, the budget is considered as an essential variable in determining gross domestic product and the level of use of public financial resources.

A certain level of gross domestic product and the extent to which it is assigned to gross capital formation and consumption determine the level of budget indicators

and form the basis of the favourable evolution of resources in the future.

The experience of applying budgetary policies has generated plenty of controversy, which highlighted the fact that budgetary interventions are at the origin of the effects of destabilization, the effects of clearing, eviction effects, as well as some uncertain effects of redistribution. Economic and financial analysis of the State budget facilitates the understanding of the mode of functioning of a market economy, in which the State can act through fiscal instruments and expenditure flows to correct, to generate or exacerbate economic imbalances.

When accomplishing the attributions regarding the management of public financial resources, maintaining permanent balance between revenue and expenditures of the State budget requires a careful examination of the planned objectives and actions, aiming to improve the their quality, economic efficiency increase and social effectiveness.

Therefore, the problem of choosing an optimum ratio between the volume of budgetary revenues and the public expenditure implies a maximum political liability. In many cases, to pass more easily the parliamentary exam and finally get the budget approval, Governments camouflage the real deficit through practices such as taking out of the system certain expenditures or

accounting fireworks, through special treasury accounts etc., which allows the financing of certain actions and less public expenditures and determines eventually temporary insufficient resources. Because of this, we note again the special importance assigned to the establishment and implementation of rigorous rules to be adhered to while designing public budgets, particularly the State budget.¹

Government revenue are not mere indicators of the State budget, but also fulfill the role of levers used by the State to stimulate the development or the diminishment of some activities, of the production and consumption of certain products, for influencing the achievement of certain social categories of actions in which the State is directly concerned.

The total of revenues and expenses of the State budget is set up by taking into account the development of the national economy for the year considered, the preliminary execution of the State budget, as well as the expected effects of the measures adopted, probably visible in following year.

2. Literature review

The entire budgetary system is built on the budget itself, a document through which there are provided and approved every year household income and expenditure or, where appropriate, only the expenses, according to the system of financing of public institutions.

The Romanian Explanatory Dictionary defines it as “an annual budget of revenue and expenditure of the State, of an enterprise, etc. on a determined period”, and Romanian Encyclopedic Dictionary, as “list of income and expenditure, the bodies of State administration, local government, institutions, organizations, etc., for a certain period of time (year, quarter, month)”. Public accounting Act since 1929, page 4, defines it as “the Act by which annual revenues and expenditures of all public services are provided and approved beforehand.” Actually, many authors agree that budget is a financial plan that includes household income and public expenditures of the State for a certain period of time. For example, Prof. Paul Leroy Beaulieu defines it thus: “a budget is a provision of the revenue and expenses over a specific period, an evaluative and comparative picture of planned revenues and expenditures”, and Prof. R. Stourm defines the State budget as “a paper containing preliminary approval of public revenues and expenditures”. Also, Prof. Raymond Muzellac considers the budget “the Act by which the revenues and annual expenditures of the State are provided and authorized

“or “all accounts which describe a year calendar year for State resources and expenditures”.²

Among the consolidated general budget components, the most important is the State budget, through which the major financial resources of the State are carried out. The State budget, as the main component of the budget system, mirrors the financial resources for the State, allocated mainly to achieve social and cultural actions, the defense of the country, the assurance of public order/ public authority, as well as to support the financing of investments, strategic interest activities and social protection measures of population.³

According to the Public Finances Law no.500/2002, reviewed in 2012, state budget is approved by law. The projects of the annual budgetary law are approved by the Government, with the support of the Ministry of Public Finance, considering the following ones:

- Macroeconomic and social indicators forecasts for the next year, which includes the draft budget for the following year and the following 3 years, too;
- Fiscal and budgetary policies;
- The provisions of memoranda of the financing, memoranda of agreements and other arrangements with international organizations and international financial institutions, signed and/or adjusted;
- Sector politics and strategies, priorities set up when making budget proposals, presented by the main fund managers;
- Proposals of detailed expenditures from fund managers;
- Programmes prepared by the chief fund managers for the purpose of financing some actions or set of actions that are associated with defined objectives and indicators of results and efficiency; the programmes are accompanied by the annual performance assessment of each program, which must include: actions, associated costs, objectives, and expected results for the coming years, measured by precise and well-justified indicators.
- Proposals of divided amounts of money coming from certain revenues of the State budget, as well as consolidated transfers for the local public administration authorities;
- Possibilities to finance budgetary deficit.

² Belean P.; Anghelache G.; Risti L.; Ginguta A., (2007), *Finantele publice ale Romaniei*, 3rd edition, Economica Publishing House, Bucharest, p. 250

³ Vacarel I.; Bistriceanu Gh.D.; Anghelache G.; Bodnar M.; Bercea F.; Mosteanu T.; Georgescu F., (2007), *Finante publice*, 6th edition, Didactica si Pedagogica Publishing House, Bucharest, p. 520

¹ Belean P.; Anghelache G.; Risti L.; Ginguta A., (2007), *Finantele publice ale Romaniei*, 3rd edition, Economica Publishing House, Bucharest, pp. 289-290

3. Background research

In the practice related to the field, in order to determine the amount of the revenue of the State budget, analytical or synthetic methods are applied. If the analytical method involves direct assessment of each fund of financial resources, synthetic method starts from the absolute size of the macroeconomic indicators and realizes the financial years from existing between them and further provided with tools from the manifest tendency in their evolution.

Forecasting methods of budgetary revenue flows has a major importance for the economic policy of the Government and for the management of public finances in general. Economic and financial indicators, established with the help of econometric models, are adjusted after the impact of the factors taken into account is better enhanced. The size of budget indicators is done in direct correlation with the level of gross domestic product forecast for next year, considering an estimated rate of inflation and a

predictable level of the exchange rate of the national currency.

Classical methods of assessment of budgetary incomes presents certain limitations caused by an insufficient amount of information and the impossibility of quantifying and predicting the effects of some factors that will influence the future of the State's economy. The modern methods of assessing budget indicators are based on estimates of future costs and benefits, which go into the calculation of budget indicators as certain variables. But, as the future can never be fully prefigured, always register differences between the initial size and the real size of the indicators taken into account. The effects of a certain budgetary policies are difficult to quantify.

In this context, we have tried, in this paper, to do a comparative analysis between the revenues stipulated to be cashed in accordance with the law on State budget and the real revenues according to the budgetary execution in 2001-2012, which has generated an analysis on the accuracy of the forecast budgetary revenues.

Table 1. Revenues of the state budget 2001-2005

A. Revenues of the state budget	2001	2002	2003	2004	2005
1. Budgetary provisions approved by State Budget Law	153.092,4	178.422,0	241.235,5	288.279,8	35.736,7 bil.lei
2. Final Budgetary Provisions	149.123,8	175.557,2	244.536,3	313.075,2	36.433,3 bil.lei
3. Returns	148.209,2	179.205,5	252.447,3	321.953,6	36.599,5 bil.lei
B. GDP (considered value)	1.154.126,4	1.512.256,6	1.890.778,3	246.371,6 bil.lei	287.186,3 bil.lei

Source: *The State Budget Law for 2001-2005, Note presentation of the annual general account of the execution of the state budget, 2001-2005*, Ministry of Public Finance, Romania. All the other figures of the table are in *billion lei*, according to the documents.

Table 2. Revenues of the state budget 2006-2012

A. Revenues of the State Budget:	-billion lei-						
	2006	2007	2008	2009	2010	2011	2012
1. Budgetary provisions approved by State Budget Law	42.822,6	55.575,5	67.004,7	75.689,7	66.654,3	80.802,1	95.757,1
2. Final budgetary provisions	41.675,9	55.133,4	73.661,6	56.585,8	69.731,9	84.606,3	-
3. Returns	40.698,1	48.984,6	61.151,0	56.434,8	66.546,5	79.688,0	87.171,5
B. GDP	342.418	404.708,8	503.959	491.273,7	513.640,8	578.551,9	585.200

Source: *The State Budget Law for 2006-2012, Note presentation of the annual general account of the execution of the state budget, 2006-2012*, Ministry of Public Finance, Romania and *The Public Report for 2007-2011, Synthesis*, Court of Accounts, Romania.

4. Methodology of research

In our research the data series are represented by the government revenues in three forms: the predictions made by the government according to law of government budget (denoted by p1) and the final forecasts (denoted by p2) and the real values that were

registered for the revenues (denoted by real). These indicators were expressed in comparable prices by dividing them with GDP deflator. The data series are stationary, the results of Phillips-Perron test putting in evidence this conclusion.

Table 3. Phillips-Perron test for checking the data sets stationary

Variable	Model with trend and constant	Model without trend and constant	Model with constant
P1	PP= -5.149415 1%, 5%, respectively 10% critical values: -4.6193 -3.7119 -3.2964	PP= -5.364172 1%, 5%, respectively 10% critical values: -3.8877 -3.0521 -2.6672	PP= -5.566751 1%, 5%, respectively 10% critical values: -2.7158 -1.9627 -1.6262
P2	PP= -4.666863 1%, 5%, respectively 10% critical values: -4.5348 -3.6746 -3.2762	PP= -2.662268 1%, 5%, respectively 10% critical values: -2.6968 -1.9602 -1.6251	PP= -4.753948 1%, 5%, respectively 10% critical values: -3.8304 -3.0294 -2.6552
real	PP= -5.059481 1%, 5%, respectively 10% critical values: -4.5348 -3.6746 -3.2762	PP= -2.545634 1%, 5%, respectively 10% critical values: -2.6968 -1.9602 -1.6251	PP= -5.065676 1%, 5%, respectively 10% critical values: -3.8304 -3.0294 -2.6552

We proposed to make forecasts based on our own econometric model and to compare them with the two forms of forecasts provided by the government. An auto-adaptive model was proposed, the dependent variable being the real values of government revenues.

The independent variables are represented by the real values in a previous period and each prediction made for the current period.

Dependent Variable: REAL
 Method: Least Squares
 Sample (adjusted): 2002-2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10023.95	2090.834	-4.794234	0.0020
REAL(-1)	0.026440	0.012636	2.092492	0.0747
P1	0.308216	0.125713	2.451752	0.0440
P2	0.750922	0.118344	6.345264	0.0004
R-squared	0.999166	Mean dependent var		111898.2
Adjusted R-squared	0.998808	S.D. dependent var		96157.27
S.E. of regression	3319.553	Akaike info criterion		19.32834
Sum squared resid	77136015	Schwarz criterion		19.47302
Log likelihood	-102.3058	Hannan-Quinn criter.		19.23713
F-statistic	2794.611	Durbin-Watson stat		1.922155
Prob(F-statistic)	0.000000			

The regression model is valid, a Prob. less than 0.05 indicating that with a probability of 95% all the coefficients are statistically significant. The Durbin-Watson value is almost 2, fact that indicates the errors' independence.

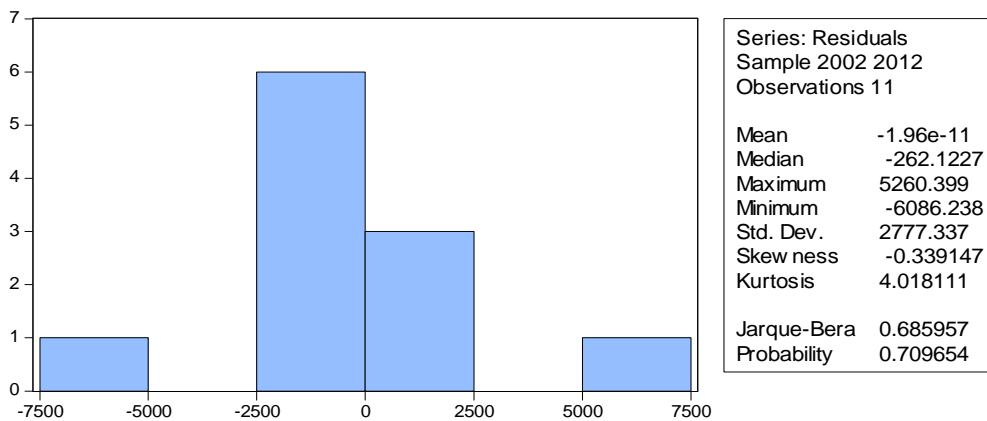
White test was applied to check the errors homoscedasticity under the null hypothesis that the errors are homoscedastic.

Heteroskedasticity Test: White

F-statistic	97.28780	Prob. F(9,1)	0.0785
Obs*R-squared	10.98745	Prob. Chi-Square(9)	0.2766
Scaled explained SS	6.714487	Prob. Chi-Square(9)	0.6668

A probability to reject the null hypothesis greater than 0.05 was registered, this implying that we do not have enough proof to reject the errors homoscedasticity.

Jarque-Bera test was applied to check the errors normality.



The value of Jarque-Bera statistic is less than the critical value of a chi-square with one degree of freedom (5.99). In conclusion, we do not have enough evidence to reject the errors normality.

The model is built using a small set of data. Therefore, we re-estimated it by resampling the residuals value, using the bootstrapping procedure in EViews. The new model for which the mentioned assumptions were checked again is the following:

Dependent variable: REAL
 Method: Least Squares
 Sample: 2001-2010
 Bootstrapped coefficient estimates and standard errors (10000 repetitions)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10019.58	1680.804	-5.961185	0.0006
REAL(-1)	0.026432	0.010082	2.621592	0.0343
P1	0.307275	0.100980	3.042924	0.0188
P2	0.751926	0.095120	7.905044	0.0001

R-squared	0.999166	Mean dependent var	111898.2
Adjusted R-squared	0.998808	S.D. dependent var	96157.27
S.E. of regression	3319.553	Akaike info criterion	19.32834
Sum squared resid	77136015	Schwarz criterion	19.47302
Log likelihood	-102.3058	Hannan-Quinn criter.	19.23713
F-statistic	2794.611	Durbin-Watson stat	1.922155
Prob(F-statistic)	0.000000		

Predictions are made on the horizon 2011-2012 using the previous econometric model. The predictions made for the Government revenues (mil. RON)

Year	Forecast for Government revenues (mil. RON)
2011	80185.5191
2012	90488.40981

Some accuracy indicators were computed in order to compare our forecasts with those provided by the government.

U Theil's statistic is calculated in two variants by the Australian Treasury in order to evaluate the forecasts accuracy.

The following notations are used:

- a- the registered results;
- p- the predicted results;
- t- reference time;
- e- the error ($e=a-p$);
- n- number of time periods.

$$U_1 = \frac{\sqrt{\sum_{t=1}^n (a_t - p_t)^2}}{\sqrt{\sum_{t=1}^n a_t^2} + \sqrt{\sum_{t=1}^n p_t^2}} \quad (1)$$

According to Bratu (2012), if U_1 is closer to one, the forecast accuracy is higher.

$$U_2 = \sqrt{\frac{\sum_{t=1}^{n-1} \left(\frac{p_{t+1} - a_{t+1}}{a_t}\right)^2}{\sum_{t=1}^{n-1} \left(\frac{a_{t+1} - a_t}{a_t}\right)^2}} \quad (2)$$

If $U_2 = 1 \Rightarrow$ there are not differences in terms of accuracy between the two forecasts to compare

If $U_2 < 1 \Rightarrow$ the forecast to compare has a higher degree of accuracy than the naive one

If $U_2 > 1 \Rightarrow$ the forecast to compare has a lower degree of accuracy than the naive one

the predictions made by the government according to law of government budget (denoted by p_1) and the final forecasts (denoted by p_2)

U_1 and U_2 Theil's statistics for comparing the Government revenues forecasts (mil. RON)

According to U_1 indicator, our forecasts are more accurate than those provided by the government. U_2 static values put in evidence that all the forecasts are more accurate the naïve forecasts.

Year	Own forecasts for Government revenues (mil. RON)	the predictions made by the government according to law of government budget	the final forecasts of the government
U1	0.01403292	0.035569459	0.02333077
U2	0.193395011	0.498618338	0.368653972

5. Conclusions

The predictions based on an auto-adaptive model that takes into account the revenues values predicted by the government during 2001-2012 proved to be a good strategy to improve the initial forecasts. Moreover, these predictions are more accurate than those based on random walk.

The forecasts accuracy assessment is a very good criterion for the quality of the forecasting process. An improvement in accuracy will generate a better decision process. The forecasts provided by the government for the revenues are important not only for the political factors in establishing the planning process, but also for the micro-economic agents.

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