ECONOMETRICAL INTERPRETATION OF THE INTERDEPENDECE BETWEEN FISCALITY RATE- FISCAL INCOMES- GROSS DOMESTIC PRODUCT

Popa Ionela
Ph.D. Candidate "Constantin Brâncoveanu" University;T. Vladimirescu, 248 A, Băile Govora, Valcea, popaionela80@yahoo.com, 0723089561
Pietraru Alina
Ph.D. Candidate "Constantin Brâncoveanu" University, Piteşti, pietrarualina@yahoo.com
Codreanu Diana
Ph.D. Candidate "Constantin Brâncoveanu" University, Piteşti, codreanudia@yahoo.com

Econometrics has come into being and grown as a result of the need to set up instruments of investigation and increase of the methods to organize, conduct and manage the economy, and on the other hand, due to the successful statistical and mathematical methods in other scientific fields, thus making economic sciences adopt econometrical models.
Joining the importance of domestic fiscal policy with the compliance of Romanian fiscality with the European Union's norms, econometrical models provide a prognosis for a sufficient period of time so as to justify an economic or social policy decision, and they also allow macroeconomic effects in a sensible way; they allow the testing of several scenarios to allocate financial resources in a potential economic structure and give the chance to analyze the directions in which the economy is responsive in terms of national concern fields.

Keywords: econometric model, rate of tax liability, fiscal incomes, gross domestic product

JEL classification: C10, E62, H20

1. Introduction

Modelling represents an activity of searching and knowing reality by means of several representations called models: they represent artificial systems with the help of which one can study the behavior of a real system (on micro and macroeconomic level) represented by analogy, this simplification not presenting the danger of changing the essential characteristics of the process or phenomenon that has been studied.
Within macroeconomic studies, the use of data and analyzing methods of existent information cannot be avoided. The economic-mathematical simulation is a method of searching and knowing complex economic phenomena and process, analyzed in an abstract way with the help of logical and mathematical formalization.[196] It can be seen as an alternative to the "experiment" used within exact sciences.
One of the main characteristics of all operational research methods is the fact that some operational research problems can be seen, from a purely theoretical point of view, as mathematical problems. This will not be the perspective approached in the following lines, as we will analyze operational research problems in close relation to practical problems. More exactly, we have in view achieving an econometrical model for seeing fiscal incomes in Romania.

2. Econometrical interpretation of the interdependence between – fiscal incomes – gross domestic product

The model I have intended to develop is one of multiple regression, under the form:

$$FR= a0+ a1\ FI + a2GDP$$

Where:
FR- represents the fiscality rate, which is a dependent variable;

196 Pârlog Cornelia – "Provisional analyses methods", Print Oscar Publishing House, Bucharest, 1998, pag.53

FI-fiscal income; GDP- gross domestic product – independent variables
With the help of this model we want to study the impact that the two independent variables have on the dependent one.
Fiscality rate (fiscal pressure) represents the relation between the total level of fiscal incomes and the Gross Domestic Product (GDP) and it shows the percentage of the GDP that belongs to the state by means of taxes and cntributions.[197]

$$R_f = \frac{V_f}{GDP} \times 100$$

where:
R_f = fiscality rate; V_f = fiscal incomes; GDP = Gross domestic product.
In our country, macroeconimic indices that represent the object of this analysis register the following values:

Table no. 1: Evolution of fiscal incomes and Gross Domestic Product between 2001- 2008

Year	Fiscal incomes, in comparable prices, millions lei	GDP In comparable prices, millions lei	Real fiscal rate, RFR %
2001	13.727,7	116.768,7	11,76
2002	13.694,1	122.844,6	11,15
2003	16.710,5	129.252,0	12,93
2004	19.141,2	140.188,7	13,65
2005	20.044,2	146.043,7	13,72
2006	20.645,5	157.422,3	13,11
2007	22.970,3	164.050,6	14.00
2008*	26.317,8	171.894,1	15.34

Source: data taken by the author according to information in the Statistical Book of Romania, 2007 and 2008. In the last editions of the book the value data for 2001-2008 are expressed in the new Romanian currency.
*- statistical information for 2008 are taken from the preliminary execution
Econometrical analyses are usually made for at least 15 years< in applying this econometrical model the data were limited to 2001-2008, as a representative period in our opinion that allows obtaining consistent information.
For the inference based on the multiple linear regression results to be available, a series of six hypotheses should be met, the regression based on such hypotheses being known as the normal classical model of multiple regression. Here are the hypotheses:

1. The relation between the dependent variable and the independent ones is linear.
2. Independent variables are at random. Among independent variables included in a regression there is no such linear relation. If independent variables are correlated then there is no multi co-linearity.
3. The expected value of the error term εt, is zero $E(\varepsilon t) = 0$
4. the variability of the error term εt *i*s the same for all observations. These errors are called homoskedastice.
5. The error term ε is nor correlated among observations.
6. The error term is normally distributed.

After having introduced data in Eviews[198], we obtain the following results of equation:

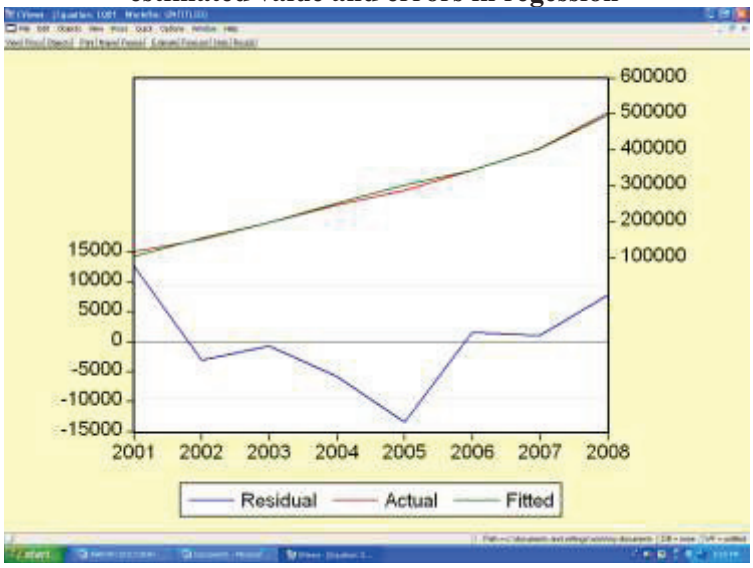
197 Tatiana Moşteanu (coordinator) – Public Finance, University publishing House, Bucharest, 2004, p. 169
198 We refer to tests presented in table no 1

Dependent Variable: RFR
Method: Least Squares
Date: 03/18/09 Time: 19:41
Sample: 2001 2008
Included observations: 8

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	186972.4	84744.52	2.206306	0.0785
VFR	16.25329	2.861734	5.679526	0.0024
PIBR	-22.28124	9.174846	-2.428514	0.0595
R-squared	0.996332	Mean dependent var		281707.1
Adjusted R-squared	0.994865	S.D. dependent var		131475.8
S.E. of regression	9421.595	Akaike info criterion		21.41939
Sum squared resid	4.44E+08	Schwarz criterion		21.44918
Log likelihood	-82.67757	F-statistic		679.0704
Durbin-Watson stat	1.360311	Prob(F-statistic)		0.000001

For each independent variable and constant EViews reports the standard error of the value, the *t-Statistic* and its associated probability.
We have been working on 5% level of relevance and the probability attached to this kind of test is inferior and the values are considered significant from statistical point of view.
Durbin Watson statistic (*DW*) is a statistic test that checks the serial correlation of errors. If errors are not correlated then DW value will be about 2. In the above mentioned example this indicator has the value of 1.36 and consequently there is serial correlation of errors. EViews also reports two informational criteria: *Akaike info criterion and Schwarz criterion*. These indicators are used when an equation must be chosen among more variants. According to the informational criterion we choose the specification for which informational criteria have the smallest values.
We also report *F-statistic* and its probability. As this possibility is smaller than the level of relevance, according to this test at least a value in regression is significant from statistical point of view.With *View/Actual, Fitted, Residual/Actual, Fitted, Residual Graph* option we can represent graphically the effective value of the dependent variable, its estimated value and errors in regression.

Figure no. 1: **Graphical representation of the effective value of the dependent variable, its estimated value and errors in regession**



With the option *View/Residual tests the regression equation errors are tested.*

Thus with the option *Residual tests/Correlogram – Q-statistics* we can test the auto-correlation of the equation errors in regression (similarly with testing the auto-correlation of time series).

CORRELOGRAM OF RESIDUALS

Date: 03/18/09 Time: 20:25
Sample: 2001 2008
Included observations: 8

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |* . |	. |* . |	1	0.075	0.075	0.0638	0.801
. | . |	. | . |	2	0.017	0.012	0.0678	0.967
. ***| . |	. ***| . |	3	-0.320	-0.324	1.7074	0.635
. ****| . |	. ****| . |	4	-0.492	-0.498	6.5472	0.162
. | . |	. | . |	5	0.025	0.065	6.5644	0.255
. | . |	. *| . |	6	-0.025	-0.115	6.5886	0.361

According to the results of this test for Lags 3 and 4 there is serial correlation of errors (the auto-correlation value exceeds the graphic interval). The auto-correlation is also confirmed by the test *Q-statistic* and associated probability.

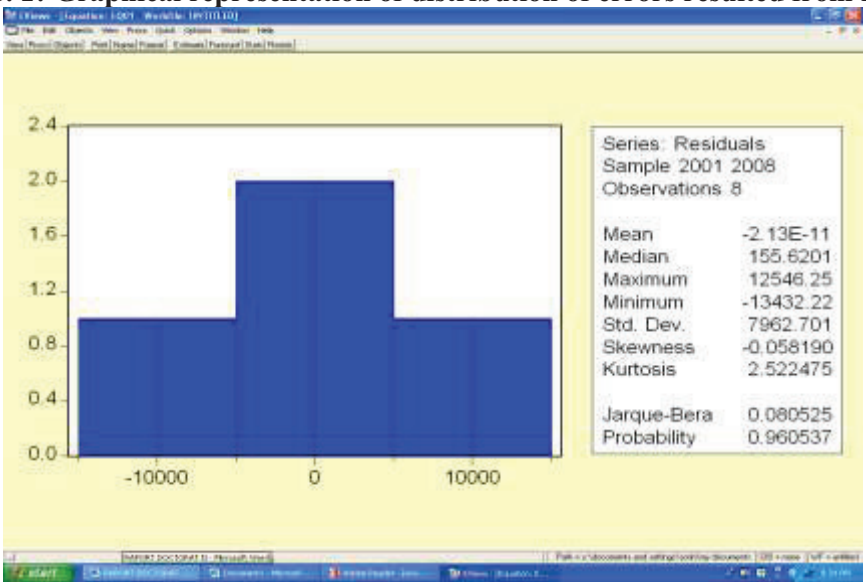
With the option *View/Residual tests/Correlogram Squared Residuals* we can test errors auto-correlation. If this auto-correlation of errors exists it is in fact an indication of heteroskedasticity (terms *ARCH*).

Date: 03/18/09 Time: 20:32
Sample: 2001 2008
Included observations: 8

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. **| . |	. **| . |	1	-0.207	-0.207	0.4893	0.484
. ****| . |	. ****| . |	2	-0.461	-0.526	3.3195	0.190
. *| . |	. ****| . |	3	-0.090	-0.497	3.4483	0.328
. |****. |	. | . |	4	0.482	0.025	8.1002	0.088
. *| . |	. *| . |	5	-0.084	-0.169	8.2873	0.141
. *| . |	. |* . |	6	-0.154	0.076	9.2346	0.161

According to econometrical results, for the above mentioned equation, there is serial correlation of square errors, so there is a possibility to speak about *ARCH* terms. With the option *View/Residual tests/Histogram – Normality test* we can analyze (in the same way as the analyses of a series distribution) the distribution of errors resulted from regression.

Figure no. 2: **Graphical representation of distribution of errors resulted from regession**



According to the results of J*arque-Bera test*, errors are normally distributed. The normal distribution of errors is very important especially when we want to make interpretation according to the estimated econometrical equation. The serial correlation, shown in errors diagram is confirmed with the help of *Serial Correlation LM* test, available with the help of the option *View/Residual tests/Serial Correlation LM Test.*

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.013019	Probability	0.987120
Obs*R-squared	0.068839	Probability	0.966166

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 03/18/09 Time: 20:36
Presample missing value lagged residuals set to zero.

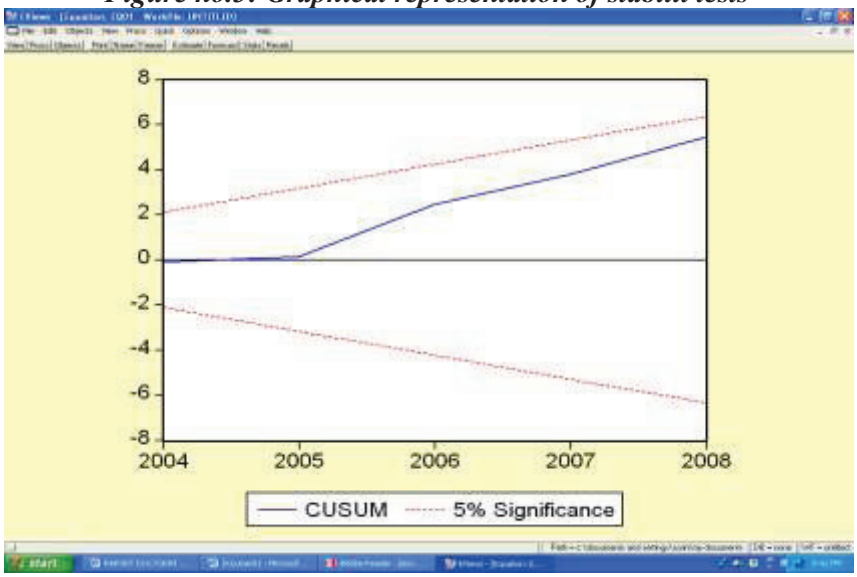
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5829.101	119100.5	-0.048943	0.9640
VFR	-0.156066	4.014568	-0.038875	0.9714
PIBR	0.572674	12.88378	0.044449	0.9673
RESID(-1)	0.109420	0.696034	0.157206	0.8851
RESID(-2)	0.024741	0.697118	0.035491	0.9739

R-squared	0.008605	Mean dependent var	-2.13E-11
Adjusted R-squared	-1.313255	S.D. dependent var	7962.701
S.E. of regression	12110.78	Akaike info criterion	21.91075
Sum squared resid	4.40E+08	Schwarz criterion	21.96040
Log likelihood	-82.64300	F-statistic	0.006510
Durbin-Watson stat	1.502786	Prob(F-statistic)	0.999862

The most important part of the test output is the first part that presents the two statistical tests *F-Statistic and R-squared* and the probabilities associated to these tests. The null hypothesis of these two tests is that there is no serial correlation of the equation errors up to *lag k* (mentioned above). If the probability associated to the two tests is below the level of relevance we are

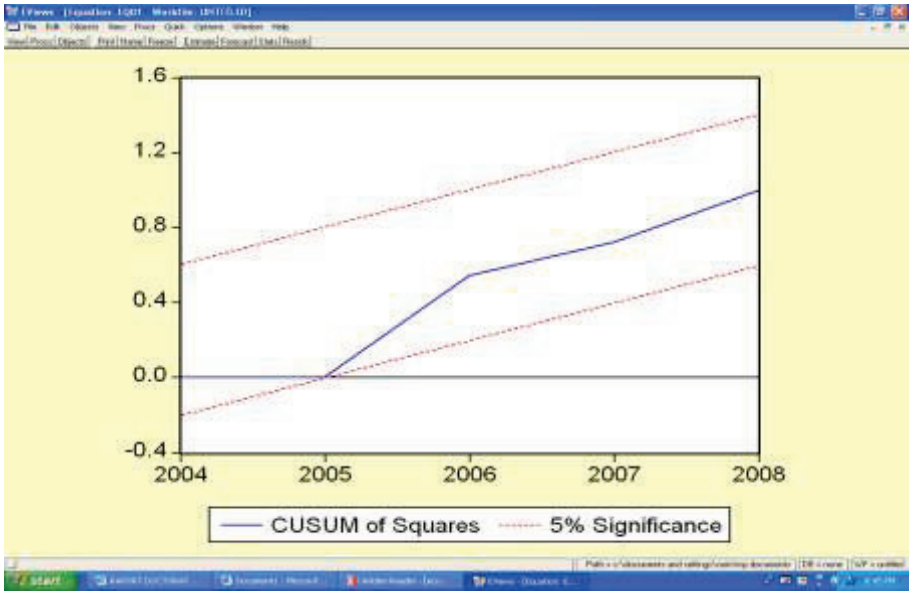
working at, then the null hypothesis is rejected, so we reject the non existence of serial correlation. On the contrary, the null hypothesis is accepted (there is no serial correlation).
The tests of equation stability and of estimated values are available with the option *View/Stability Tets/Recursive Estimates (OLS only)*. The most used tests of stability are: *CUSUM Tests*; *CUSUM of Squares Tests*; *Recursive Coefficients*.

Figure no.3: Graphical representation of stabilit tests



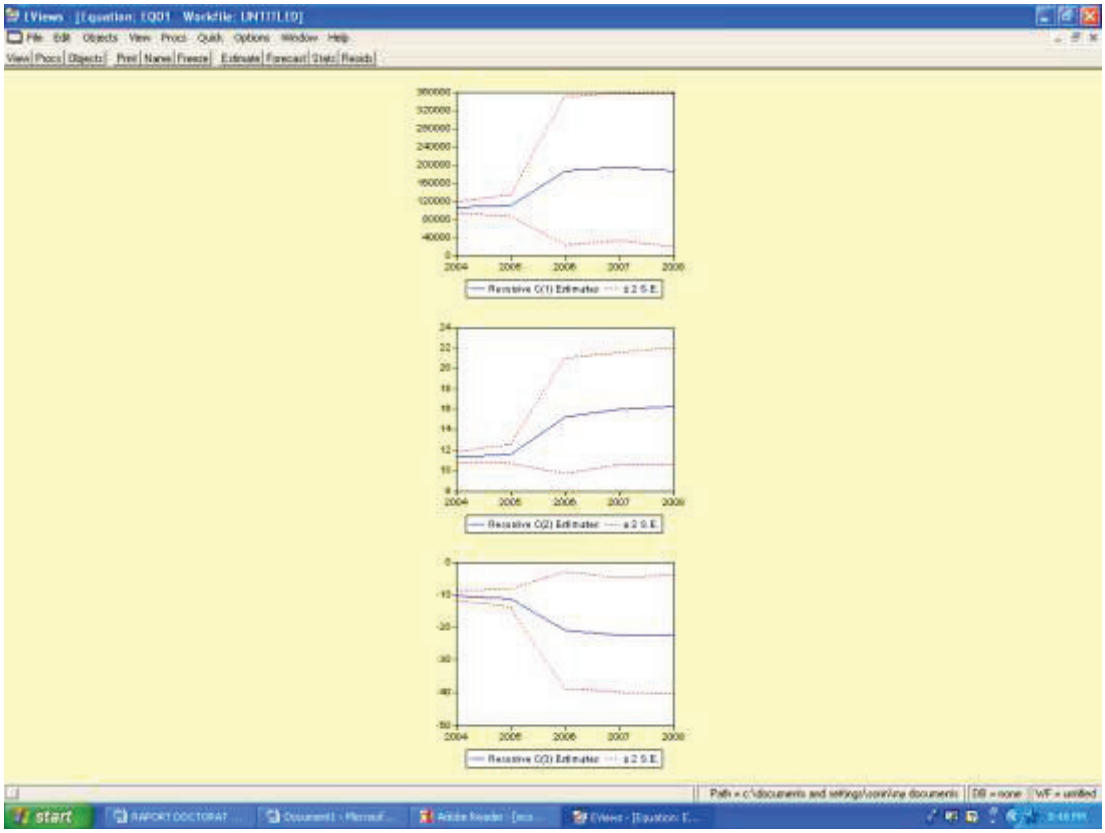
CUSUM test is based on the cumulative sum of the equation errors in regression. EViews represents graphically the cumulative sum of errors together with critical lines of 5%.
The equation parameters are not considered stable if the whole sum of recursive errors gets outside the two critical lines.
CUSUM of Squares test is similarly calculated and interpreted as *CUSUM test*, with the difference that instead recursive errors we use recursive doubled errors.

Figure no. 4: **Graphical representation of stabilit tests**



For the analyzed equation, according to this test, the values of the equation are stable.
Recursive Coefficients presents the equations values calculated regressively.
The values are stable if, together with the increase of the pattern, their value is not modified. For calculating recursive coefficients we start with the first observation *k + 1 where k* represents the number of coefficient of the regression equation. We proceed similarly until we estimate coefficients for the whole pattern of available data. Then recursive coefficients are graphically represented. For the analyzed equation, recursive coefficients are represented in the following graphics:

Figure no. 5: **Graphical representation of stabilit tests**



After having analized the multiple linear regression model the general conclusion is that it is valid. Between the level of fiscal pression and economic activity there is a close relation, that is: a high fiscality determines decreased production activity and investments of economic operators, decreased demand of goods and services, economic growth brakeking process. On the contary, a moderate fiscality stimulates production activity, investments, demand of goods and services and stimulates economic growth.
The problem of fiscal pressure is more actual than anywhere else in our country, due to the fact that we are facing the improvement of the fiscal system, secondly because Romanian economy lacks available capitals to be invested which determined a special fiscal policy, and thirdly, due to our present economic situation, the incomes earned by most payees are not relevant for being marked by a too high fiscality without having unwanted effects.
For fulfilling its purpose within the fiscal policy, the fiscal pressure imposed by public organisms should put toghether two different tendencies totally opposed: on the one hand that of the state, which wants it to be higher and higher for covering the increasing public debts and on the other hand, that of the citizens who want a small fiscal pressure. No matter the terminology used in the

literature in the field, (fiscal coefficient, fiscal tenssion) , fiscal pressure expresses the same idea: that of obligation through imposists for the state.

3. Conclusions and proposals

The practice for over the last years in our country shows that the high frequency of the fiscal system changes have not had as an essential purpose diminishing fiscal pressure on payees, among its main objectives being the following:

Repeated separated and incorrect attempt, sometimes done in campaigns, of adjusting the fiscal system to the budget requirements and less to the strategical and liable needs.

The every four year successive taking of power, which otherwise explicates the democracy of our political evolution, and the struggle of the majority party to maintain its power no matter how much the volume of public expenses has increased, have forced the fiscal system, which has turned fiscality into an important way of supporting such expenses.

The existence and maintaining of an inadequate social-professional structure, of a total disproportion between active and retired people, against weak economic financial performance, has strongly forced the financial system which made it almost impossible to direct the fiscal policy towards the payee.

At present, the effects of the international financial crisis have also affected the economy of our country. In a country affected by financial crisis, which will have to incur investments of billions of Euros in education, infrastructure and defense, alongside with high budget expenses and under the threat of strikes and social conflicts between the Government and all budgetary workers, the fiscal policy detains a very important role. Countries all over the world are taking measures against the international financial and economic crisis. From fiscal point of view, such approaches include simulative packages, ad-hoc measures, temporary stipulations, accelerating the process of implementing several measures that had been previously planned or, adopting all these measures at the same time.

In Romania, the fiscal policy has to be strongly strengthened, the recently approved budget for 2009 representing a step in this direction, especially due to the relatively high funds allocated to investments that could create spillover effects on the other economic fields. Thus, monetary policy is liable to recover gradually. It becomes obvious how a not very optimal combination in the last years (lax budget and salary policies, a very close monetary policy) can be replaced by an optimal combination where all policies (budget, salary and monetary) should have a similar level of restrictions and direct economic activity towards work and productivity.

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