The Relationship between the EUR/RON Exchange Rate and The Romanian Inflation

By

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Abstract:

Using monthly data from January 2000 to October 2007, the present working paper analyses the degree of exchange rate pass through into inflation in the case of Romania. The econometrical method used is the recursive VAR that suggested a low level of the influence of the exchange rate on inflation. Despite the historical role of the exchange rate on the macroeconomical adjustment, this finding is consistent with the inflation targeting regime adopted by National Bank of Romania.

1.   Introduction

There are many debates regarding the monetary policy suitable for transition economies: all these countries experienced episodes of inflation and due this recordings the level and the influence factors for the internal prices is very important for political ruler. Due to the size of international trade and capital flow and also due to the dependence of small open economies on global market, one of the main determinants of inflation is the level of the exchange rate pass through. The influence of the exchange rate volatility on the macroeconomics indicators affects not only the participants to the international trade, but also the monetary policy. From Romanian point of view, the degree of passing through is important due to the decision of adopting inflation targeting because if the influence of the exchange rate on the inflation is lower, then the independence in conducting the monetary policy is bigger.

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2.   Literature Review

The changes at the prices' level due to the modification at the exchange rate's level are called "exchange rate pass through". There is many ways to study this macroeconomic phenomena and Gueorguiev (2003) identify, two opinion trends in theory about pass through: one is Obstfeld and Rogoff's (1995), who analyze the influence of the exchange rate over the inflation, in a economical environment with fixed prices and monopolistic competition, taking into account the ratio between local prices and the partnership's currency, which takes part at commercial transactions; the other approach developed by McCarthy (1999) uses a simplified form of the "distribution chain" model, where the influence of the exchange rate is conditioned by the different shocks at the level of demand and offer, which is reflected in the imported goods, at the production prices and at the consuming goods.

Taylor (2000) was the first who disputed the lower passing at the inflation level manifested beginning with 1990. The explanation is made with a model based on the companies' behavior. The companies establish the prices for a couple of months in advance and the settled prices will be changed only if the cost's alteration is estimated as being persistent. The reason for such a behavior is the wish to maintain the actual market share. In conclusion, for no inflationary economical environment the pass through will tend to be lower. Another explanation can be represented by the lower proportion of imported goods in the basket used for determining the consuming goods' prices and the lower quantity of imported breeding materials.

Choudhri and Hakura (2001) link the lowering of the exchange rate pass through with credibility degree for the adopted monetary policy. The study uses a large panel data for seventy one countries and is based on the hypothesis that inflation expectations are linked by the actual level of inflation and show that the inflation's level dominates the exchange rate and the macroeconomic variables, which explains the differences form one country to another between the levels of putting the prices out in inflation.

The Taylor hypothesis is extended by McCarthy (1999). Changing the exchange rate and the impact over the production prices, consuming goods' prices and well as the imported goods are analyzed using the distribution chain and a recursive VAR. The study is made for nine industrialized countries and this survey shows that there is a reduced effect for the exchange rate over the consuming goods and this phenomenon is linked with the economy's degree of openness, respective with the import share in consuming goods basket.

3.   The Methods of Exchange Rate Pass Through and Influence Factors

According to Kiptui, M., D. Ndolo and S. Kaminchia (2005), the process of passing the exchange rate into inflation has two stages: during the first step, the changes of the exchange rate is reflected in the imported goods' prices, and in the second stage the prices for the imported goods are transmitted to the consuming goods according to the coefficient of imported goods in the basket of consuming

goods, in conclusion, the countries with a high degree of imports are more possible to have a higher pass through of the exchange rate. The prices for the consuming goods will be also affected through a secondary channel: the supply-demand mechanism. A monetary depreciation will have as side-effect higher prices for imported goods; as a result, internal consumers will switch the choices from foreign to national goods. The higher demand for national goods will be reflected in higher prices due to the production's rigidity (not all the new demand can be covered by supply).

The exchange rate pass through level is depending also by the companies' behavior. For competitively markets, the economic agents tend to act as a pass through decreasing factor. When the companies are not sure that the price alteration is temporary (due to the volatility of the exchange rate) or permanent (due some changes in macroeconomical environment), will delay the price's changes until they can somehow determine the shock's characteristics. In order to maintain the customers and the market share, the economical agents will register lower profits until the adverse evolution of exchange rate will be past.

4.   The Analyze Of the Link between the Exchange Rate and Inflation in Romania

During the transition period to market economy, the Romanian inflation was very high, reaching at the beginning of the period at maximum limits of 200-300% comparing with previous year. The monetary policy authorities had as major concerning to identify the inflations' influence factor and to limit the price rising. According to IMF (2001), the econometrical proofs indicate the price of the working force as the most important cause of the inflation. The inflation component of the cost for the working force derives from financial indiscipline at the companies' level, that pay higher salaries than imposed by the labor productivity, and even more than they could afford. Another important role in explaining the inflation evolution was due to growing the monetary mass and the credit. National Bank of Romania uses during almost all this interval the exchange rate as nominal anchor for monetary policy in order to achieve the stability of prices.

Unlike the first stages of the transition, starting with 2000, Romania adopted a macroeconomical policies mix which had as effect the continuous descending of inflation measured by CPI (figure 1).

Because BNR adopted in 2005 the strategy of inflation targeting, then the factors that influence the aggregate price level are highly important. The changes in the exchange rate level are reflected in the prices for the imported goods and are transmitted to the prices for all the consuming goods, so the exchange rate pass through phenomena is a very actual topic.

During 2006, deflation process continues, the annual rate of the inflation was substantial reduced until the desired percent of 6.56% measured by CPI, at the end of the year, although in May and June as at a higher level. The main sustaining level of deflation identified by NBR (2007) was the evolution of volatile prices, whose annual rhythm knew an important lowering.

In the second half of 2007, due to the drought, the food prices sudden increased. This fact, together with the negative evolution of exchange rate due to the high volatility on the international financial markets, had as effect the miss of inflation target.

In order to determine the effect of variation of the exchange rate over the prices, was used the distribution chain developed by McCarthy in 1999 and used also by Gueorguiev (2003). In order to estimate the shock for the offer's level, was used the harmonized prices index for the European Union; this index was chosen because our country is a goods' importer, especially of products designed for intermediary and final use for the people.

$$\Delta P^{HPI} = E_{t-1}(\Delta P_t^{HPI}) + \varepsilon_t^{HPI} \tag{1}$$

$$\widetilde{y} = E_{t-1}(\widetilde{y}_t) + \alpha_1 \varepsilon_t^{HPI} + \varepsilon_t^{\widetilde{y}} \tag{2}$$

$$\Delta e_t = E_{t-1}(\Delta e_t) + \beta_1 \varepsilon_t^{HPI} + \beta_2 \varepsilon_t^{\widetilde{y}} + \varepsilon_t^{e} \tag{3}$$

$$\Delta P^{PPI} = E(\Delta P^{PPI}) + \gamma_1 \varepsilon_t^{HPI} + \gamma_2 \varepsilon_t^{\widetilde{y}} + \gamma_3 \varepsilon_t^{e} + \varepsilon_t^{PPI} \tag{4}$$

$$\Delta P^{CPI} = E(\Delta P^{CPI}) + \delta_1 \varepsilon_t^{HPI} + \delta_2 \varepsilon_t^{\widetilde{y}} + \delta_3 \varepsilon_t^{e} + \delta_4 \varepsilon_t^{PPI} + \varepsilon_t^{CPI} \tag{5}$$

In order to make the estimation, monthly data series were used for the consumers price index (CPI), the industrial production index *(PPI)*, the exchange rate EUR/RON (*EURRON*) and the industrial production for the time period beginning with January 2000 – October 2007 (figure 2). In order to assure the data compatibility, because in 2005 the Romanian leu was denominated, the estimation was done in RON. In order to determine the exogenous shock at the supply's level, was used the harmonized consumer goods prices index of European Union (HCPI), and the source for this being the Central European Bank. The gap of the output (used as proxy for a shock at the demand level) is defined as the difference between the actual and potential output, where the potential output reflects the maximum output without generating inflation. The output's gap (*OUTPUTGAP*) is determined by using the Hodrick-Prescott filter: $Y_{GAP} = Y - Y_{HP}$.

In order to damper the disturbance created by the decision of NBR to not influence anymore the exchange rate, in November 2004, a dummy variable was introduced.

The first part of the analyze consists in making the Granger causality tests (table 1). The Granger's causality indicates the measure in which the value of one variable is explained through the past values of another variable, but the cause-effect relationship resulted in the econometrical calculation does not imply the real link between the two variables, the relationship must be certified by the economical reality. In conclusion, results obtained from this test must be double-checked by the Romanian macroeconomic environment.

The model of the distribution chain suggested by McCarthy and modified to the condition of Romanian economy used is compound from equations (4) and (5)

and is validated by statistical tests of causality. The consumer price index is influenced by the prices for industrial production, by the output's gap, by the harmonized price index for the European Union and by the exchange rate; also the prices' coefficient for the industrial production are influenced by the consumer price index, by the output's gap, by the harmonized price index in the European Union and also the exchange rate (table 1). It is to be observed the double way relationship between CPI and PPI: both the coefficient for the industrial production's prices influence the consuming goods index and vice-versa.

The autoregressive vector (VAR) is used to determine the systems formed from time series interconnected and also for the analyze of the random shocks over the system variables. The number of lags chosen for estimating the VAR was determined in such a way that the AIC was diminished: thus, a number of three lags were chosen. This number of lags is consistent with the observation regarding Romanian economy, according to which the alteration at the level of one variable from the transmittance chain is fast transmitted to another variable. The resulted VAR after the estimation has the following form. The lags with a low importance are taken out of the equation:

$$\text{DCPI} = 0.274142 \times \text{DCPI}(-1) + 0.215270 \times \text{DCPI}(-2) + 0.221392 \times \text{DCPI}(-3) +$$
$$\quad [2.44] \qquad\qquad [1.94] \qquad\qquad [1.99]$$
$$+ 0.155355 \times \text{PPI}(-2) + 0.811414 \times \text{DHCPI}(-1) - 0.249297 \times \text{DHCPI}(-3) +$$
$$\quad [2.55] \qquad\qquad [1.15] \qquad\qquad [-0.37]$$
$$+ 0.431055 \times \text{DOUTPUTGAP}(-1) + 0.768129 \times \text{DOUTPUTGAP}(-2) +$$
$$\quad [0.15] \qquad\qquad\qquad [1.26]$$
$$+ 0.398058 \times \text{DOUTPUTGAP}(-3) + 0.083533 \times \text{DEURRON}(-1) +$$
$$\quad [1.38] \qquad\qquad\qquad [2.86]$$
$$+ 0.017741 \times \text{DEURRON}(-2) + 1.251619 - 1.694210 \times \text{DUMMY}$$
$$\quad (6)$$
$$\quad [0.35] \qquad\qquad [3.06] \qquad [-1.92]$$

There must be observed the inertia of inflation phenomenon in Romania, the level of the coefficient for the consumer price, being highly influenced by the previous values; also, the biggest influence is compressed in the inflation for the consuming goods on previous month.

Regarding the prices' for industrial production, there can be seen a two month delay in extending the inflation wave. This is due to commercial contracts established beforehand with fixed prices, which are still developing (the previous month have also an influence due to the new contracts but very low).

The effect to the harmonized prices index for the European Union spreads the fastest; Romania is a country which has imported goods as final consuming goods and the inflation degree spread through prices' coefficient is a big component for the total amount of inflation. It is to be observed the negative coefficient associated to the third lag of index of harmonized price. The explanation for this negative coefficient is linked by the customer's reaction to give up buying imported goods because of their high prices.

The output's gap, used as a proxy for a shock at the demand's level has significance for all the three lags taken into focus when making the equation and

has the widest intensity. As higher a demand for a certain category of goods or for all consuming goods has as effect bigger prices and inflation acceleration.

It is puzzling the low relationship which exists between the exchange rate EUR/RON and the coefficient for consuming goods prices. The reason is given by low exchange rate pass through, which started to register in Romania as well. The producers and importers wanted to put on they loses due to the exchange rate's volatility. However, as the end of year 2007 shows, the disturbances from currency markets are transmitted in to inflation, through contagion effect, when the general perception is that shocks are not transitory ones.

The conclusion for the consumer goods price index can be generalized for industrial production price index, as shown in the following formula:

$$
\begin{aligned}
DPPI = & \, 0.058235 \times DCPI(-1) - 0.001517 \times DCPI(-2) + 0.356233 \times DCPI(-3) + \\
& + 0.026708 \times DPPI(-1) + 0.2057020 \times DPPI(-2) + 0.022556 \times DPPI(-3) + \\
& + 0.502587 \times DHCPI(-1) - 0.884552 \times DHCPI(-2) - 0.687981 \times DHCPI(-3) + \\
& + 1.455364 \times DOUTPUTGAP(-1) + 4.62726 \times DOUTPUTGAP(-2) - \\
& - 4.420820 \times DOUTPUTGAP(-3) + 0.089387 \times DEURRON(-1) + \\
& + 0.042433 \times DEURRON(-2) + 0.015618 \times DEURRON(-3) + 3.347807 \\
& + 0.504754 \times DUMMY
\end{aligned} \tag{7}
$$

The difference is represented the degree of passing of the exchange rate into inflation, which is bigger if it is used this quantification method. The relationship may be explained by the influence of fuels and oil reflected more at the level of industry, prices mainly expressed in foreign currency.

Decomposing the variance permits to examine the importance of shocks of the exchange rate in order to explain the prices for consuming goods and industrial production on the whole analyzed period of time, also it indicates the degree in which the foreseen inflation variation can be assigned to the shock. Decomposing the price coefficient was made for 12 periods of time (one year). As shown in Figure 3, the two variables are influenced by their own past values. It is interesting how an important part (almost 20%) of the prices for industrial production is explained through the evolution of the prices for consuming goods. The explanation for this unusual observation is given by the lowering the degree of exchange rate pass through into prices, which started to function in our country as well. The producers became very careful with the retail market and because they want to maintain the market level, prefer to bear a part of the rise of prices and diminishing the profit level.

The following step in making the estimation is by studying the effect over producing a shock at the level of the exchange rate (figure 4). As the other test foresee, this shock will have reduced side-effects over the inflation in Romania, which proves a lower pass through of the exchange rate into inflation. A depreciation of the rate has as an effect the rise of inflation, being the second month from the shock and the percentage of 25% CPI and 26.37% for PPI. The first reaction for the prices' coefficient is one of descending; having in mind that the producers tend to bear some of the negative effects of changing the exchange

rate, but hoping that these effects will be transitory and this way the market level will be maintained.

The effects of the shock are quite persistent, even though the amplitude is not that big, descending under 1% after one year (CPI), respectively 10 months (PPI). After one year, the inflation's reaction tends to be zero, but not inexistent. Thus, it is proved once again, how important is the previous inflation, the people couldn't be able to forget so easily the inflation periods after the revolution.

5.   Concluding Remarks

The economical stability form the last period and raising the transparency in the NBR's monetary policy conducted to rising the credibility of central bank, regarding the deflation and lowering the volatility of the exchange rate. Also, the rise of competition on the consuming goods' market, included the imported goods resulted in a low profit margin of producers, which had as side-effect the lowering the exchange rate pass through.

In the last years, the degree of passing the exchange rate into inflation has decreased at maximum 25%. These levels of the passing stage have a dual character: are, on one hand, influenced by higher previous values and on the other hand, the economical situation in our country and monetary credibility had as effect the lowering of the influence of exchange rate over the prices. Thus, the future steps of inflation can be input at a lower level.

The lowering of the degree of putting the exchange rate into inflation doesn't only have a theoretical importance but a practical one, due to NBR's decision of adopting inflation targeting. Historically, after 1990, exchange rate was used as nominal anchor for monetary policy. The high degree of exchange rate pass through (60%-70% in the beginning of transition period, according to Gueorguiev (2003)) made this strategy to be the only one viable for Romania. Once the inflation targeting is adopted, the attention on the exchange rate was highly reduced. In the last years, BNR's intervention on the money market in order to influence the exchange rate for accomplishing the Bank's objectives was reduced quantitatively. In this circumstances, the descend of the degree of exchange rate pass through into inflation is good because the high volatility of the exchange rate for short time periods and won't influence the inflation objective established by BNR; but for long time periods will affect the target.

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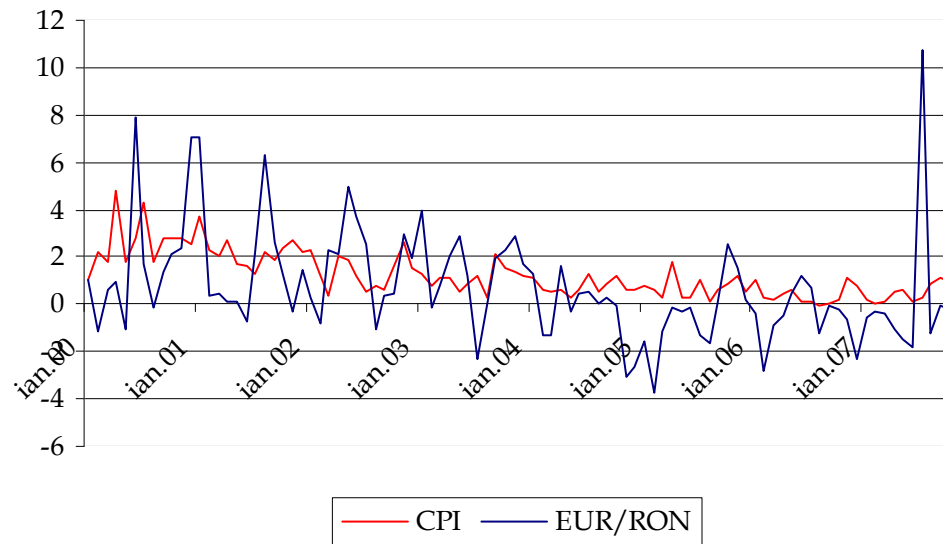
11. *** NBR – Statistical Section of Monthly Reports.

APPENDIX

Table 1: Granger causality tests

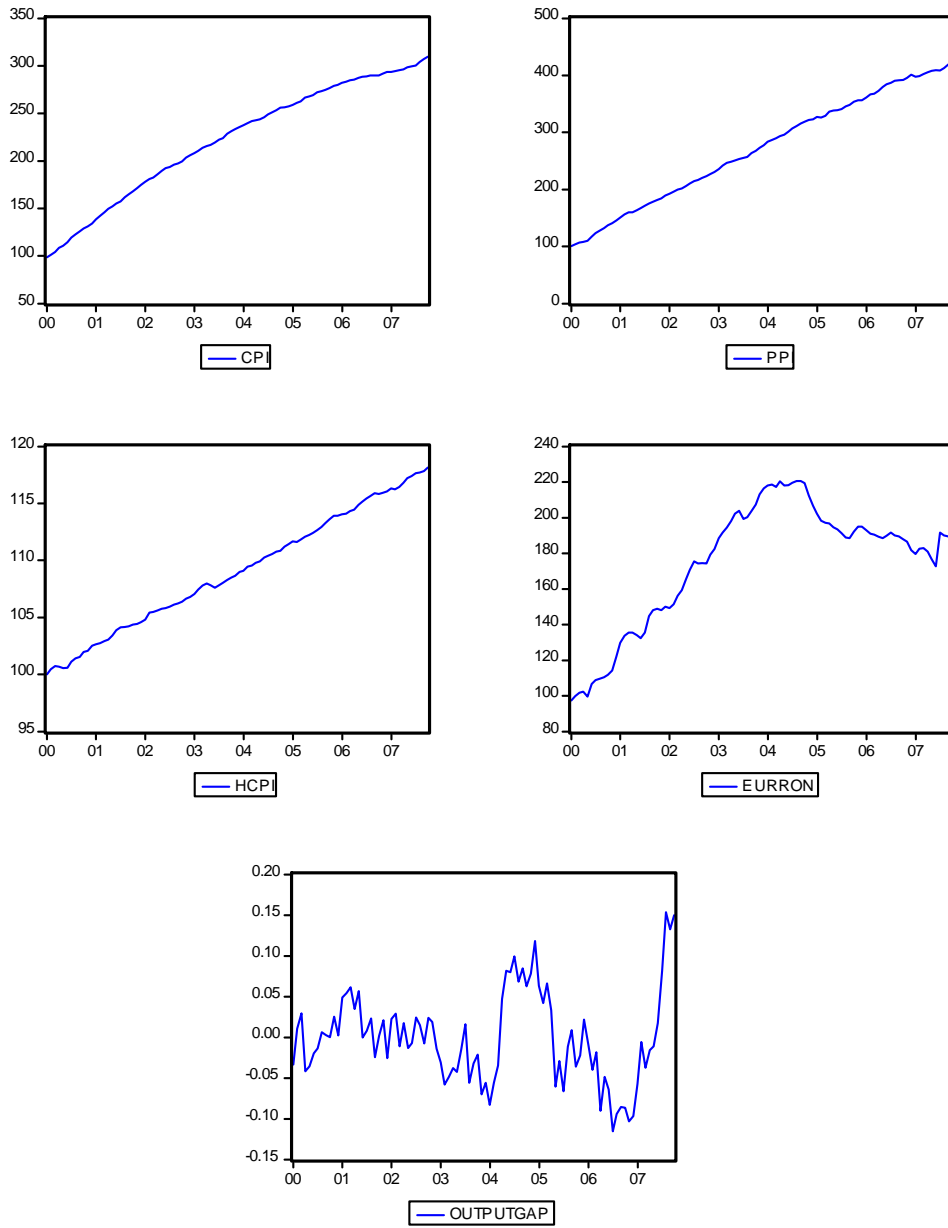| Pairwise Granger Causality Tests			
Sample: 2000:01 2007:10			
Lags: 12			
Null Hypothesis:	Obs	F-Statistic	Probability
PPI does not Granger Cause CPI	81	1.79789	0.07089
CPI does not Granger Cause PPI		1.19974	0.03063
HCPI does not Granger Cause CPI	81	1.59439	0.01199
CPI does not Granger Cause HCPI		1.16621	0.32935
EURRON does not Granger Cause CPI	81	2.54956	0.00921
CPI does not Granger Cause EURRON		1.05680	0.41295
OUTPUTGAP does not Granger Cause CPI	81	1.58242	0.01236
CPI does not Granger Cause OUTPUTGAP		1.25467	0.27119
HCPI does not Granger Cause PPI	81	1.05679	0.00413
PPI does not Granger Cause HCPI		2.06591	0.03464
EURRON does not Granger Cause PPI	81	1.27043	0.00262
PPI does not Granger Cause EURRON		2.56955	0.00872
OUTPUTGAP does not Granger Cause PPI	81	1.30549	0.00242
PPI does not Granger Cause OUTPUTGAP		2.12050	0.02987

Source: Own estimation based on NBR data

Figure 1:   Inflation and EUR/RON exchange rate evolution (monthly change)
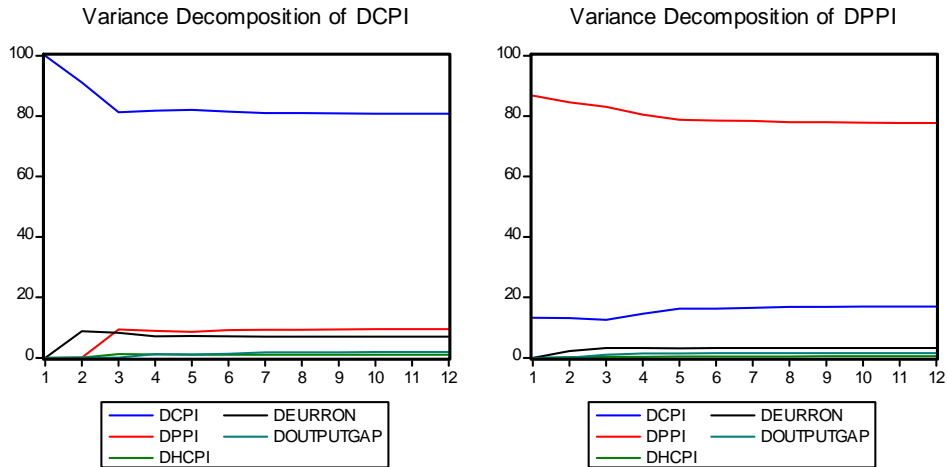January 2000–October 2007

Source: Own graphic based on NBR data

Figure 2: The data used
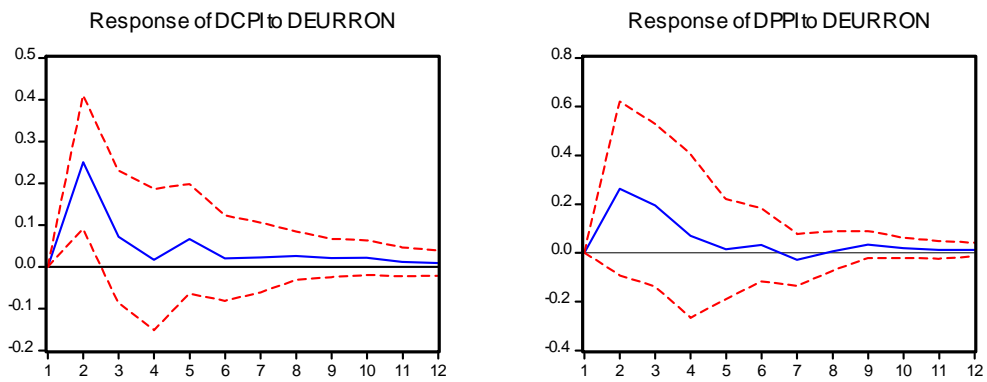

Source: Own graphic based on NBR data

Figure 3: Variance decomposition for CPI and PPI

Variance Decomposition of DCPI   Variance Decomposition of DPPI

Source: Own graphic based on own estimation using NBR data

Figure 4: Response of CPI and PPI to an exchange rate shock

Response to One S.D. Innovations ± 2 S.E.

Response of DCPI to DEURRON   Response of DPPI to DEURRON

Source: Own graphic based on own estimation using NBR data