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# Econometric Model Of Inflation And Currency Rate Of Exchange

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**Abstract**:

*Because the frequent utility and the accuracy imposed by the econometrical changing we are going to present a case study made in Romania in 2000-2006. At the end of this case we will find the answer to natural question: who influences whom? (inflation influences the currency rate of exchange or the vice-versa in Romanian economy?)*

The economical relations of a country with the foreign countries have a major importance and a positive effect on the economy of that country. Considering this, an efficient instrument of adjusting the problems which may appear is represented by the currency rate of exchange. In order to be real the efficiency of this instrument it is necessary to achieve the policy rate of exchange system, putting into balance the advantages and disadvantages of each type of rate.

On the order hand it is found on the specialized literature the contention according to which a govern cooperating with the Central Bank may choose one of the following [2]:

- checking the currency rate of exchange and establishing its levels;
- the temporary "freezing" of the rate in order to adjust the prices, production and unemployment"
- alternative politics regarding the currency rate of exchange;
- financing the budget deficit or the surplus by changing the currency reserve.

Considering that lately, the fixed currency rate of exchange was given up, it is very important to be found means through which the currency rate of exchange may be influenced and implicitly to be found the causes that establish the appreciation and the depreciation of the national currency.

In order to stabilize the currency rate of exchange the Government and especially the Central Bank may adjust some measures either monetary policy or money policy.

Considering the negative influences that the instability of the currency rate of exchange may have at the macro economical level it necessary requires adjusting some of these measures.

It is true that the factors which lead to an destabilization of the currency rate of exchange are several and various so that the measures adjusted implies the modernization and permanent control of these factors.

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The currency rate of exchange takes place in the centre of a chain of causes and effects. So, the econometrical analyses may offer answers to the way in which the currency rate of exchange of the national currency responds to the action of some factors either in a direct and immediate way or indirect and with a more and less delay. Thus the equations of regression as part of the econometrics methodology give more accurate the influences of the factors on the currency rate of exchange [3].

In Romanian economy and not only a very important condition regarding the assurance of the stabilization of currency rate of exchange and the control of depreciation is the control of inflation.

According to the relative version of the parity theory of purchasing power the currency rate between two countries initially being into balance goes to values established by the relative price changes between the two countries. In Romania the price determination practice is often invoked by the fact that the price rise is determined not only by the relation leu/dolar but also leu/euro. So it is interesting and necessary to be checked if inflation influences the currency rate of exchange or vice-versa. We are using the method suggested by Granger: Granger test [3].

According to this methodology Granger test can be used when data in line are represented by the chronological series and the economical process represented has an inert nature (just like inflation).

It is necessary to be introduced a X factor in the initial model:

$$y_t = a + by_{t-1} + u_t \tag{1}$$

when:

a) the accuracy of the prognosis rise so that:

$$\sigma^2\left(y(t)/x(t), x(t-k), y(t-k)\right) < \sigma^2\left(y(t)/y(t-k)\right) \tag{2}$$

where the term of the left side of the inequality refers to the residual values $V_t$ from:

$$y = a + by_{t-1} + cx_t + dx_{t-1} + v \tag{3}$$

and the term from the right side of the inequality refers to the residual $u_t$ from the initial model;

b) parameters of regression "c" and "d" which show the role of the $x_t$ , $x_{t-k}$ factors is not zero (provided the methodology of the test t).

It can be found in this method the concept "Granger's causality" which requires the first stage a model of two dependent equation (VAR model):

$$\begin{aligned} y_{1t} &= a_1 y_{2t-1} + a_2 y_{1t-1} + u_{1t} \\ y_{2t} &= b_1 y_{2t-1} + b_2 y_{1t-1} + u_{2t} \end{aligned} \tag{4}$$

Starting from the t test methodology and considering the significance (is different from zero) or insignificance (equal with zero) of the regression parameters raters "a" and "b" the following situation may be possible:

- if $a'_1 \neq 0$, $b'_2 = 0$ – $y_2$ influences $y_1$

- if $a'_1=0$, $b'_2 \neq 0$, $y_1$ influences $y_2$
- if $a'_1 \neq 0$, $b'_2 \neq 0$, two lateral causality (feed - back)
- if $a'_1=0$, $b'_2=0$, the two variables $y_1$ and $y_2$ are independent,
  where $a'_1$, $b'_2$ – the estimators of the regression parameters.

If there are recorded delays of the effect more than one it will taken into consideration the significance of the parameters sum ($\sum a_i \approx 0, \sum b_i \approx 0$).

Granger test can be applied:

- when the option for including or non-including the x-variable in a regression equation is based on the restrictive regression result; that is equivalent to non-including x

$$y'=a'_1 y_{t-1}+b'_1 z_t \tag{5}$$

- when the option for including or non-including the x-variable in a regression equation is based on the non-restrictive regression, that is equivalent to including the x-factor

$$y'_t=a'_1 y_{t-1}+b'_1 z_t+b'_2 x_{t-1}+b'_3 x_{t-2} \tag{6}$$

In both cases of the used regression, calculating the squares sum of the residues this presents the necessary elements for determine the calculated F size with the following relation:

$$F_{calculated}=\frac{\left[\left(\sum u'_{restrictive}-\sum u'_{non-restrictive}\right):m\right]}{\sum u'_{non-restrictive}:(n-k)}, \tag{7}$$

where: m – lag size (delay size)

k – parameters number in the non-restrictive regression

It is recommended for the $F_{calculated}>F_{theoretiq}$ to include the x-variable between regression.

In the last few years there were made a lot of comments related to the inclusion of the econometric models of the explicative variables, comments related to [4]:

- selecting factors based only on economic theory elements
- arbitrary inclusion of explicative variables without verifying carefully their significance for reasons related to the model form
- in this sense Leamer, an English econometrician, suggest a solution according to which the explicative variable will be a causal one if the conditioned distribution of they effect variable referring to x is invariable when the x values generating process is modified.

Coming back to our subject relating to inflation direction determination corresponding to the relations system (1.4.) we will have:

$$\begin{aligned} I^p_{\diagup 0} &= a_0 + a_1 CS_{t-1} + a_2 I^p_{(t-1)\diagup 0} + u_1 \\ CS_t &= b_0 + b_1 CS_{t-1} + b_2 I^p_{(t-1)\diagup 0} + u_2 \end{aligned} \tag{8}$$

where: $I_t^p$ - prices index with a fixed base for the consumer

CS – leu/dollar currency rate of exchange.

Further, we must estimate and test the regression equation parameters using the best square method and the t-test.

The data used refer to 2000-2006 period regarding the index, respectively the medium rate of exchange of the trimester. We look into consideration the quarter as being the most suitable period unity, being given the distance in time, which is usually interposed between the variables modifications included in the analyze.

As a result of the calculations made, there where obtained the results from the solved model:

$$\begin{aligned} I^p_{t/0} &= -0.495 + 2.263CS_{t-1} + 0.673Y^p_{(t-1)/0} \\ CS_t &= 268.43 + 1.0786CS_{t-1} + 0.0005Y^p_{(t-1)/0} \end{aligned} \quad (9)$$

We have also obtain the following values for determination report ($R^2$), Snedecor test (F) and Durbin-Watson test (DW):

$R^2$=0.9957; F=3167; DW=1.98
$R^2$=0.983; F=711; DW=1.8

The regression parameter testing was accomplished using the t-test and in this way there were obtained the following values for the calculated corresponding to each rater:

| | $a'_0$ | $a'_1$ | $a'_2$ |
|---|---|---|---|
| $t_{calculated}$ | -0.64 | 4.207 | 0.635 |

| | $b'_1$ | $b'_2$ | $b'_3$ |
|---|---|---|---|
| $t_{calculated}$ | 0.89 | 21.98 | 0.05 |

Starting with these values of $t_{calculated}$ we can notice that the rater which obviously differs from 0 is $a'_1$ because by comparing it:

$$t_{calculated} > t_{theoretic}$$

(4.207>2.051)

On the other side the $b'_3$=0.0005has a great significance for t-test because $t_{calculated}$=0.0456 for α=0.05.

## Conclusions

In conclusion, the important influence direction signifies that in Romania the currency rate of exchange determined the price index modification at least for the mentioned period of time. The values of Snedecor test indicate that evolution of prices index is very much influenced by the currency rate of exchange and also the big value of determination report.

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